HEGGIES

REPORT 10-8765-R2

Revision 2

Proposed Residential Development
Discovery Point Concept Plan Wolli Creek
Wind Tunnel Study - Environmental Winds

PREPARED FOR

Australand Holdings Limited
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30 JULY 2010

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Proposed Residential Development
Discovery Point Concept Plan Wolli Creek
Wind Tunnel Study - Environmental Winds

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EXECUTIVE SUMMARY

Heggies Pty Ltd (Heggies) has been commissioned by Australand Holdings Limited (Australand) and Landcom to assess the impact on the local wind environment of the proposed Discovery Point Development Concept Plan, Wolli Creek, via an Environmental Wind Tunnel Study.

The Discovery Point site is located at Wolli Creek and is bounded by the Princes Highway on the east, the Illawarra Rail Line on the west and Cooks River to the north. The immediate surrounding premises consist of several medium/high rise residential buildings and low rise warehouses to the south west. The development site sits to the west and south of the Cooks River waterways.

This report assesses the wind environment of the proposed Discovery Point Concept Plan to be developed on the site. The proposed Discovery Point Concept Plan comprises of mixed-use building envelopes, maximum heights ranging from RL 42.7 to RL 79.65 (which corresponds to an indicative 5 to 21 storeys) that will be progressively constructed.

In relation to key characteristics of the Sydney Region Wind Climate (refer wind roses provided in **Appendix A**) relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- Summer winds occur mainly from the northeast, south and southeast.
    - While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer.
- Winter/Early spring winds occur mainly from the west and the south.
    - West quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

The wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/sec *"Walking Comfort"* criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc, the 16 m/sec *"Walking Comfort"* level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.

The test approach used for the current study is the so-called "Scour Technique". This industry accepted technique is particularly suited to the assessment of large development sites and provides reliable estimates of pedestrian level winds, especially when large areas are to be assessed.

This technique has enabled the entire site to be assessed in terms of its wind comfort.

Initially, a set of baseline tests was performed to determine locations where the maximum annual gust speed has the potential to exceed the standard wind comfort in the absence of wind mitigation measures, in particular without landscaping. These test results provided a clear insight as to the specific approach angles and extent of impacted area where potential adverse wind conditions may occur as well as the potential level of exceedance of such adverse conditions.

This information was then used to assess the effectiveness of already-planned landscaping and concept planning for architectural treatments such as canopies, awnings, etc.

EXECUTIVE SUMMARY

- It was found that the currently planned landscaping will mitigate most of the potentially adverse wind conditions identified throughout the site.
- Additional landscaping and horizontal windbreak elements (ie awnings, canopies) have been proposed to supplement the already-planned landscaping, on the basis of the current wind tunnel test results.

The combination of currently planned landscaping, additional landscaping described above and localised wind treatments (eg awnings at major building entrances) will enable wind speeds throughout the Discovery Point Concept Plan to be contained at or below the 16 m/sec walking comfort criterion.

The current Concept Plan will be refined during the detailed design stage of each specific building within the development. It is therefore recommended that, as each building design progresses to the point of confirmed design approval, the wind mitigation treatments are also refined, ie specific landscaping strategies, dimensions recommended for awnings, etc, to ensure that wind comfort conditions are achieved.

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1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been commissioned by Australand Holdings Limited (Australand) and Landcom to assess the impact on the local wind environment of the proposed Discovery Point Development Concept Plan, Wolli Creek, via an Environmental Wind Tunnel Study.

1.1 Director-General's Environmental Assessment Requirements (DGRs)

The DGRs were received from the NSW Department of Planning on 23 March 2010. The "Issues" relating to wind are outlined below, using the DGR's "Issue No." reference.

1 Planning EPI's, Policies and Guidelines

The EA must address planning provisions applying to the site, including permissibility and the provisions of all plans and:

5A Environmental and Residential Amenity

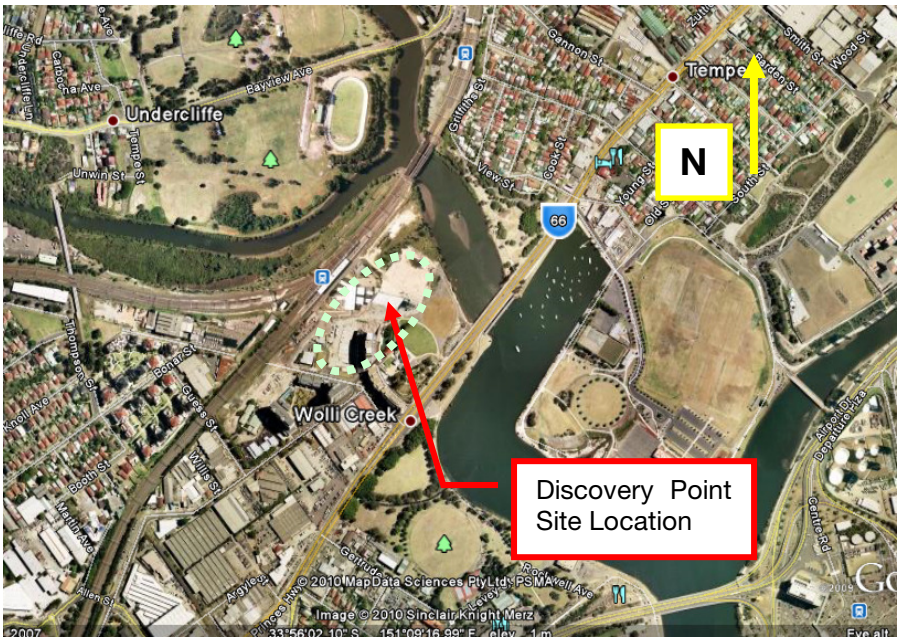
- The EA must address wind impacts and achieve a high level of environmental and residential amenity.

2 DEVELOPMENT SITE

The Discovery Point site is located at Wolli Creek and is bounded by the Princes Highway on the east, the Illawarra Rail Line on the west and Cooks River to the north. The immediate surrounding premises consist of several medium/high rise residential buildings and low rise warehouses to the south west. The development site sits to the west and south of the Cooks River waterways.

Construction of three buildings (Greenbank, Verge and Vine), of the Discovery Point development located at the southern end of the site are underway or complete. This report assesses the wind environment of the proposed Concept Plan covering the remaining buildings to be developed on the site.

Figure 1 Site Location



2.1 Proposed Concept Plan Description

The proposed Discovery Point Concept Plan comprises of mixed-use building envelopes, maximum heights ranging from RL 42.7 to RL 79.65 that will be progressively constructed. **Figure 2** shows the proposed Concept Plan for the Discovery Point development including the building identifier labels.

Figure 2 Discovery Point Concept Plan

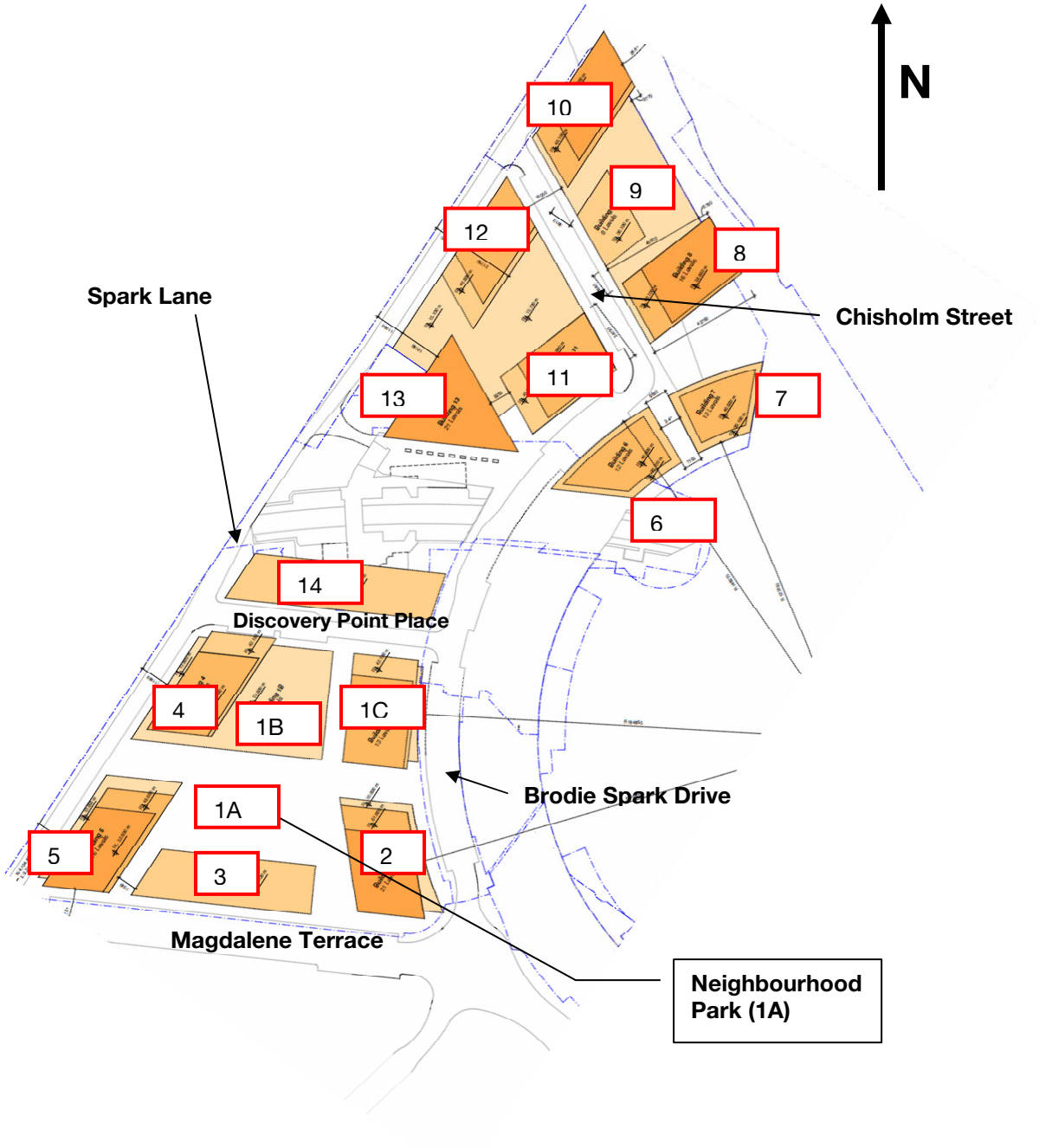


Figure 3 shows the Indicative roof level plan the Discovery Point Concept Plan and surroundings east of the Illawarra Railway line.

- The existing buildings are shown in white, including the three Discovery Point buildings already approved and under construction or complete.
- The remaining proposed buildings within the proposed Discovery Point Concept Plan development are shown in green and grey.

Figure 3 Indicative Plan Roof Level

3 SYDNEY'S WIND CLIMATE

The data of interest in this study are the annual, extreme mean hourly wind speeds and largest gusts experienced throughout the year, how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney wind seasons.

3.1 Seasonal Winds

In relation to key characteristics of the Sydney Region Wind Climate (refer wind roses provided in **Appendix A**) relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- Summer winds occur mainly from the northeast, south and southeast.
  - While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer.
- Winter/Early spring winds occur mainly from the west and the south.
  - West quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

3.2 Wind Exposure at the Site – the "Local" Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, which all influence the "local" wind environment.

- The development site currently receives moderate shielding at lower levels from the low rise developments surrounding the site from the south clockwise around to the northeast.
- The site is somewhat more exposed to winds from east to southeast quadrant due to the low lying over-water terrain in close proximity to the proposed development in this direction.

4 WIND ACCEPTABILITY CRITERIA

4.1 Standard Local Government Criteria

The wind acceptability criteria found in Central Sydney DCP 1996 Section 4.2 were developed from research on suitable criteria for evaluating the acceptability of particular ground level conditions. They are currently referenced by many Australian Local Government Development Control Plans (including Rockdale City Council) and have been summarised in **Table 1**.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	**16 m/s**	**Comfortable Walking**
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/sec *"Walking Comfort"* criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc, the 16 m/sec *"Walking Comfort"* level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.

4.2 Application of Standard Council Wind Criteria

The criteria provided in **Table 1** should not be viewed as *"hard"* numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary with the height, strength, age, etc, of the pedestrian concerned.

A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

Finally, it is noted that the limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year. Winds at all other times, ie monthly winds, weekly winds, etc, would be of lesser magnitude. So for example, a location with a maximum annual gust of 10 m/sec would experience winds throughout the year of a generally very mild nature, conducive to stationary activities (seating, dining, etc).

5 WIND TUNNEL TEST METHODOLOGY

5.1 Simulation of Natural Wind

Similarity requirements between the wind tunnel model and prototype (ie full-scale) need to be fulfilled so that similitude in the flow conditions is satisfied. Usually all requirements cannot be satisfied and compromises need to be made. In this type of wind tunnel test it is possible to waive strict adherence to the full range of similarity parameters.

- The wind tunnel test has been carried out using a geometric length scale of 1:400 for all dimensions and by scaling the boundary layer approach wind in the wind tunnel to the same scale as in the atmosphere.

The approach wind was modelled by matching Terrain Category conditions for all wind directions. In the wind tunnel, this is achieved by an upstream trip fence and a 15-metre fetch of appropriate roughness elements. The upstream profile conditions simulated in the present study is a terrain category 3 due to the medium density suburban surroundings.

To take into account the influence of the immediate surrounding physical environment, all neighbouring buildings and local topography within a 400 m radius around the site were included in the purpose-built 1:400 scale *"proximity model"* used for the test. The proximity model details included in the test turntable simulate existing building conditions as of May 2010.

Note that the existing and proposed landscapes were not included in the wind tunnel model. The wind mitigation provided by proposed landscape is assessed afterwards to check if areas of high wind flow are properly mitigated. Refer also the discussion in **Section 6.1** for further explanation of this methodology.

Figure 4 Scaled Development Model in Wind Tunnel (View from East)

5.2 Test Method – "Scour Technique"

The test approach used for the current study is the so-called "Scour Technique". This technique was developed in the 1980s and is particularly suited to the assessment of large development sites.

- In the scour technique, all spaces between the buildings of the scaled Discovery Point model are covered with a uniform layer of particulate matter ("sand").
- The wind tunnel speed is then increased in several stages.
- At each stage, scouring of the "sand" takes place and is allowed to reach a steady state.
- The resulting scour pattern indicates where the wind speed is greater or equal to the pre-determined (ie known) threshold scour speed (V_{sc}) of the chosen "sand" material.

This technique has been used in numerous wind tunnel studies, on projects such as the large-scale Canary Wharf development, London UK, as well as a number of similar-scale Sydney projects, eg Forest Road (Hurstville), Waterpoint (Homebush Bay).

Comparison with quantitative data obtained using hot-wire anemometers have shown conclusively that the technique provides reliable estimates of pedestrian level winds, especially when large areas are to be assessed.

5.2.1 Cubic Model Scour Test – Threshold Scour Speed V_{sc}

During the wind tunnel tests, four different reference wind velocities, V_{Ref}, at a constant reference height are used. The reference wind speed is kept steady for at least several minutes, during which the "sand" is blown away around the model and the scour pattern observed. The scouring contour for each reference wind speed is then marked and a photograph taken. The contour lines are quantified with a scale factor:

$$\Phi = \frac{V}{V_{ref}}$$

where Φ = scour scale factor

V = velocity at the sand contour

V_{ref} = reference wind velocity at reference height

Figure 5 shows the sand erosion contours around a cubic model for different free stream wind velocities tested in the wind tunnel, as performed for wind comfort studies. The wind velocity is augmented, each velocity is kept constant for several minutes and then a top view picture taken. The wind tunnel velocity is then raised to the next reference wind speed.

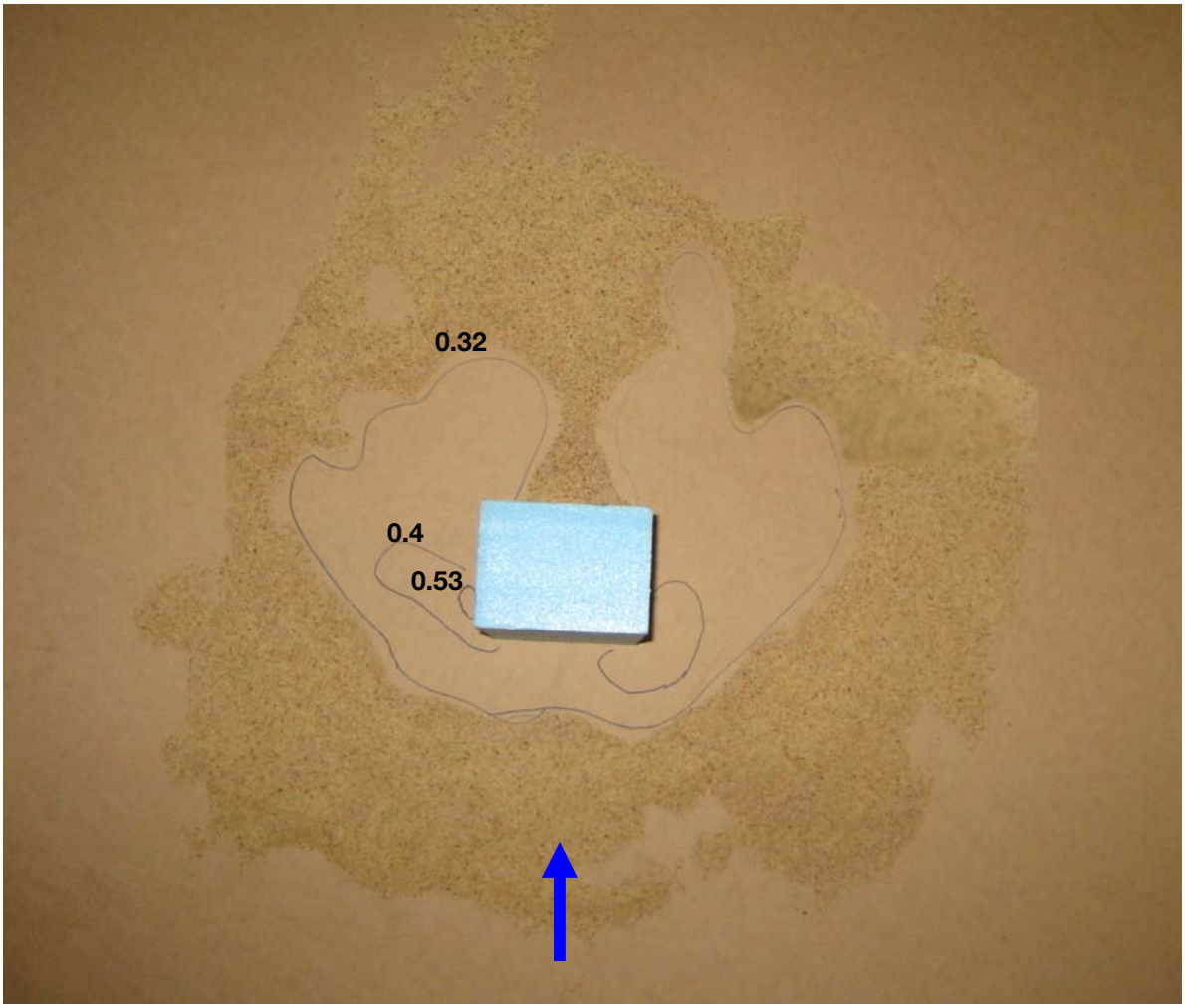
To "calibrate" the scouring patterns, the wind tunnel is run again with the same free stream velocities which were used for the scour part of the test.

The wind speed at ground level at locations within the already-observed scouring contours are then measured using a hot-wire anemometer. From the hot wire measurements, the scour velocity for that contour (V_{sc}) is noted and the scale factor, Φ, for each contour calculated.

The scale factor (Φ) for each contour is marked next to the contour line – as shown in **Figure 5**.

Once the scale factors are known, they can be related to the local wind climate via the probability distribution of winds at the known reference height, eg 1-week return period winds, 1-year return period winds, etc. This then can be related to the wind comfort criteria discussed in **Section 3**.

Figure 5 Scour Contours around a Cube at Different Free Stream Wind Speeds



5.2.2 Discovery Point Concept Plan Scour Test

The scour technique used for the scaled model testing of the Discovery Point Concept Plan development utilised four different reference wind speeds similar to the single cube test described above. The wind tunnel scour technique assessment was performed initially for 12 wind directions (ie 30° intervals) and then at 45° intervals (NE, SE, SW, NW).

The following procedure was adopted:

- At the commencement of each test, the entire surface area of the Discovery Point Concept Plan development was covered uniformly with a layer of fine lightweight particles of consistent aerodynamic diameter (the "sand").
- Airflow in the wind tunnel was then stepped up through a series of fixed speeds.
- At each increment, the wind tunnel speed was maintained for at least several minutes to allow the scouring of the "sand" to reach a steady state. A digital photograph was then taken of each scour pattern, once the scouring had stabilised.
- The process was repeated for each test wind approach angle.

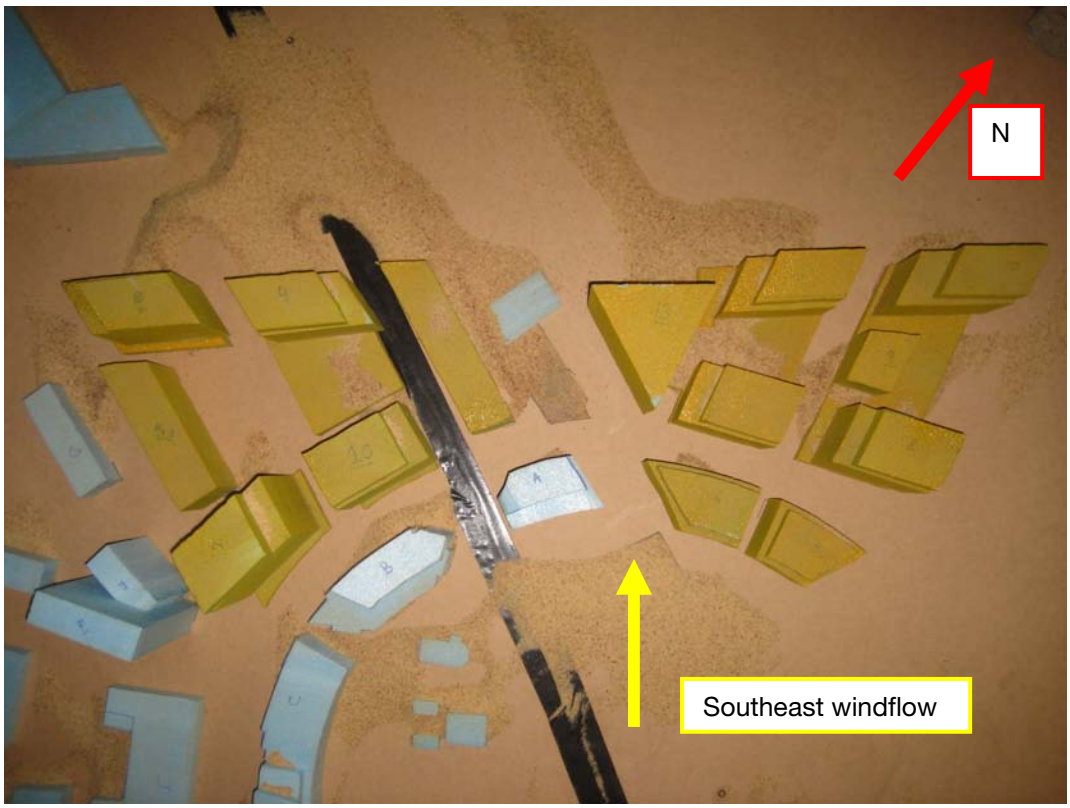
As the wind tunnel speed is ramped up in each consecutive test (for a particular wind angle), the amount of scouring increases in localised areas as a function of the local wind speed at that area. Areas which are most wind-prone scour first. Areas which are in more sheltered areas scour last. The scouring patterns can then be turned into:

- Wind speed contours at a fixed probability level of occurrence (eg annual wind events, weekly wind events, etc), or
- Occurrence contours (eg once per week, once per month, etc) at a fixed speed of interest (eg a speed suitable for outdoor dining, pedestrian safety, etc).

An example of the scouring patterns achieved in the testing is provided in **Figure 6**, showing windflow patterns past the site from the southeast under very strong wind conditions. The following can be noted:

- Scouring of the railway line at Wolli Creek Train Station between Blocks 14 and 13 and along Discovery Point Place is evident. In fact, scouring occurs for the areas as a result of channelling and building deflected winds.
- The Neighbourhood Park surrounded by Blocks 1C, 2, 3, 5 and 4 shows evidence of partial scouring only, with the northern areas of the park exposed to greatest winds. This scouring has occurred as southeast winds pass over the southern buildings and are then deflected downwards by the northern buildings back into the park.

Figure 6 Sample Scouring Pattern – Southeast Winds



6 TEST RESULTS

6.1 Overview – Wind Impact with No Mitigation

It is instructive to review locations where the maximum annual gust speed has the potential to exceed the criteria nominated in **Section 3** *in the absence* of wind mitigation measures, in particular without landscaping.

These test results then provide an insight as to the specific approach angles and extent of impacted area where potential adverse wind conditions may occur as well as the potential level of exceedance of such adverse conditions.

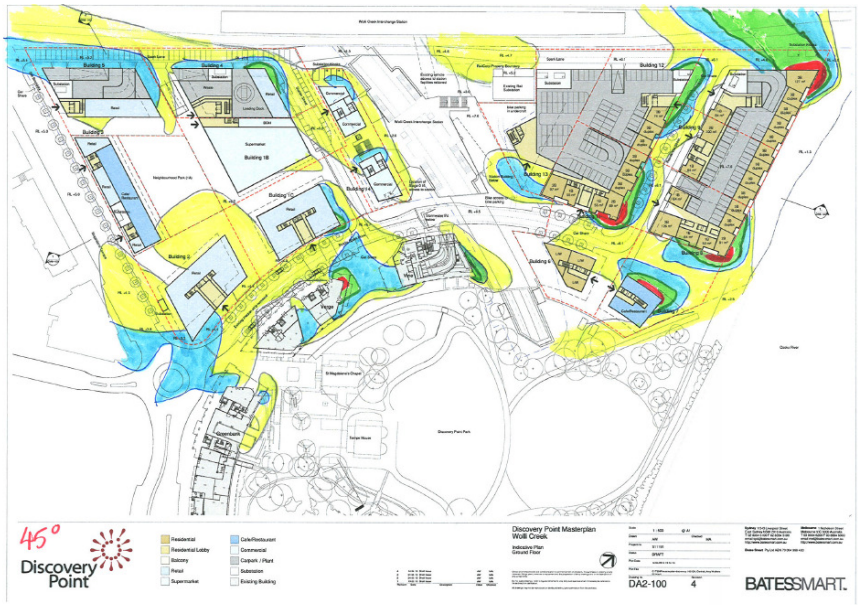
This information can then be used to develop *effective* mitigation options such as landscaping, canopies, awnings, etc.

6.2 Baseline Scour Test Results

The scour contour pattern diagrams for each wind directions tested in the wind tunnel are shown in **Appendix C**. An example for northeast winds based on the indicative design scheme plans is shown in **Figure 7**.

Figure 7 Sample Scour Results at 45 Degrees (ie Northeast Winds)

Scale factor, Φ	Colour
$\Phi \geq 0.53$	Red
$0.53 > \Phi \geq 0.4$	Green
$0.4 > \Phi \geq 0.32$	Blue
$0.32 > \Phi \geq 0.25$	Yellow



6.3 Annual Return Period Wind Impact

The baseline scour test results were then converted to a single set of contours corresponding to the areas – shown in bold – where there was potential for the 16 m/s walking comfort criterion to be exceeded on a 1-year (annual) return period basis. These are shown in **Figure 8 to Figure 21**.

Figure 8 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 0°

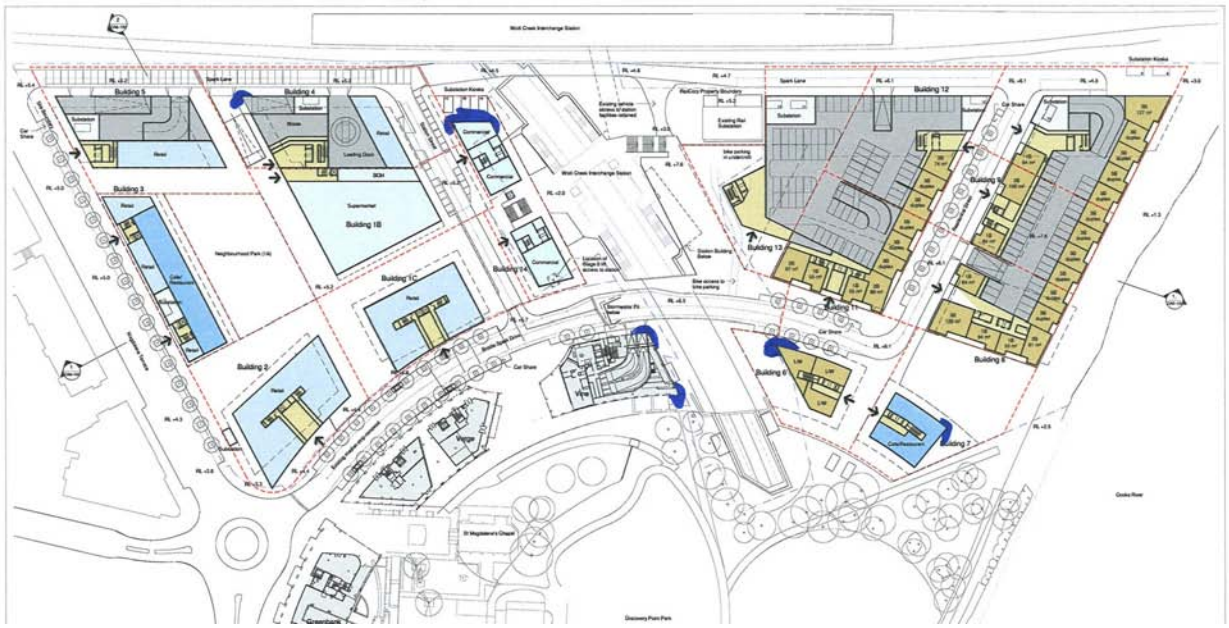


Figure 9 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 30°

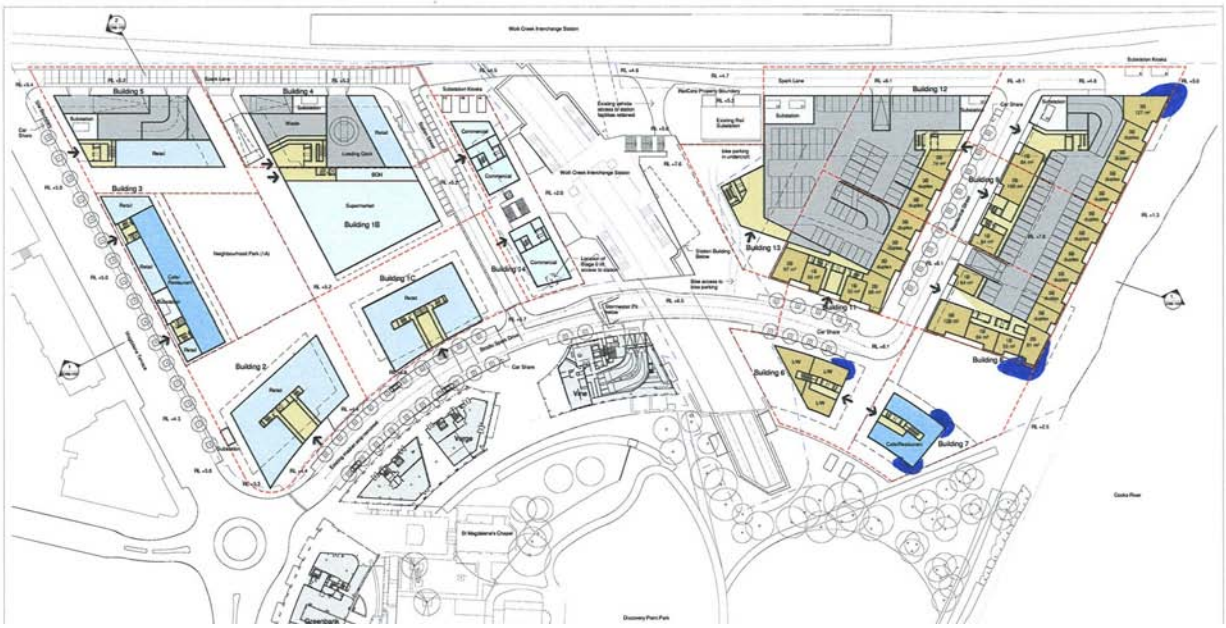


Figure 10 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 45°

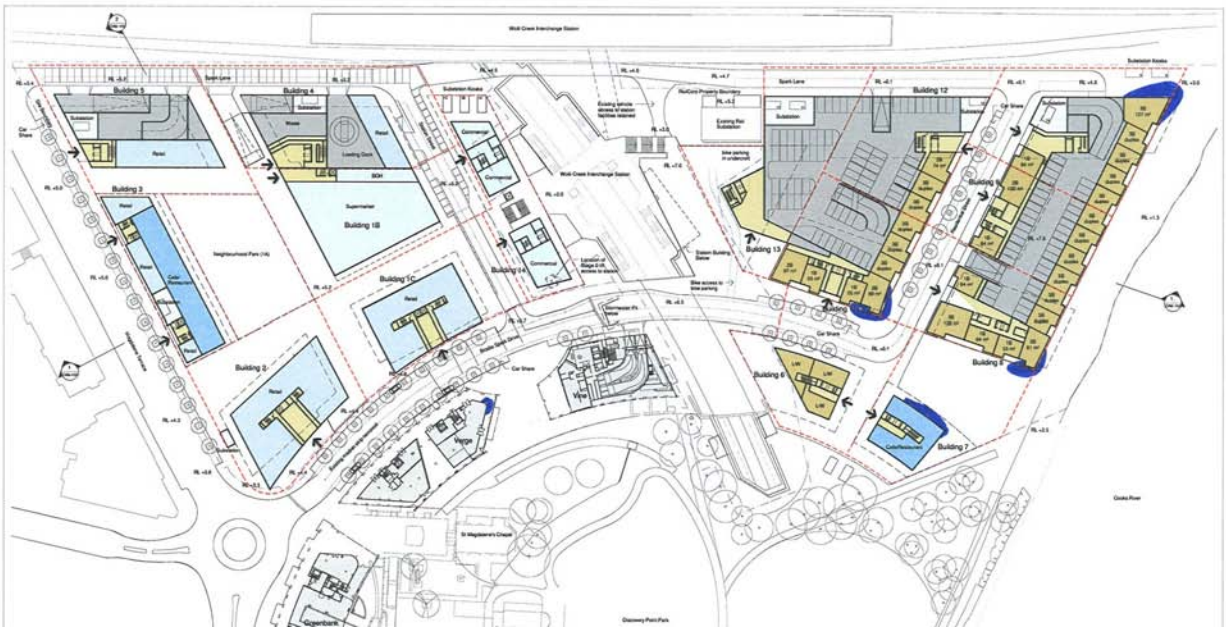


Figure 11 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 60°

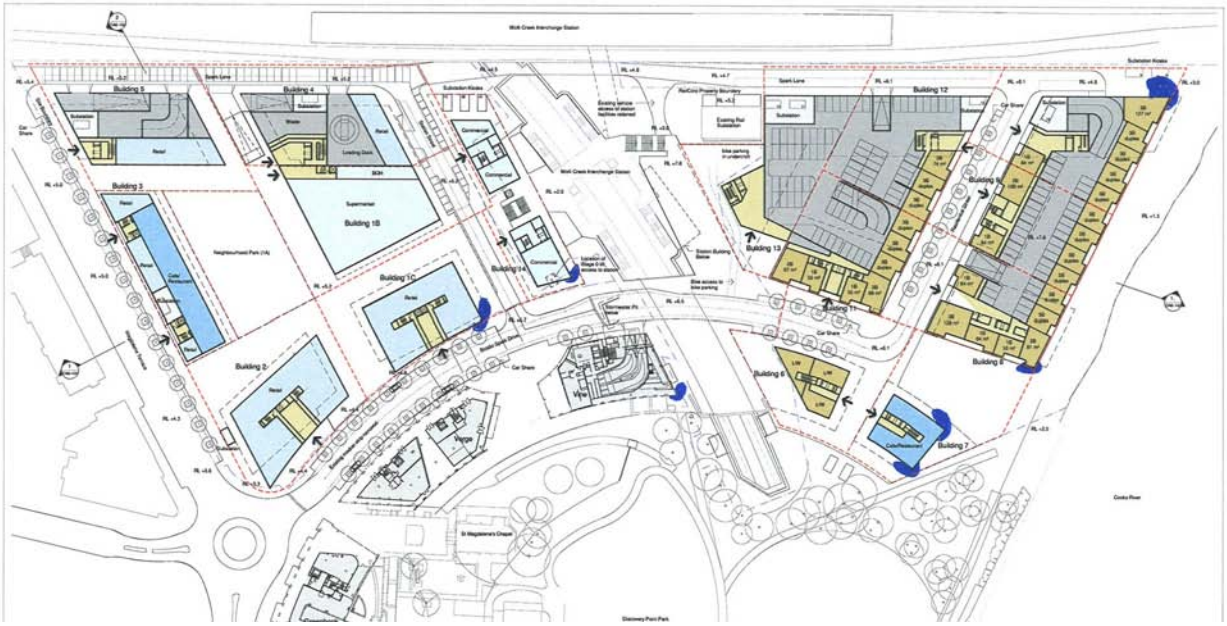


Figure 12 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 90°

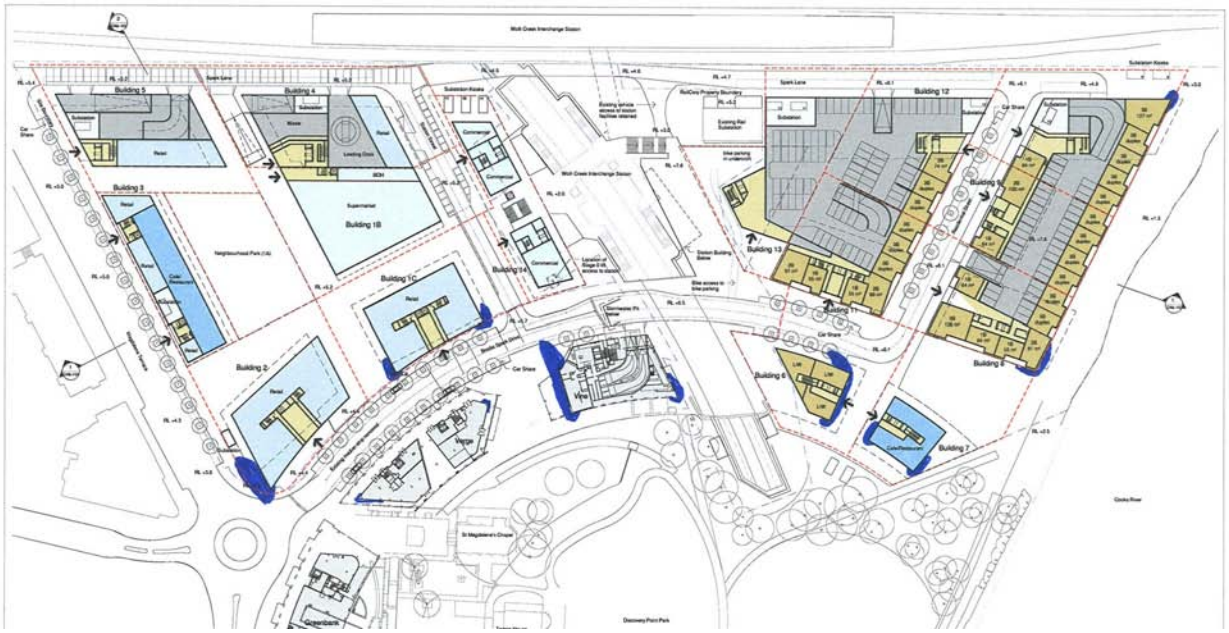


Figure 13 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 120°

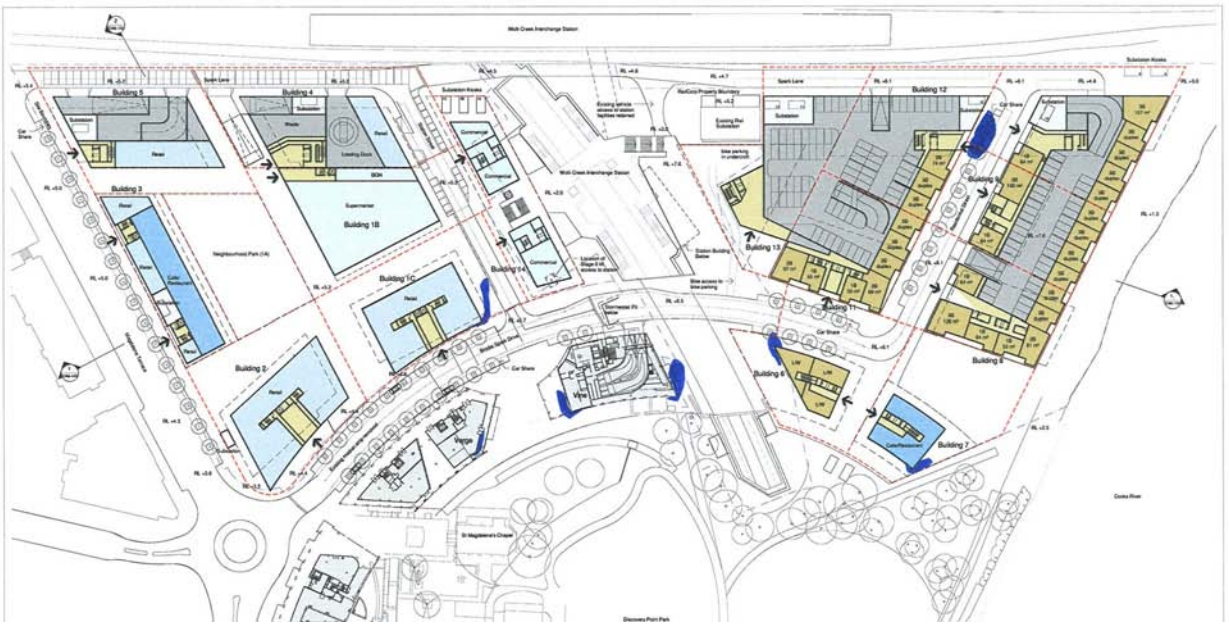


Figure 14 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 135°

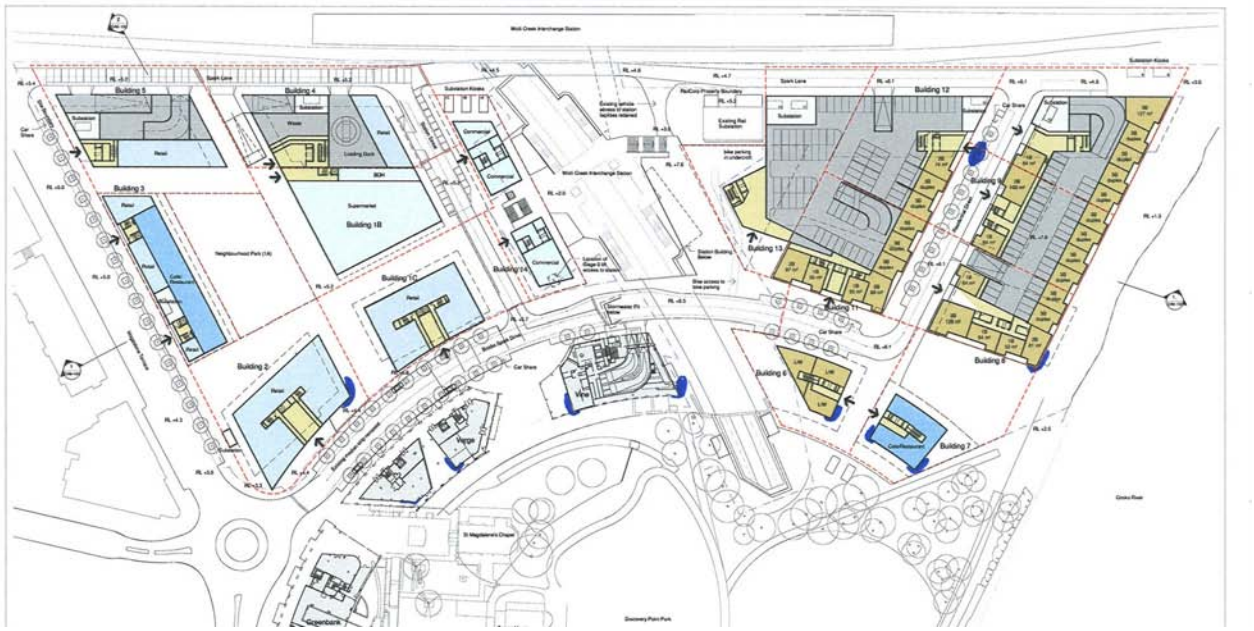


Figure 15 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 150°

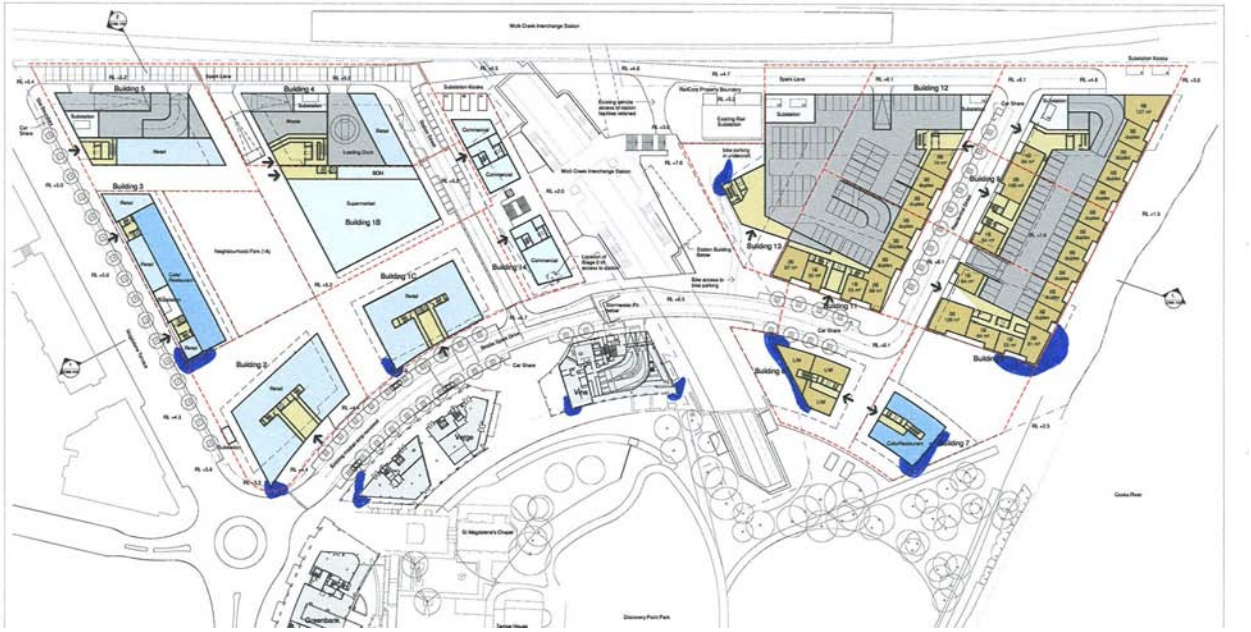


Figure 16 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 180°

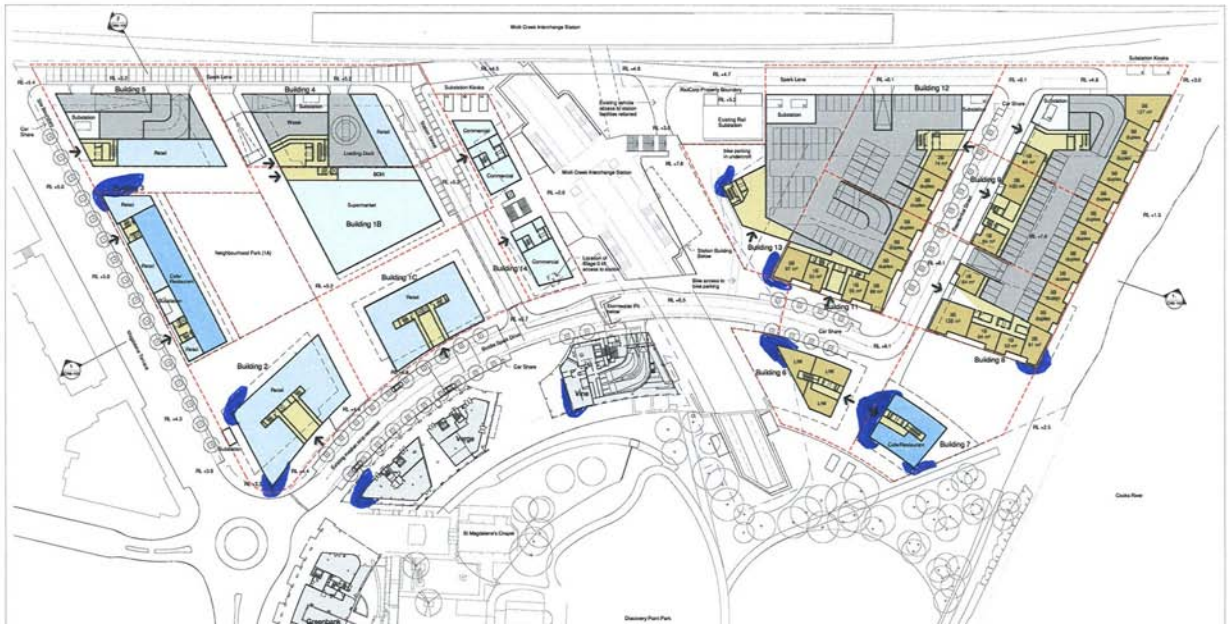


Figure 17 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 210°

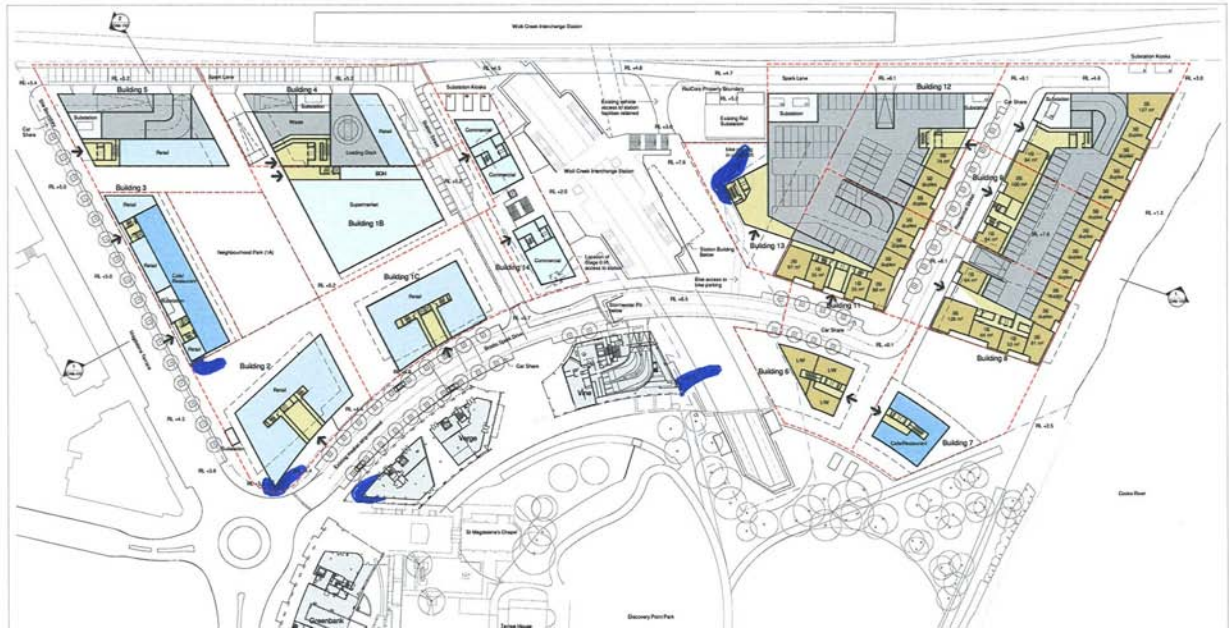


Figure 18 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 240°

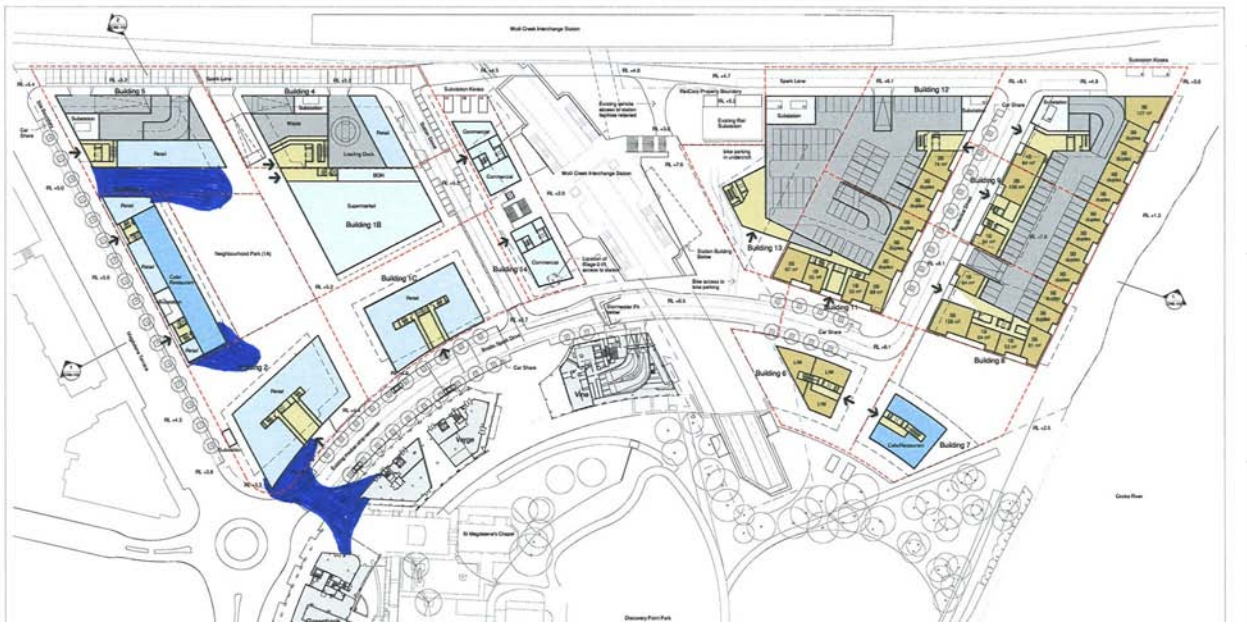


Figure 19 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 270°

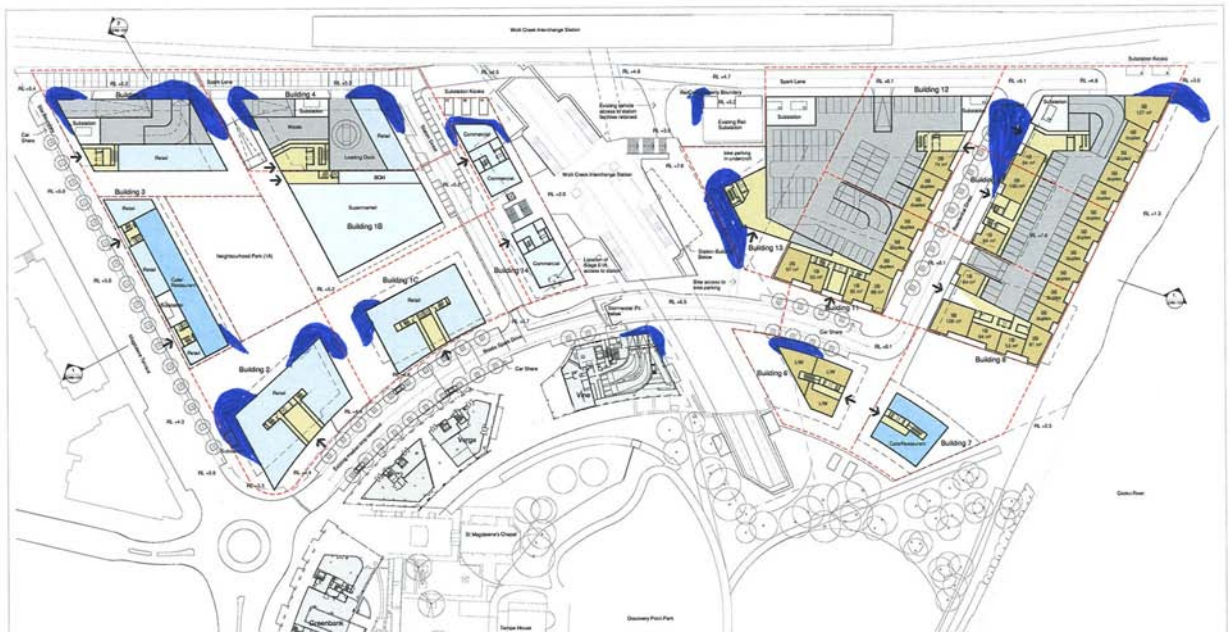


Figure 20 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 300°

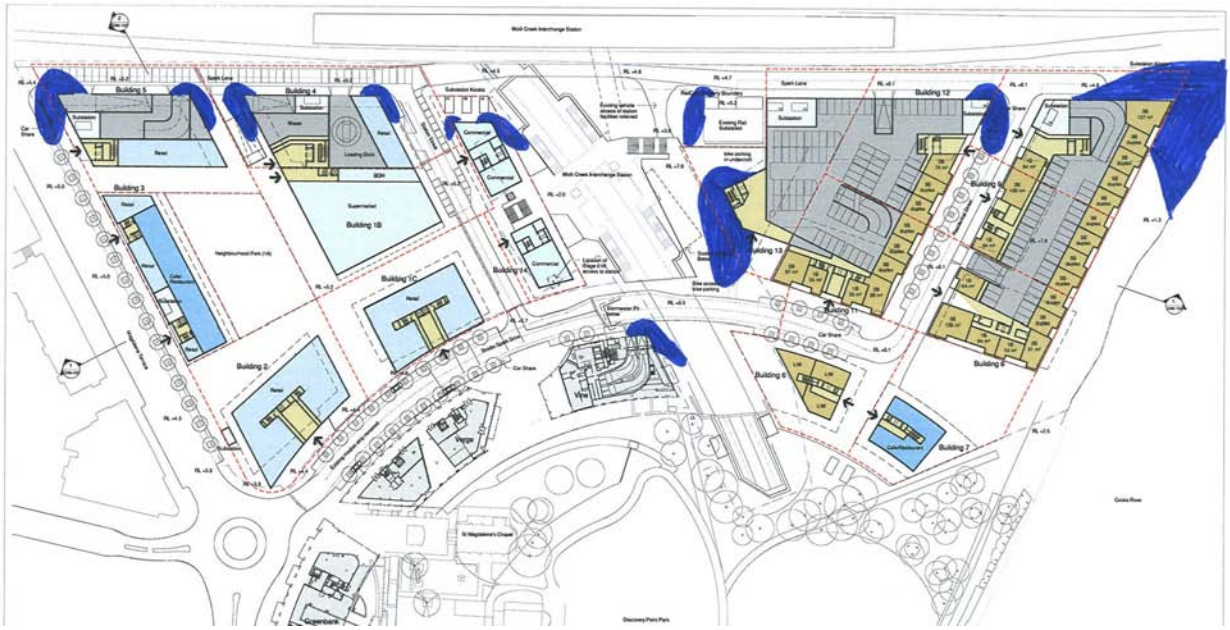
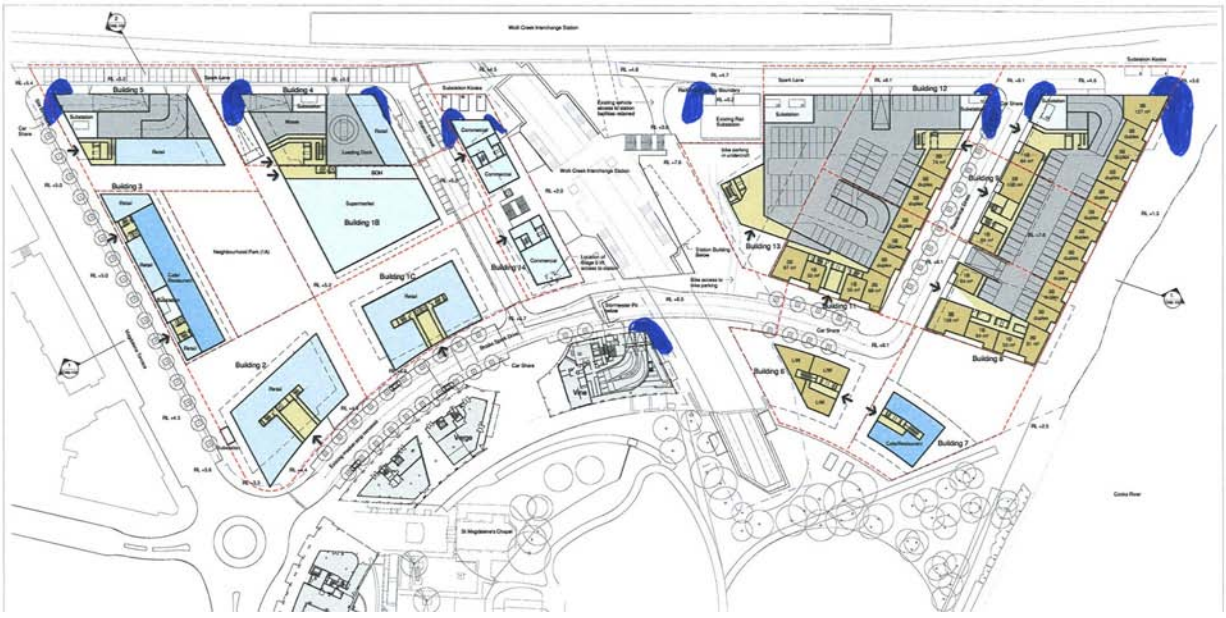


Figure 21 Areas Exceeding Walking Comfort Criterion with Wind Flowing from 330°



7 MITIGATION TREATMENTS

The preceding section examined areas of potential adverse wind conditions. In particular, the test results described in **Section 5** were for a building environment with no landscaping around the site and no other architectural wind mitigation treatments, eg canopies, awnings, etc.

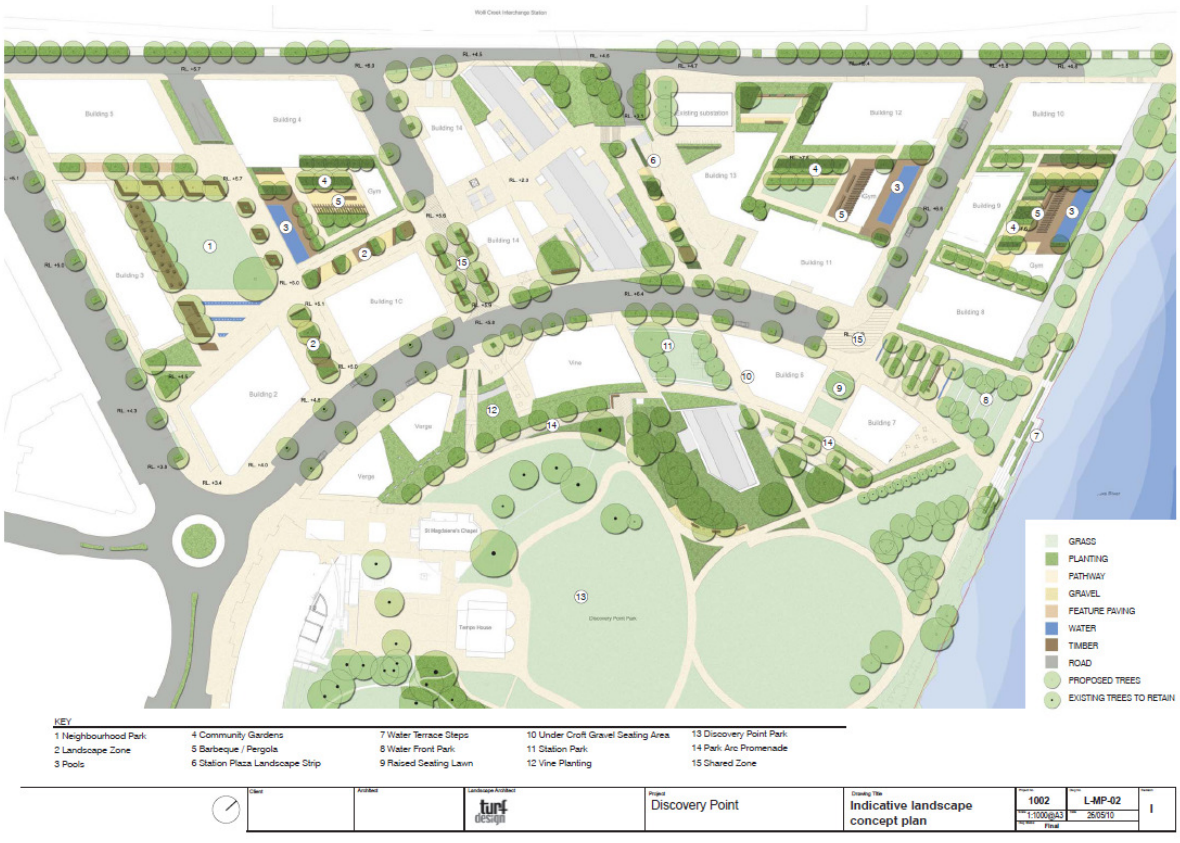
In fact, abundant landscaping has been planned for the entire development (refer to Turf Discovery Point Landscape Report). This includes a virtually continuous line of trees along

- Spark Lane;
- Discovery Point Place;
- Chisholm Street;
- Magdalene Terrace;
- Brodie Spark Drive between the Verge and Building 2 and 1C;
- Brodie Spark Drive between Building 6 and 11.

Dense landscaping is also proposed on the southeast part of the site, at Discovery Point Park, thus shielding the site from strong south east winds.

The currently planned landscaping is shown in **Figure 22**.

Figure 22 Current Landscaping Proposal



The proposed landscape will help mitigate winds impacting:

- Southwest facades of Buildings 2, 3 and 4 under southwest wind quadrant conditions
- Southeast facades of Buildings 2, 1C, 6, 7 and 11 under southeast quadrant wind conditions
- West façade of Buildings 10, 9 and 8 and northwest Building 6 from west quadrant wind conditions

Moreover, eaves, awning or canopies are planned over the main entrance of all the proposed major residential buildings and retail tenancies on the site, as well as retail umbrellas (fixed) to all outdoor dining areas, mitigating downwash and other accelerated windflow impacting these areas.

7.1 Additional Landscaping Recommendations

On the basis of the baseline wind tunnel test results, additional dense landscaping is recommended as follows:

- For the Neighbourhood Park, close the Building 2 corners where there are adverse windflow for westerly winds
- At the under croft below Building 13 to mitigate the wind funnelling underneath Building 13
- At the northern corner of Building 10 to mitigate winds from the west clockwise through to east quadrants.

7.2 Other Windbreak Recommendations

There is an outdoor Café (dining) area located in the northern forecourt area of Building 7 (facing the water) of the indicative design scheme. This area is likely to be prone to higher wind conditions for a number of prevailing wind directions (eg refer **Figure 11** and **Figure 15**).

Here it is recommended that the future Project Application considers the shielding of outdoor dining areas by a combination of:

- Perimeter landscaping (or alternative vertical windbreak elements), plus
- Awnings or canopies adjacent to building corners.

The indicative design scheme also shows that there is a communal garden with outdoor pool, barbecue areas and gym proposed at the podium levels at Building 1B, between buildings 11,13 and 12 and between buildings 8, 9 and 10. For the sand scour wind tunnel test, these areas are under higher wind conditions for a number of prevailing wind directions. From the landscape plan, trees and pergolas over the barbeques are already planned throughout the podium level communal gardens within the indicative design scheme.

It is recommended that the future Project Application considers awnings or canopies over the entrances to the buildings and footpaths close the building facades to mitigate downwash impacting these areas.

The indicative design scheme shows green roofs garden featured at the roof levels of some buildings (Refer **Figure 22**). These areas are under high wind conditions due to higher wind speeds at elevated height. If green roofs are proposed in subsequent applications, wind amelioration to help achieve the environmental wind criteria includes

- Implementing the proposed indicative landscaping elements for the roof gardens.
- Providing a 1.5 m high parapet surrounding the green roof garden area that will reduce the wind impact.

The above wind mitigation options will be refined during the detailed design stage of the project to ensure that wind comfort conditions are achieved.

7.3 Detailed Design Confirmation of Wind Mitigation Treatments

The combination of currently planned landscaping, additional landscaping described above and localised wind treatments (eg awnings at major building entrances) will enable wind speeds throughout the Discovery Point Concept Plan to be largely contained at or below the 16 m/sec walking comfort criterion.

It is further understood that the current Concept Plan will be refined during the detailed design stage of each specific building within the development.

It is therefore recommended that, as each building design progresses to the point of confirmed design approval under subsequent Project Application, the wind mitigation treatments should also be refined, ie specific landscaping strategies, dimensions recommended for awnings, etc, to ensure that wind comfort conditions are achieved.

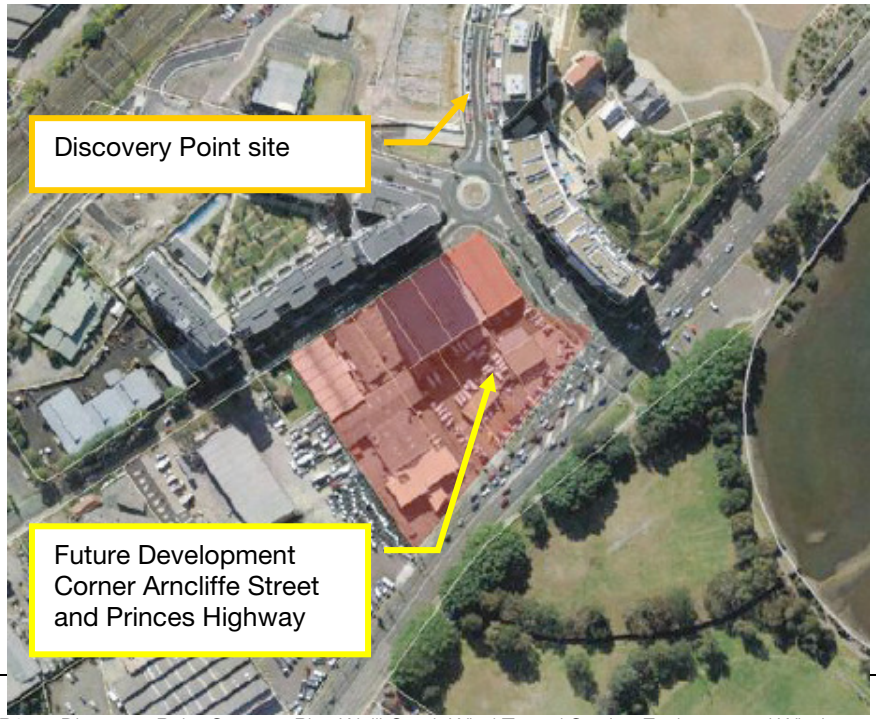
Finally, Heggies understand that residential buildings within the development may feature residents-only "green roofs", featuring gardens, shade structures and BBQ facilities for small group gatherings. While these areas are not strictly "public access" areas, they would also be reviewed during the detailed design phase of each building to ensure the wind comfort conditions of these spaces as well.

7.4 Future Surrounding Developments

A future development is planned to the south-southwest of the Discovery Point Concept Plan site at 78-96 Arncliffe Street and 31-45 Princes Highway – refer **Figure 23**. The future development will likely comprise three blocks of height 8, 16 and 22 storeys, ie comparable to the scale of height of Discovery Point.

In terms of relevance to the present assessment, this future development is likely to have a positive (beneficial) impact, thanks to the additional shielding it will provide the Discovery Point site for stronger southerly winds.

Figure 23 Future Development Block at Corner Arncliffe Street and Princes Highway



8 CONCLUSION

Heggies Pty Ltd (Heggies) has been commissioned by Australand Holdings Limited (Australand) and Landcom to assess the impact on the local wind environment of the proposed Discovery Point Development Concept Plan, Wolli Creek, via an Environmental Wind Tunnel Study.

The Discovery Point site is located at Wolli Creek and is bounded by the Princes Highway on the east, the Illawarra Rail Line on the west and Cooks River to the north. The immediate surrounding premises consist of several medium/high rise residential buildings and low rise warehouses to the south west. The development site sits to the west and south of the Cooks River waterways.

This report addresses the wind environment of the proposed Concept Plan assessing the proposed new buildings on the site.

The test approach used for the current study is the so-called "Scour Technique". This industry accepted technique is particularly suited to the assessment of large development sites and provides reliable estimates of pedestrian level winds, especially when large areas are to be assessed.

This technique has enabled the entire site to be assessed in terms of its wind comfort.

Initially, a set of baseline tests was performed to determine locations where the maximum annual gust speed has the potential to exceed the standard wind comfort in the absence of wind mitigation measures, in particular without landscaping. These test results provided a clear insight as to the specific approach angles and extent of impacted area where potential adverse wind conditions may occur as well as the potential level of exceedance of such adverse conditions.

This information was then used to assess the effectiveness of proposed landscaping in the indicative design scheme and concept planning for architectural treatments such as canopies, awnings, etc.

It was found that the proposed landscaping shown in the indicative plans would mitigate most of the potentially adverse wind conditions identified throughout the site.

Additional landscaping and horizontal windbreak elements (ie awnings, canopies) have been proposed to supplement the already-planned landscaping, on the basis of the current wind tunnel test results.

The combination of proposed landscaping shown in the indicative plans, additional landscaping described above and localised wind treatments (eg awnings at major building entrances) will enable wind speeds throughout the Discovery Point Concept Plan to be largely contained at or below the 16 m/sec walking comfort criterion.

The current Concept Plan will be refined during the detailed design stage of each specific building within the development. It is therefore recommended that, as each building design progresses to the point of confirmed design approval, the wind mitigation treatments are also refined, ie specific landscaping strategies, dimensions recommended for awnings, etc, to ensure that wind comfort conditions are achieved.

Finally, Heggies understand that residential buildings within the development may feature residents-only "green roofs", featuring gardens, shade structures and BBQ facilities for small group gatherings. While these areas are not strictly "public access" areas, they would also be reviewed during the detailed design phase of each building to ensure the wind comfort conditions of these spaces as well.