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for Expert Evaluation on Air Ventilation  
Assessment Services

*Expert Evaluation on Air Ventilation  
Assessment of Yuen Long Town*

**FINAL REPORT**

PLANNING DEPARTMENT

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## Executive Summary

WSP was commissioned by the Planning Department of HKSARG under the Term Consultancy for Expert Evaluation on Air Ventilation Assessment Services to assess the air ventilation impacts of the plot ratio/ gross floor area and building height restrictions incorporated in the draft Yuen Long Outline Zoning Plan No. S/YL/16 and recommend mitigation measures to alleviate the impacts.


The methodology adopted here follows that for an expert evaluation in the “Technical Guide for Air Ventilation Assessment for Developments in Hong Kong” as well as those requirements in the Project Brief.

Wind data at multiple locations and heights have been analysed and it is concluded that there is no discrepancy among the wind data, and the annual prevailing wind directions for the project area are: north-easterlies, easterlies and southerlies.

The existing scenario does not present major problems to the air ventilation issue apart from the development of YOHO town phases one and two, and the West Rail Yuen Long Station development. These developments already approved have negative impacts on the air ventilation environment. The knoll north of YOHO town in the area will benefit the wind penetration towards the town centre and must be preserved and should not be built upon. This is a key channel for the north-easterlies, in particular for YOHO Town. Since some of these developments are built and planning permissions have been granted for the future phases, no more developments of this scale should be erected in the vicinity.

Ideally, to improve air ventilation at pedestrian level, there should be no podiums for future developments along Castle Peak Road as the buildings will be already in close proximity of each other. The width of Castle Peak Road is approximately 25m, the buildings (including podium) along this road should be set back to maximise the distance of the buildings on the northern and southern sides of Castle Peak Road to approximately 35 to 40m. Negative wind effect will be possible if the adjacent lots in the town centre along Castle Peak Road are amalgamated and redeveloped to consecutive massive and tall buildings of uniform height of 30 storeys (about 100m). However, it is recognized that it is not feasible to build such massive buildings for the existing consecutive small lots, based on the current plot ratio restriction on Outline Zoning Plan and site coverage restriction on Building (Planning) Regulations. Besides, land assembly problem will render large scale site amalgamation unlikely. Nevertheless, to mitigate potential adverse impact, the height of the future buildings along Castle Peak Road is preferably to be lowered to approximately 85m (about 25 storeys). If the height limit is to be maintained at 30 storeys (about 100m), then the buildings in the southern side of Castle Peak Road should be shorter by at least 15m (about 5 storeys) than those in the northern side. Besides, the layout of the towers must encourage breezeways or permeable. The “O” and low-rise “G/IC” sites in the town centre already create irregular heights that contribute to wind penetration.

Narrow alleys of the north-south direction between the buildings on Castle Peak Road will restrict the air ventilation in the space. Should there be podiums in the narrow alleys on either the northern or southern side of the Castle Peak Road, the buildings above the podium should be set back by approximately 5 m to widen these



narrow canyons. The ventilation in the narrow alleys on either side of the Castle Peak Road will be improved if the adjacent buildings are spaced further apart. For example, take an alley of 10m wide, if the buildings are set back from the boundary by approximately 5 m on either side, the spacing between these adjacent buildings will be increased to approximately 20m.

The development of Long Ping Station with the proposed plot ratio and height limit is acceptable.

The combination of village type, open space and green buffer areas amount to approximately 35% of the project area. These clusters of breezeways should be maintained. The landscape corridor in Area 13 is a key breezeway in the planned scenario, especially with the nearby development zoned under R(A)1. This key wind corridor should be kept free of developments.

The development restriction in the OZP would not create significant negative impact if:

- Large podium is avoided or an approximate 5m set-back is introduced for developments in Tai Kiu Tsuen “Comprehensive Development Area” (“CDA”) on Tai Kiu Road (see Figure 11). An initial air ventilation assessment (AVA) is recommended to assess air ventilation impact of the proposed development on the surrounding areas and recommend mitigation measures, as appropriate.
- Large podium is avoided or an approximate 5m set-back is introduced for the three developments on Wang Yip Street and Tak Yip Street in Area 7, Tung Tau business area (see Figure 20) to improve future local wind environment. The plot adjacent to Kerry GoDown (see Figure 11) on Tak Yip Road has a small podium or permeable podium; and if slab type buildings facing north-easterlies are avoided.
- The plot zoned “Residential (Group A)” (“R(A)”) at Area 4 and bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road, i.e. the ex-Yuen Long Estate site (see Figure 11) has no podium or if the podium is made permeable and set back by 5m from the street; and the buildings are arranged in line with breezeways without wind screen effects. An initial AVA is therefore recommended.
- Skimming flow is minimised in Areas 14, 13 and south of Yuen Long Park, and around Grand Del Sol, i.e. the southern part of the Town, see Figure 13. Otherwise, the negative impact to the wind environment is likely to be local to the developments’ users.

The sensitivity of the YOHO Town development to the existing wind environment leads to the requirement of mitigation. However, these developments are already approved and the initial AVA study could only be beneficial to the air ventilation if there is opportunity to implement the mitigation strategies. For the remaining area with proposed developments of relatively low (50m) heights and fair spacing, it is not envisaged that the air ventilation would be significantly impacted.



For the town centre developments along Castle Peak Road and its vicinity, initial AVA study is not envisaged **IF** the recommendations of orientation and geometrical relations described in this report are observed.

An initial AVA study is recommended for the following focus areas:

- The “R(A)” site bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road; and
- The “CDA” site at Tai Kiu Tsuen on Tai Kiu Road



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# 1 Introduction

The draft Yuen Long Outline Zoning Plan (OZP) No. S/YL/16 incorporating amendments to rezoning and imposing maximum plot ratios/gross floor area and building height restrictions was exhibited for public inspection in January 2007. WSP HK were commissioned by the Planning Department of HKSARG under Category A Service of the Term Consultancies for Air Ventilation Assessment Services. The objective is to assess the air ventilation impacts of the plot ratio/gross floor area and building height restrictions under the draft OZP and recommend mitigation measures to alleviate the impacts.

The main tasks are to provide the followings:

- A desktop study of the wind environment of the project area in Figure 1;
- A qualitative evaluation of the air ventilation impacts of the development restrictions (Table 1) as illustrated under the planned scenario as compared to the exiting scenario;
- Recommendations of mitigation measures.

Figures 2 and 3 show photographs of the project area taken from Location 7 and Yuen Long Park in Figure 1 respectively. The existing scenario (Figures A1 to A4 in Appendix A) presents the existing building profile with approved and committed developments. On the basis of the existing scenario, the planned scenario presents the building profile assuming development/redevelopment of some sites up to the maximum development restrictions under the OZP where applicable.

The methodology adopted here follows that for an expert evaluation in the “Technical Guide for Air Ventilation Assessment for Developments in Hong Kong” as well as those requirements in the Project Brief.

Zoning	Maximum Plot Ratio (PR) /GFA	Maximum Building Height (No. of Storeys excluding basement(s))
"Comprehensive Development Area" ("CDA")	PR 5 or PR 5/9.5 <sup>#</sup> Except for a "CDA" site in Area 16 which is subject to max. PR of 3 and the development has completed.	No building height restriction on the OZP which is subject to approval of Town Planning Board
"Residential (Group A)"("R(A)")	PR 5/9.5	30
"R(A)1"	PR 5/9.5	25
"Residential (Group E)" ("R(E)")	PR 5	30
"Residential (Group B)" ("R(B)")	PR 3.5; and Site coverage 50%	25 storeys excluding basement carpark
"R(B)1"	PR 3	25 storeys excluding basement carpark
"Village Type Development" ("V")	--	3
"Government, Institution or Community" ("G/IC")	--	8
"G/IC(1)"	--	3 (8 for 'Hospital' and 'School' uses)
"G/IC(2)"	--	15
"G/IC(3)"	--	17
"G/IC(4)"	--	25
"Other Specified Uses" ("OU") annotated "LRT Terminus with Commercial/Residential Development" site at Sun Yuen Long Centre	Domestic GFA 66,460m <sup>2</sup> and Non-domestic GFA 25,940m <sup>2</sup> (equivalent to a domestic PR of 4.38 and non-domestic PR of 1.7)	32
"OU" annotated "Business"	PR 5	15

Table 1 Development Restrictions on the Draft Yuen Long Outline Zoning Plan No. S/YL/16

# PR 5/9.5 refer to the maximum plot ratio of 5 for domestic use or 9.5 for non-domestic use. For new development of a building that is partly domestic and partly non-domestic, the plot ratio for the domestic part of the building shall not exceed the product of the difference between the maximum non-domestic plot ratio of 9.5 and the actual non-domestic plot ratio proposed for the building and the maximum domestic plot ratio of 5 divided by the maximum non-domestic plot ratio of 9.5.



Zoning	Maximum Plot Ratio (PR) /GFA	Maximum Building Height (No. of Storeys excluding basement(s))
"OU" annotated "Business(1)"	PR 9.5	20
"OU" annotated "Industrial Estate"	GFA 1,687,625m <sup>2</sup> (equivalent to PR 2.5 for Area (a) and PR 5 for Area (b))	8 for Area (a) 10 storeys for Area (b)
"OU" annotated "Public Car Park with Ground Floor Retail Shops(1)" at Tung Tau	PR 5	15
Two "OU" sites annotated "Public Car Park with Ground Floor Retail Shops" at Shui Che Kwun Street and Ping Wui Street	PR 9.5	30
"OU" annotated "Public Car Park and Petrol Filling Station with Ground Floor Retail Shops"	PR 9.5	30
"OU" annotated "Public Car Park to include Retail and Residential Uses"	Domestic GFA 11,356m <sup>2</sup> and Non-domestic GFA 11,777m <sup>2</sup> (equivalent to a domestic PR of 2.7 and non-domestic PR of 2.8)	25
"OU(Sewage Treatment Works)"	--	2
"OU(Petrol Filling Station)"	--	1

Table 1 (contd.) Development Restrictions on the Draft Yuen Long Outline Zoning Plan No. S/YL/16

Note : For existing developments, if their existing PR/GFA or building height exceed the above restrictions, their existing development intensities would be allowed under the OZP.



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## 2 Site Information

The area, covering Yuen Long New Town, is about 561 Ha. The area shown in Figure 1 is situated in the middle of the Yuen Long Plain in Northwest New Territories. It is bounded by the outer edge of Yuen Long Industrial Estate in the north, Yuen Long Highway in the south, the Yuen Long Kau Hui group of villages in the east and Long Tin Road in the west. The boundary of the area is shown by a dotted line in Figure 1.

The development form of the New Town is basically a “core“ of high-rise developments along both sides of Castle Peak Road with the development intensity and building height generally descending to the peripheral areas, and industrial developments are situated at the northern fringe. Figures 2 and 3 are photos of the project area taken from location 7, Tai Lam Country Park, south of the project area in Figure 1 and Yuen Long Park respectively. Figures A1 to A4 in Appendix 1 show the three dimensional images of the existing scenario viewed from locations 3, 4, 5 and 6 of Figure 1. Figure 4 shows the industrial developments along tree lined roads. Figure 5 show the Castle Peak Road through the Yuen Long Town Centre from west to east. Higher-order commercial and residential developments are envisaged to be provided in the eastern extension area. Figure 6 shows the West Rail Yuen Long Station and Yoho Town development.

Strips of land in the southern extension are reserved for the provision of open space to serve as buffer to Yuen Long Highway to the south.

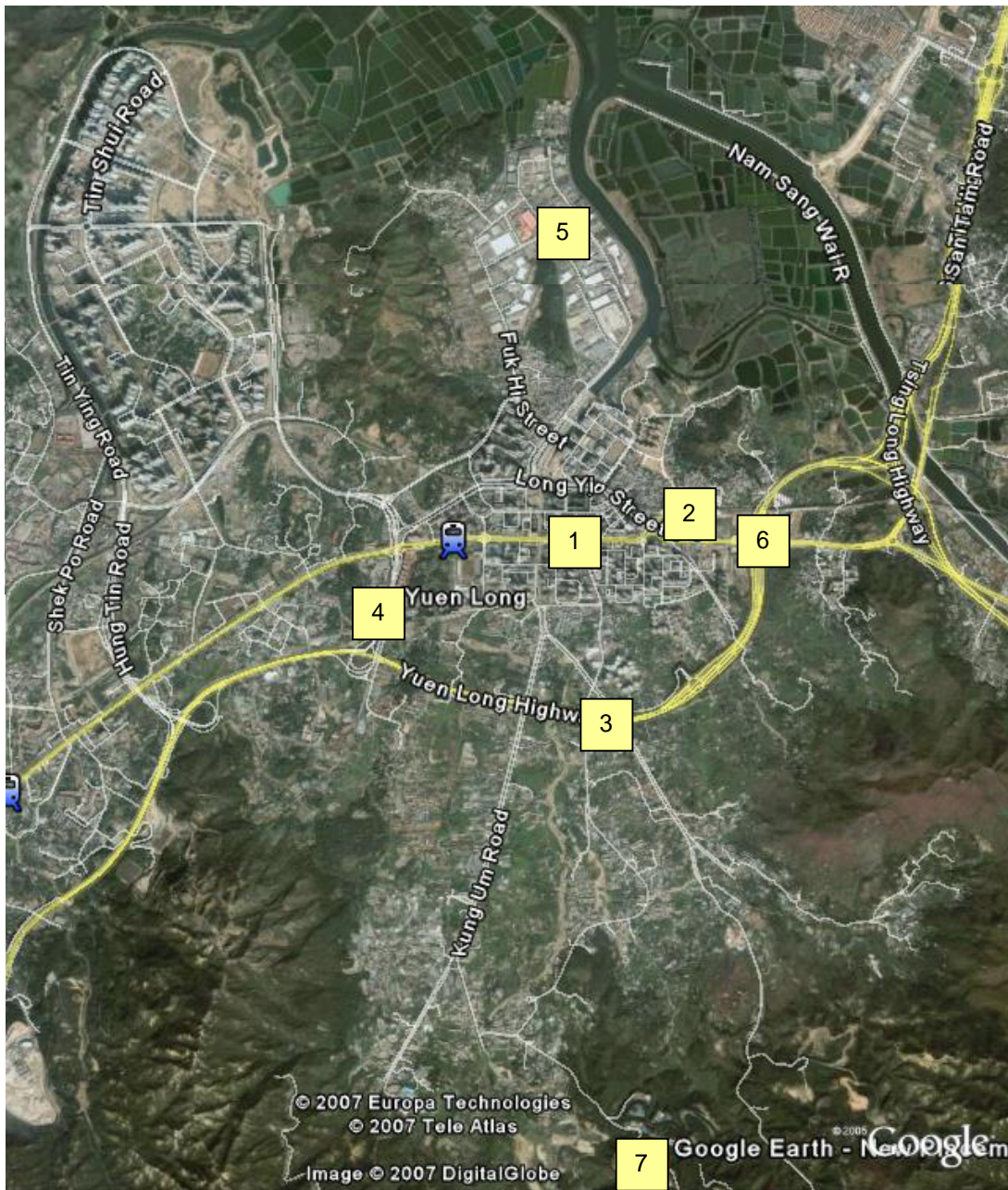


Figure 1 The AVA Project Area





*Figure 2 View Towards Project Area from Location 7 in Figure 1*



*Figure 3 View Towards Project Area from Yuen Long Park*





*Figure 4 Industrial developments to the North in Project Area*





Figure 5 Along Castle Peak Road through Yuen Long Town Centre looking Eastwards



*Figure 5 Along Castle Peak Road through Yuen Long Town Centre looking Eastwards (contd.)*





*Figure 6 West Rail Yuen Long Station and Yoho Town Development*



### 3 Wind Environment

The wind data was obtained for several locations in the Project Area from MM5 simulation from Institute for the Environment (IENV), the Hong Kong University of Science and Technology (HKUST)<sup>1</sup>. Figure 1 shows the project area. The diversity of the massing of developments of the project area may cause some local re-adjustment of wind distribution. The annual wind data at five selected locations numbered 1 to 5 as shown in Figure 1 are therefore analysed. Furthermore, the wind data at heights of 120m, 230m and 450m were also analysed to identify the sensitivity of wind directions with variation in height for these selected locations. Figure 7 compares the wind data at these locations and heights.

It can be seen from Figure 7 (a to c) that the prevailing wind direction is north-east at 450m for both locations 1 and 5. At this height, the displacement or disturbance from the developments to the wind regime is minimal, as seen from the similarity of the two wind roses. As the height is reduced from 450m to 230m, the uni-directional prevailing of north-easterlies seen at 450m is replaced by three prevailing directions: north-easterlies, easterlies and southerlies. This is a result of the proximity of the local massing and topography. As the height from ground is reduced further from 230m to 120 m, the urban canopy and topography play a more influential role and the prevailing directions become more distinct — north-easterlies, easterlies and southerlies for all locations (1 to 5). However, the overall dominant wind directions are consistent for the project area.

There is no discrepancy among the wind data at various locations. It can therefore be concluded that the annual prevailing wind directions for the project area are: north-easterlies, easterlies and southerlies.

The next step is to investigate the seasonal behaviour of the wind regime. Since the data at the locations do not vary significantly, the seasonal wind data of location 1 is selected to be representative of the project area. Figure 8 summarises the seasonal characteristic of the wind regime at 230m. This intermediate height is chosen as the variations of wind data illustrate that the data is influenced by the urban canopy at a 120m and 450m is far above the urban canopy. It can be seen that the southerlies dominate the spring and summer months, whilst the easterlies and north-easterlies dominate the autumn and winter months.

1. This MM5 data here was adopted from the Institute for the Environment (IENV), the Hong Kong University of Science and Technology (HKUST).

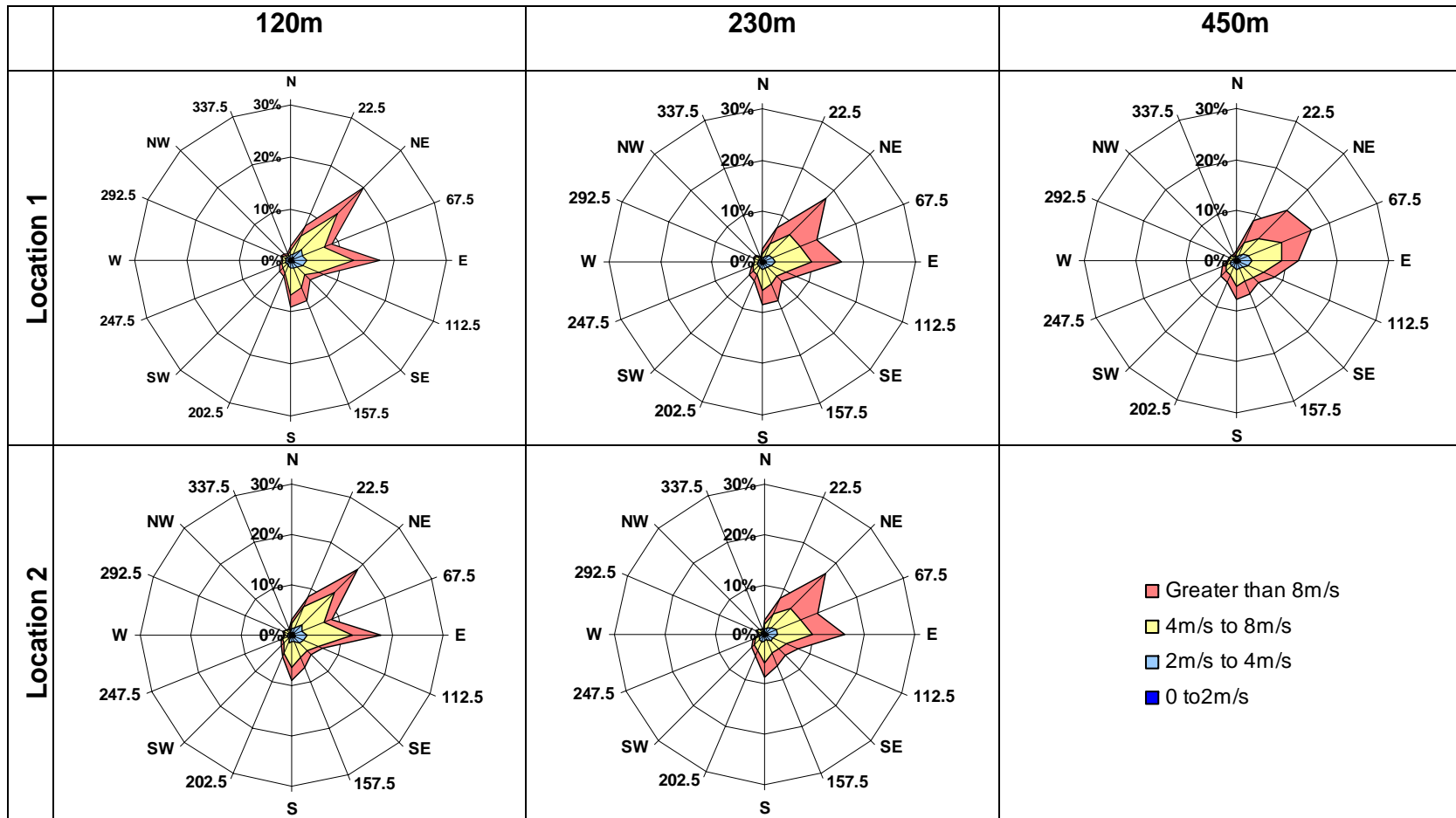


Figure 7a Wind Roses at Locations 1 and 2 at various heights (see Figure 1 for locations)

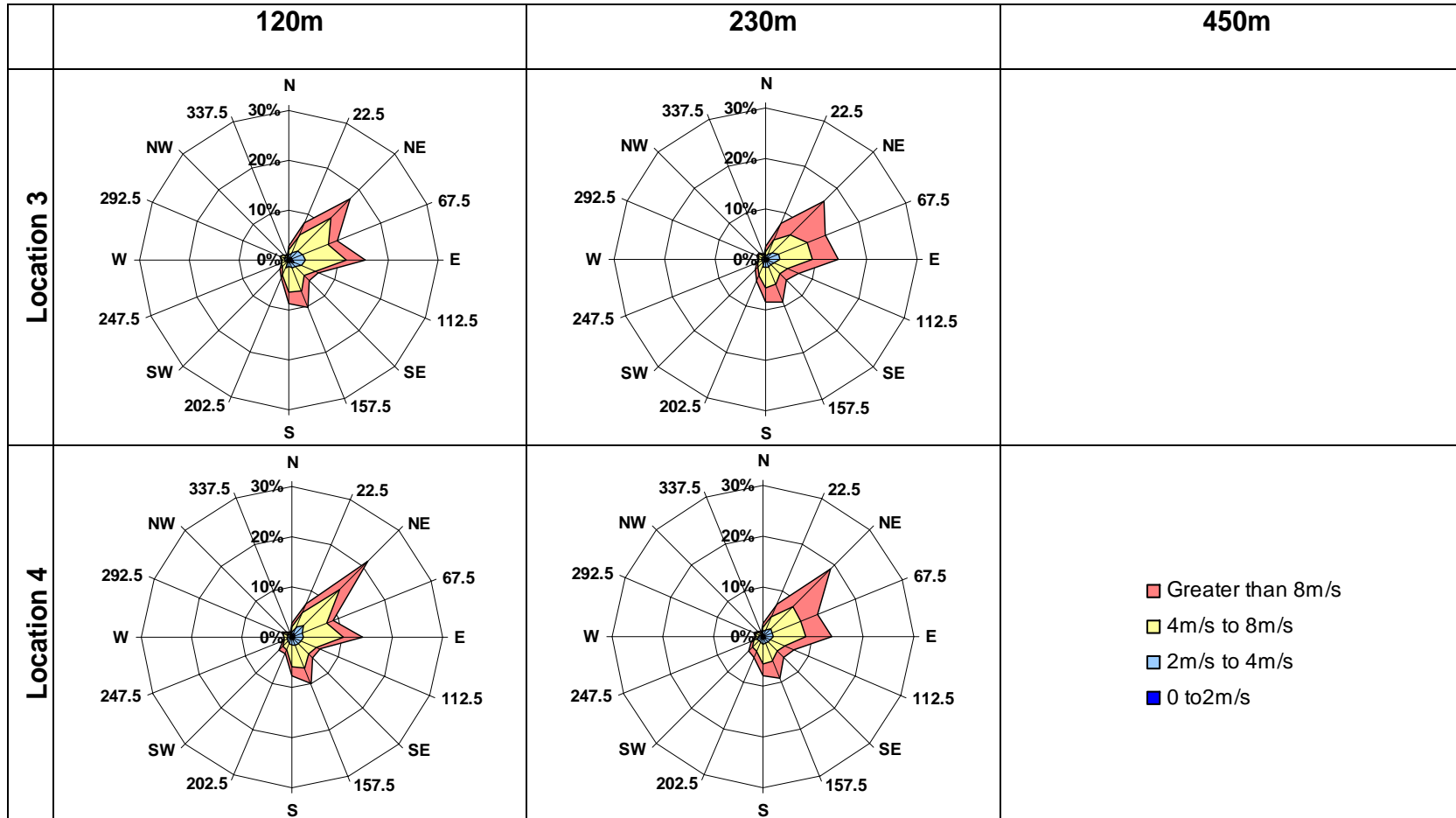
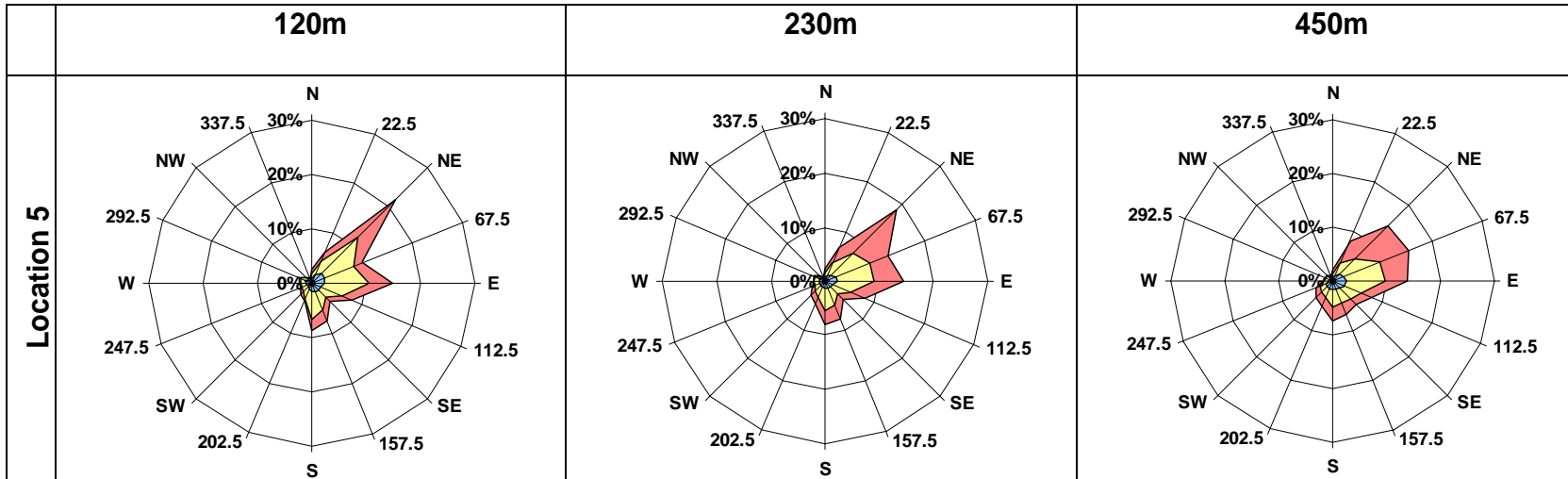


Figure 7b Wind Roses at Locations 3 and 4 at various heights (see Figure 1 for locations)



- Greater than 8m/s
- 4m/s to 8m/s
- 2m/s to 4m/s
- 0 to 2m/s

Figure 7c Wind Roses at Location 5 at various heights (see Figure 1 for locations)



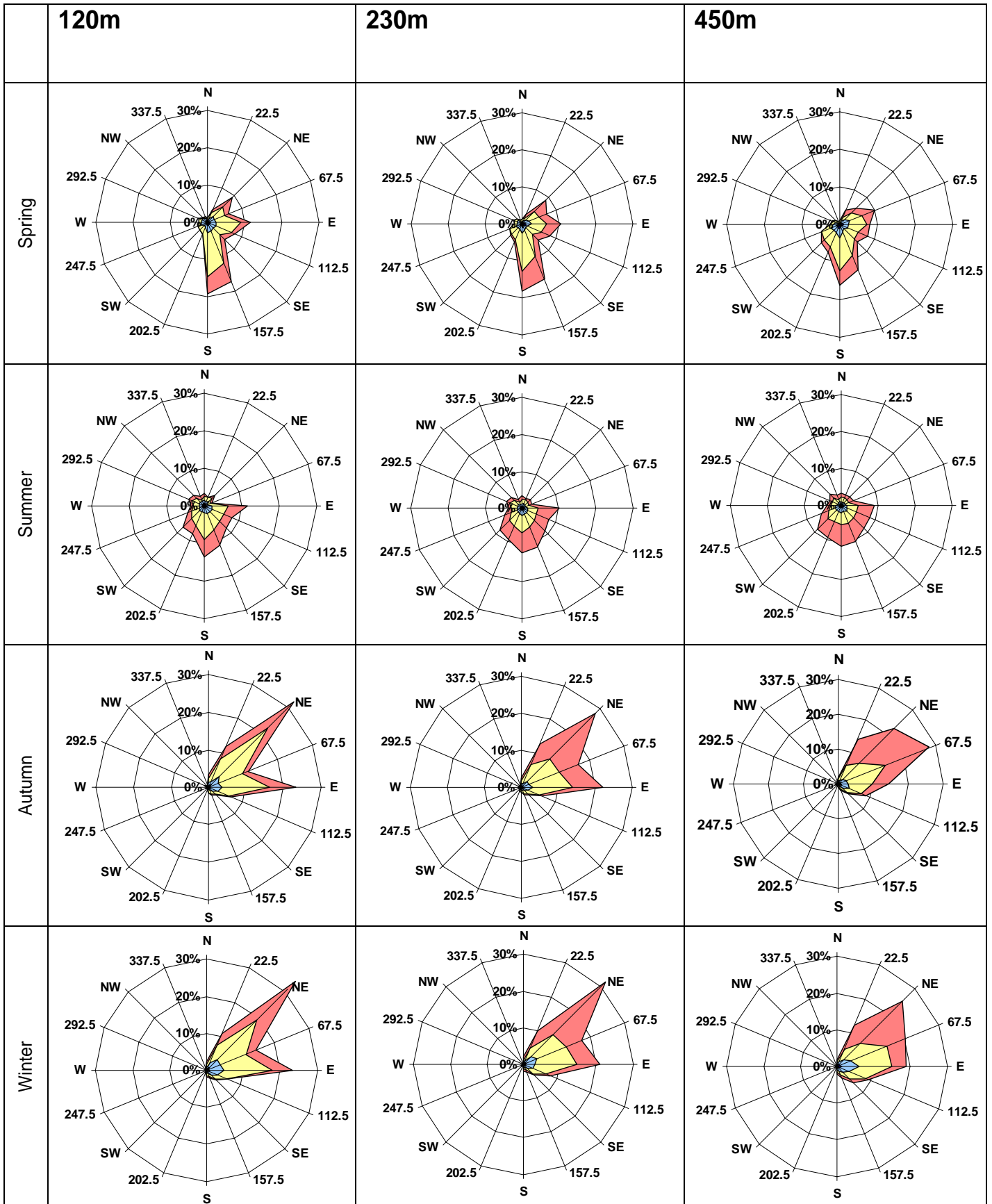


Figure 8 Wind Roses at Location 1 at Various Heights  
(see Figure 1 for locations)

- Greater than 8m/s
- 4m/s to 8m/s
- 2m/s to 4m/s
- 0 to 2m/s



## 4 Existing Scenario

### 4.1 GENERAL OBSERVATIONS

Figure 9 shows the existing scenario which includes existing and approved/committed developments with height levels. The following observations of the characteristics of the site are noted as follow:

- Yuen Long Town Area is located in the centre of a large plain, and should enjoy sufficient breeze.
- The high rise buildings (over 100 mPD) are concentrated to the east of the project area, including the YOHO Town Development and the approved West Rail Yuen Long Station Development. These developments will have negative effect on the oncoming breeze to penetrate into the centre of Yuen Long Town Centre, but create localised windy areas at pedestrian level, and worsen the air ventilation conditions.
- There are large pieces of flat land in the project area, which are zoned for villages and industrial type low-rise developments. This is a rare sight in Hong Kong and these low rise developments and open plain serve as important breezeways. The existing building height and plot ratio restrictions (Village “V” zone is restricted to 3 storeys and “OU (Industrial Estate)” is 8 storeys and plot ratio 2.5) are appropriate and should be maintained.
- There are two vegetated knolls of approximate 50m high in the project area: north of YOHO Town development in Area 16 zoned “GB”; and Chu Wong Ling zoned “GB”. There is also a large percentage of green area and open space (a total of 16% of the project area).
- The strip of open space to the south border of the project area serves as a buffer to Yuen Long Highway.
- The combination of village type, open space and green belt areas amount to approximately 35% of the project area. This cluster of breezeways should be maintained.

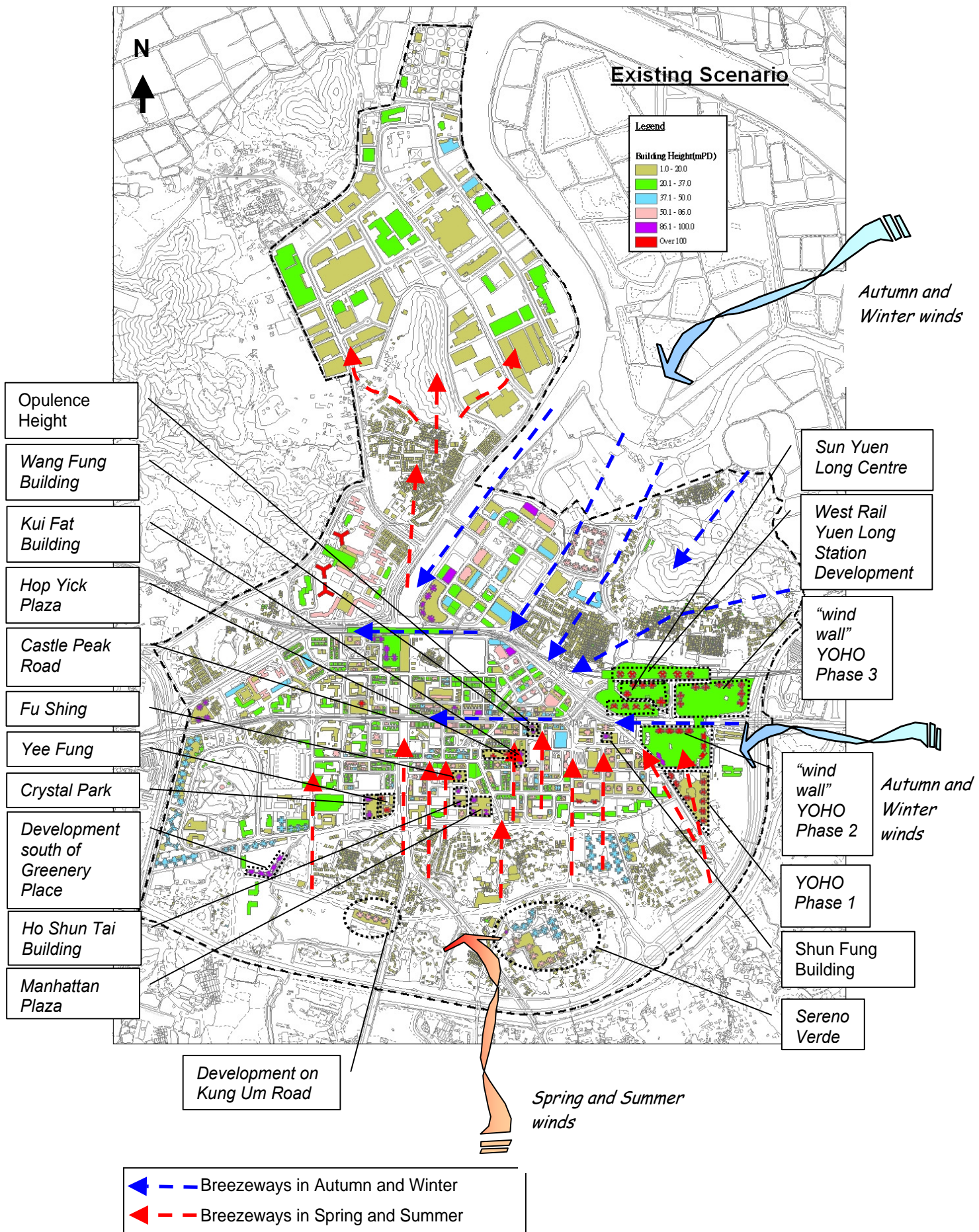


Figure 9 Existing Scenario



## 4.2 EXISTING SCENARIO IN SPRING AND SUMMER

Section 3 has identified the annual prevailing wind directions as north-easterlies, easterlies and southerlies. It has been shown that the southerlies dominate the spring and summer months.

Figure 9 shows the prevailing winds for the existing scenario, the major breezeways are marked by dotted arrows. The southern part of the project area is mainly flat land with low rise developments, open space and buffer to Yuen Long Highway, except for Sereno Verde and the committed development on Kung Um Road with a maximum of 86mPD. The developments along the southern skirt would enjoy ample breeze in their homes.

The major breezeways towards Castle Peak Road in Yuen Long town centre include:

- Yuen Long Tai Yuk Road
- Man Tin Road and Nullah
- Sai Yu Street
- Tai Tong Road
- Hop Choi Street
- Yau San Street
- Fung Cheung Road
- Fung Kam Road
- Yau Tin East and West Roads

The alignment of the streets and roads allow penetration of breeze towards the town centre from the south. The building plot ratio and building height increase towards the town centre from the southern border of the project area. The low-rise GIC facilities and open spaces along the breezeways contribute to wind penetration. The existing developments of varying heights (from 15 m to over 100m) to the south of the Castle Peak Road do not significantly impede the breezeways reaching the busiest road of the project area. This is because these buildings of various heights are dispersed and do not form a wind shield.

At present, there is ample room for the wind to divert around the taller developments such as:

- The committed development of 80.1m to 100m, just south of Greenery Place
- Crystal Park
- Yee Fung
- Ho Shun Tai Building
- Manhattan Plaza
- Fu Shing
- Hop Yick Plaza
- Kui Fat Building
- Wang Fung Building
- Opulence Height
- Shun Fung Building

For the area north of Castle Peak Road, there is no significant obstacle to southerlies from going northwards. The industrial area will have ample access of wind.

There is no major cluster of the tall development except for YOHO Town. The southerlies will funnel through the “courtyard” of YOHO Phase 1 and partially stagnate on the southern facades on the wind wall of YOHO Phase 2. See Figure 10. Part of Yuen Long Kau Hui including Tsoi Uk Tsuen, Ying Lung Wai, Tai Wai Tsuen, Wong Uk Tsuen lie in the wake of YOHO Town, Sun Yuen Long Centre and West Rail Station and will have less access to southerlies in Spring and Summer.

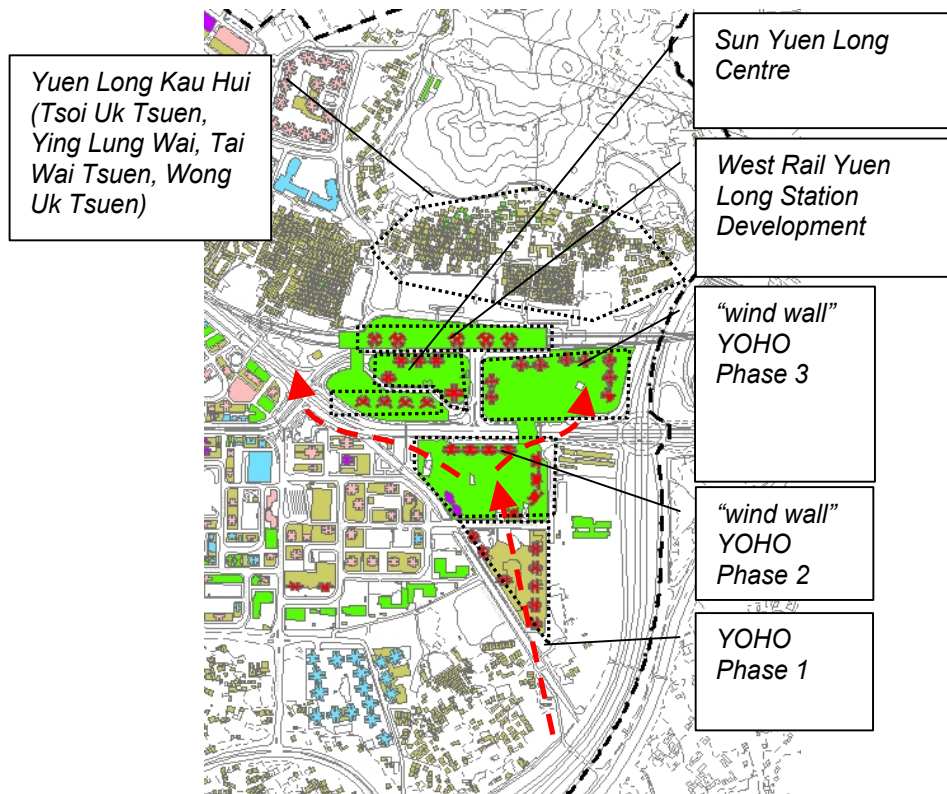


Figure 10 Existing Scenario around YOHO Town Area in Spring and Summer

4.3 EXISTING SCENARIO IN AUTUMN AND WINTER

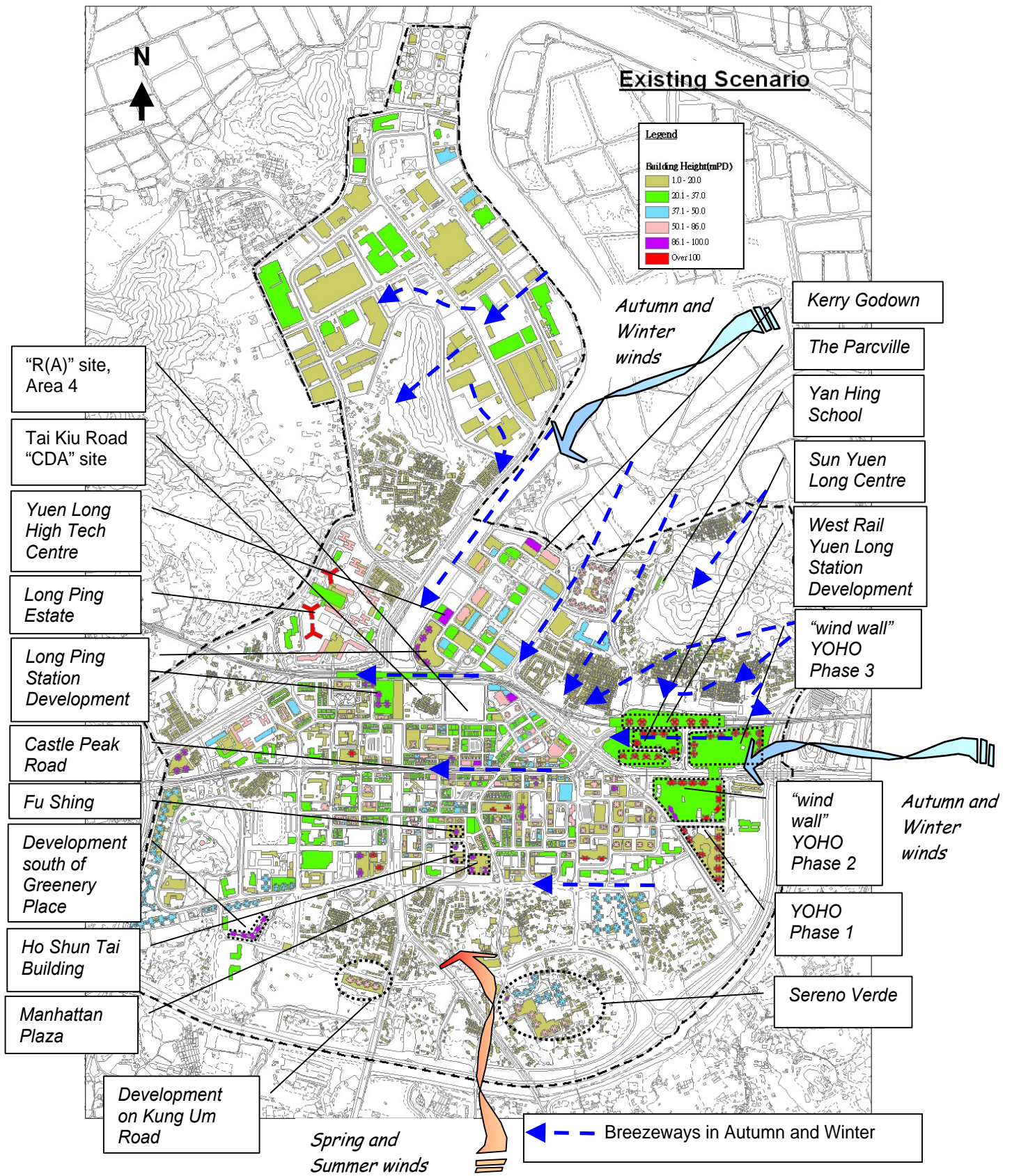



Figure 11 Existing Scenario around Project Area in Autumn and Winter





Section 3 has identified the annual prevailing wind directions as north-easterlies and easterlies and southerlies. It has been shown that the north-easterlies and easterlies dominate the Autumn and Winter months.

Figure 11 shows the prevailing winds for the project area in Autumn and Winter, the major breezeways are marked by dotted arrows. The northern part of the project area is mainly flat land with low rise developments, open space and green belts, except for:

- Kerry Godown
- Yuen Long High Tech Centre
- Long Ping Estate
- Approved Long Ping Station Development

These individual tall buildings above are far apart and will not significantly impede the breezeways from reaching southwards. In other words, the north-easterlies have good access through towards Yuen Long town centre.

The major breezeways towards Castle Peak Road in Yuen Long town centre include:

- Wang Lok Road
- Shan Pui Ho East Road
- Shan Pui River
- Po Yip Street
- Yuen Long Kau Hui Road
- Around the knoll near ex-Yan Hing School

The alignment of the streets and roads allow penetration of north-easterlies to flow towards the town centre. The building plot ratio and building height increase from the northern border of the project area towards the town centre.

The presence of YOHO Town, Sun Yuen Long Centre and West Rail Station development are obstacles to the north-easterlies, and to a lesser extent the easterlies. See Figure 11. These developments will reduce the wind penetration to the areas in the wake, extending to the vicinity of Tai Tong Road.

The knoll north of YOHO Town (zoned “Green Belt” (“GB”)) in the area will improve the wind penetration towards the town centre and must be preserved and should not be built upon. This is a key channel for the north-easterlies, in particular for YOHO Town, as the so-called “Gate to the Yuen Long Town” causes adverse air ventilation to its wake area. Besides, the building height restriction of 3 storeys for the two “G/IC(1)” sites to the east and north of the knoll and another “G/IC(1)” site to the east of West Rail Yuen Long Station is appropriate and should not be relaxed. Similarly, the knoll (Chu Wong Ling, zoned “GB”) in the industrial zone of the project area should also be preserved.

The channels for easterlies are aligned with the streets such as:

- Castle Peak Road
- Ma Tong Road
- Yuen Long Highway

South of Ma Tong Road, the low plot ratios and building heights do not significantly impede the easterlies blowing over the southern part of the project area.

# 5 Planned Scenario with Mitigations and Improvement Measures

## 5.1 GENERAL OBSERVATIONS

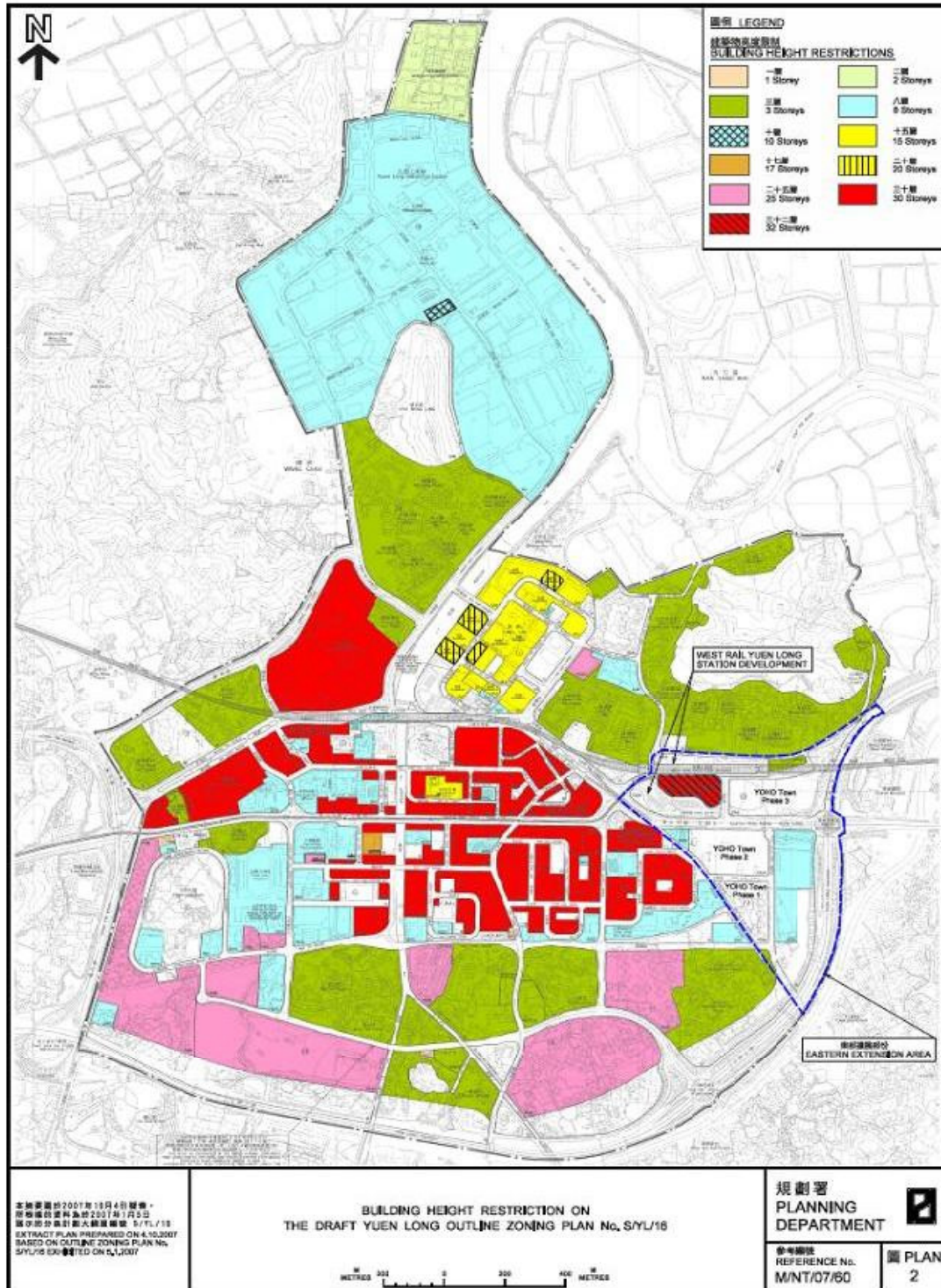


Figure 12 Building height restrictions for the project area



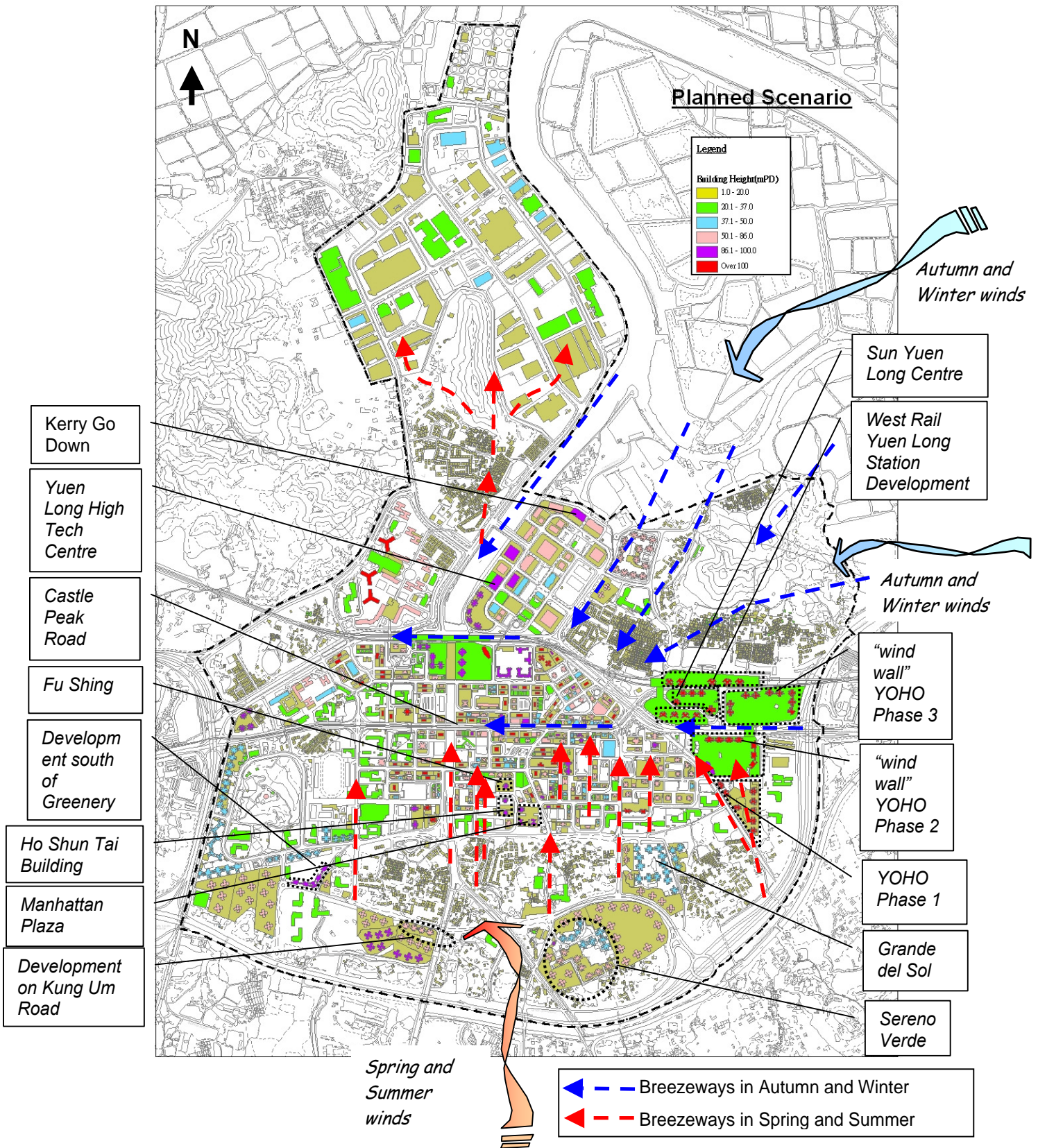


Figure 13 Planned Scenario

Note: Building blocks and layout of future developments are indicative

Figure 12 shows the building height restrictions for the project area. Figure 13 shows the assumed development/redevelopment of some sites in accordance with

the development restrictions under the OZP, on top of the existing and approved/committed ones.

The development along the southern skirt such as in the vicinity of Sereno Verdo would enjoy ample breeze in their homes. However, the future development schemes of similar height should pay attention to the dimensions of “courtyard” and inter-building spacing. Otherwise, the negative wind impact is likely to be felt by the local users. Figure 14 shows an example of such recommendation.

For example, take the area around Sereno Verde, zoned “R(B)”, with maximum plot ratio of 3.5, site coverage of 50% and number of storeys of 25 excluding basement car park. In an ideal case, the space in between the buildings in the windward direction should follow the recommendation in Figure 14(a), that is if the maximum building height is 86m, then the spacing, W, should be a minimum of 172m. If space is a constraint, then the limiting spacing to avoid skimming flow in the windward direction would be approximately 115m if the buildings are arranged in-line. This “courtyard” spacing is already found in some of the existing developments around Sereno Verde in Figure 14, and appears to be feasible in future developments.

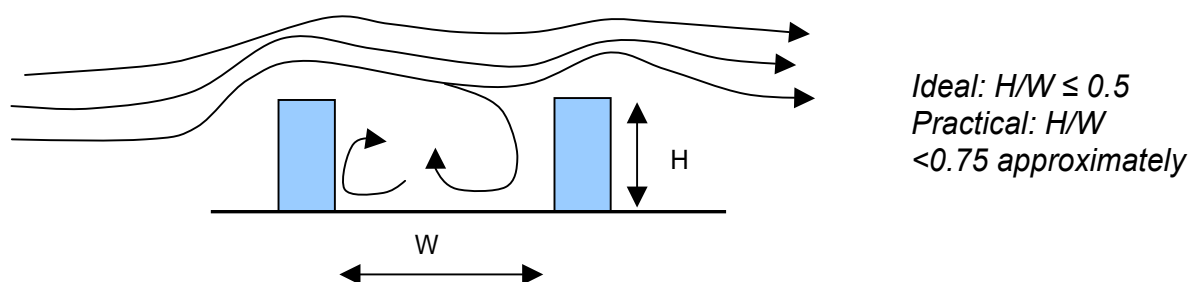


Figure 14(a) Recommendation of inter-building or “courtyard” spacing in windward direction if buildings are arranged in-line

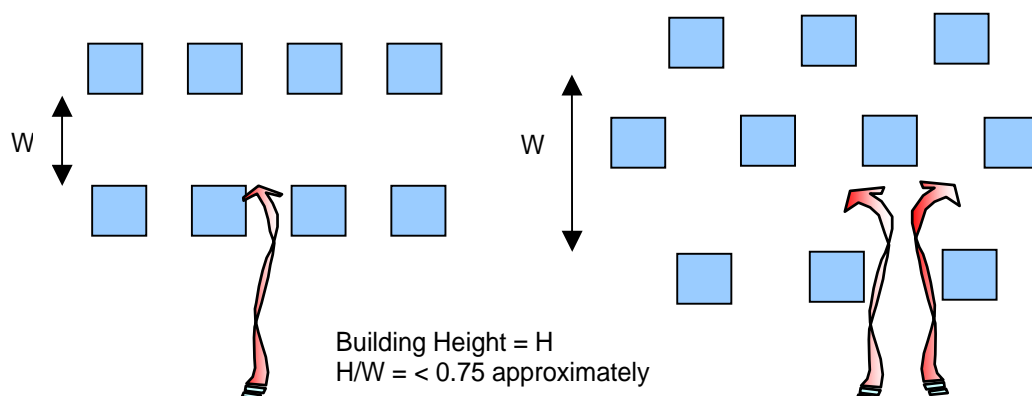


Figure 14(b) Recommendation of inter-building or “courtyard” spacing in windward direction

## 5.2 YOHO TOWN

The YOHO Town development and the West Rail Yuen Long Station development adversely affect breezeways. The “gateway” development becomes a gate which blocks oncoming wind towards the town centre. Since some of these are built and planning permissions have been granted for the future phases, the situation between the existing scenario and planned scenario is similar. No more developments of this scale should be erected in the vicinity.

### 5.3 AREA 13

The proposed landscape corridor in Area 13 is a key breezeway in the planned scenario, especially with the adjacent development zoned under R(A)1. This key wind corridor should be kept free of developments. The committed/planned low-rise school developments located in the eastern part of the site would create a gap between the existing “R(B)” development and future developments at the “R(A)1” site. This could help reduce the adverse impact arising from the “R(A)1” developments.

### 5.4 TOWN CENTRE OF PROJECT AREA

Currently, the buildings along Castle Peak Road vary from 15m to 100m in height, with the majority of the developments being low-rise. Ideally, there should be no podiums for the future developments along Castle Peak Road as the buildings will be already in close proximity of each other. The width of Castle Peak Road is approximately 25m, the buildings (including podium) along this road should be set back to maximise the width of the canyon to approximately 35 to 40m, as shown in Figure 15 (a).

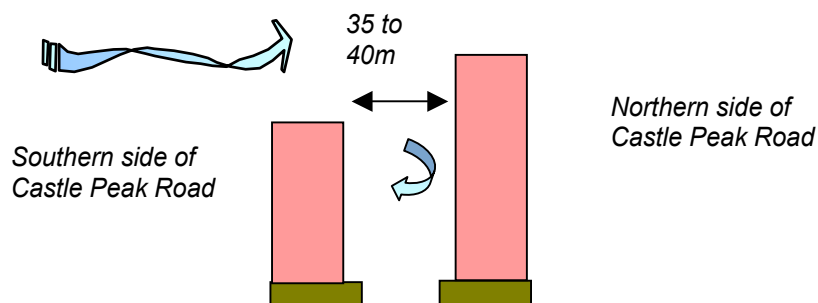


Figure 15 (a) Recommendations for Set-back

Existing narrow alleys of north-south direction between the buildings on Castle Peak Road will restrict the air ventilation in the space (see Figure 15b). As summarised in Table 2, care must be taken in the proportioning of the towers on the podium. Should there be podiums in the narrow alleys on either the northern or southern side of the Castle Peak Road, the buildings above the podium should be set back by approximately 5 m to widen these narrow canyons. The ventilation in the narrow alleys on either side of the Castel Peak Road will be improved if the adjacent buildings are spaced further apart. For example, take an alley of 10m wide, if the buildings are set back from the boundary by approximately 5 m on either side, the spacing between these adjacent buildings will be increased to approximately 20m.



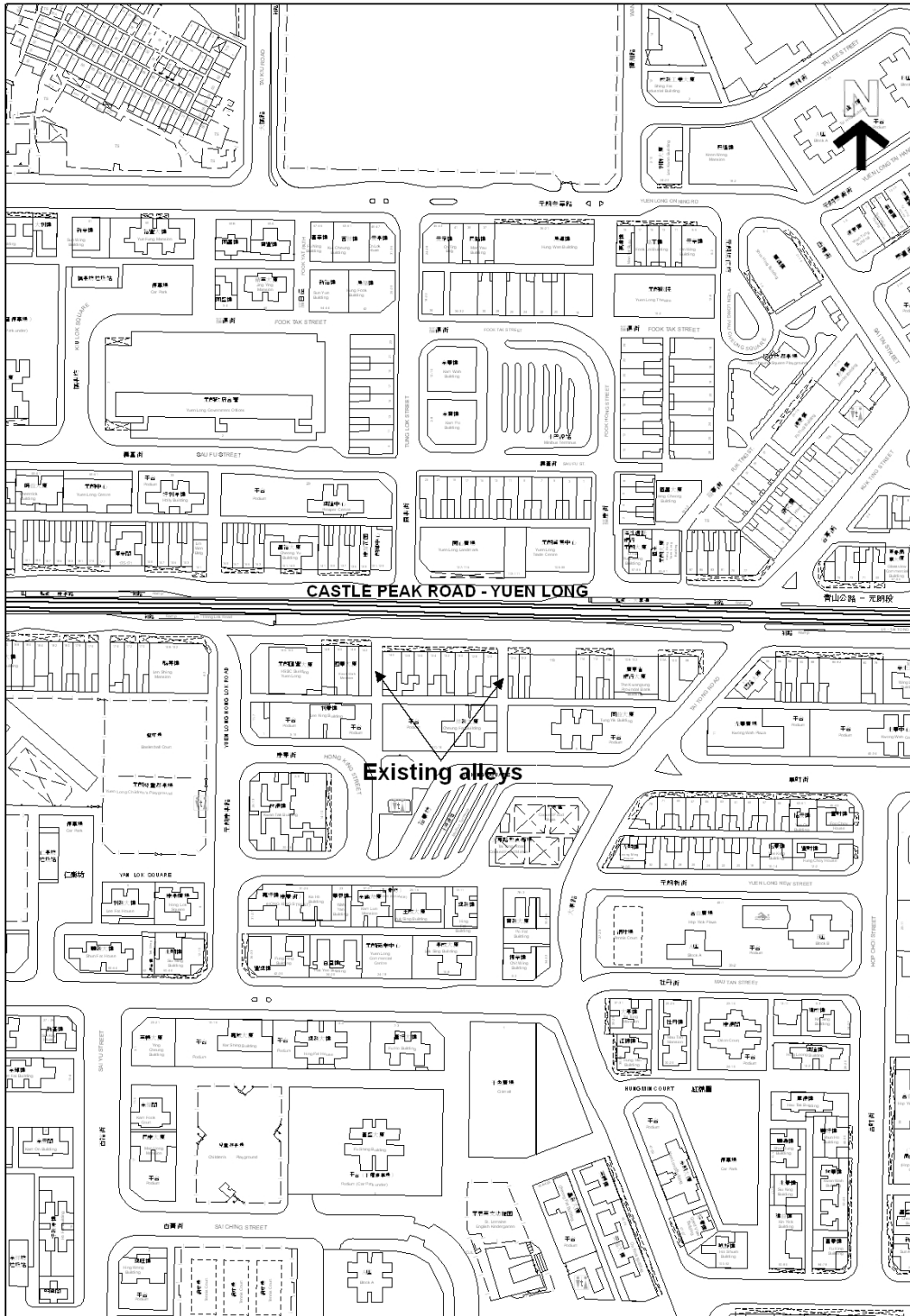


Figure 15 (b) Existing Narrow Alleys

Build forms and permeable podiums can also help to encourage wind to reach the street and disperse pollutants and heat. Figure 15 (c) illustrates this. Initial AVA modelling is required for the development if the impacts are to be quantified.

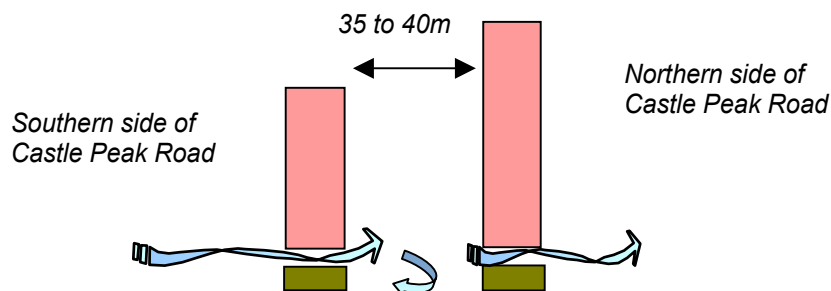


Figure 15 (c) Recommendations for Podium

The developments in the planned scenario are assumed to reach about 100m (30 storeys). The height and the potential concentrated cluster along the Castle Peak Road and vicinity would reduce the ventilation potential in the area. Not only this will reduce the potential for cross ventilation in the residential dwellings, but also reduce wind coming down to street level. Figure 16 provides an indicative layout that would minimise the reduction of breezeway through positioning of the tower with respect to the podium.

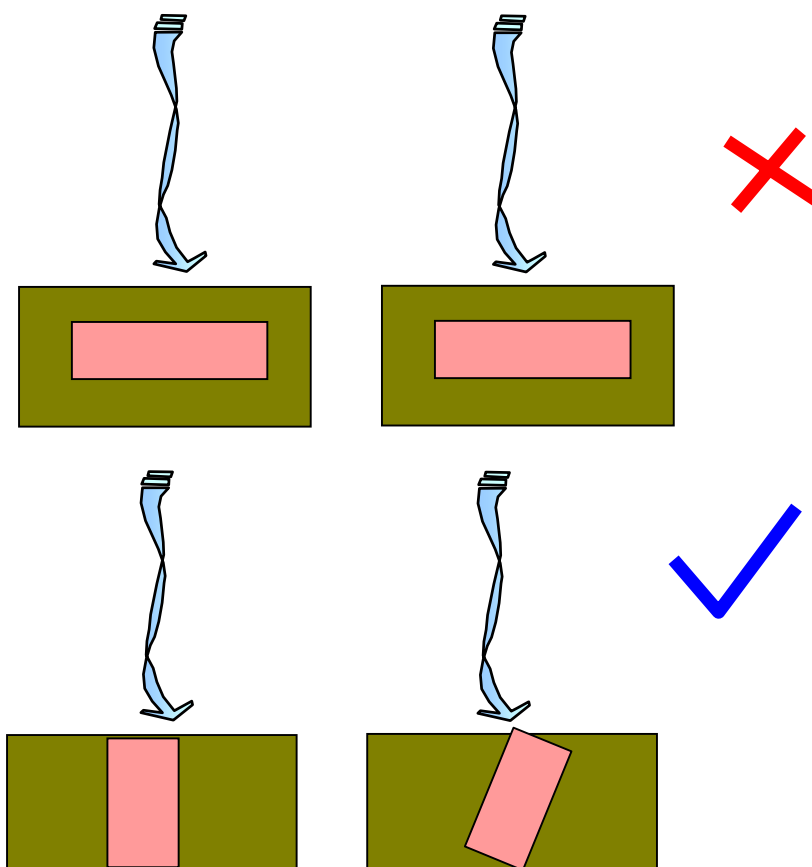


Figure 16 Recommendations for Building Alignment

Negative wind effect will be possible if the adjacent lots in the town centre along Castle Peak Road are amalgamated and redeveloped to consecutive massive and tall buildings of uniform height of 30 storeys (about 100m). Figure 17 provides indicative proportions recommended for such scenario in that for a building with a width of 20m facing the prevailing wind, the maximum height should be no more than 85m, and ideally without podiums. It would benefit the wind environment if the space between adjacent buildings is at least 20m to 30m. However, it is recognized that it is not feasible to build such massive buildings for the existing consecutive small lots, based on the current plot ratio restriction on Outline Zoning Plan and site coverage restriction on Building (Planning) Regulations. Besides, land assembly problem will render large scale site amalgamation unlikely.

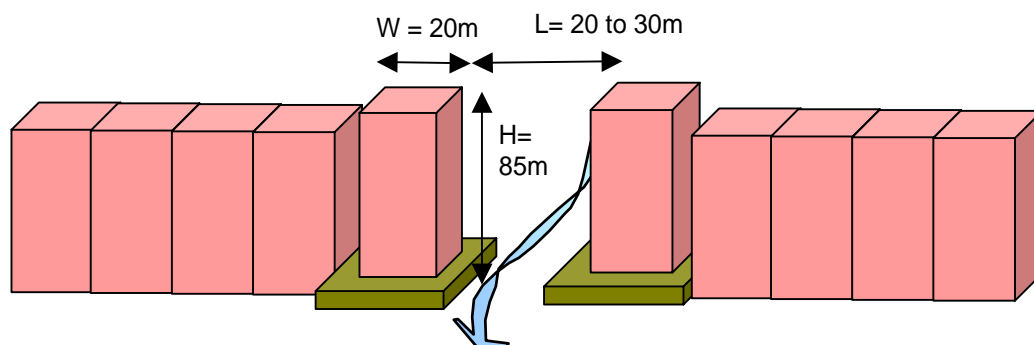


Figure 17 Recommendation for indicative dimensions for Planned Clusters in centre of Project Area (not drawn to scale)

Equation (1) can be used to determine the blockage ratio.

$$R_b = (W \times H) / (W + L)^2 \quad (1)$$

Figure 18 correlates the blockage ratio with approximate ventilation effectiveness, which is defined here as the wind velocity as percentage of unobstructed wind velocity. In other words, the smaller the value of the blockage ratio, the better the ventilation.

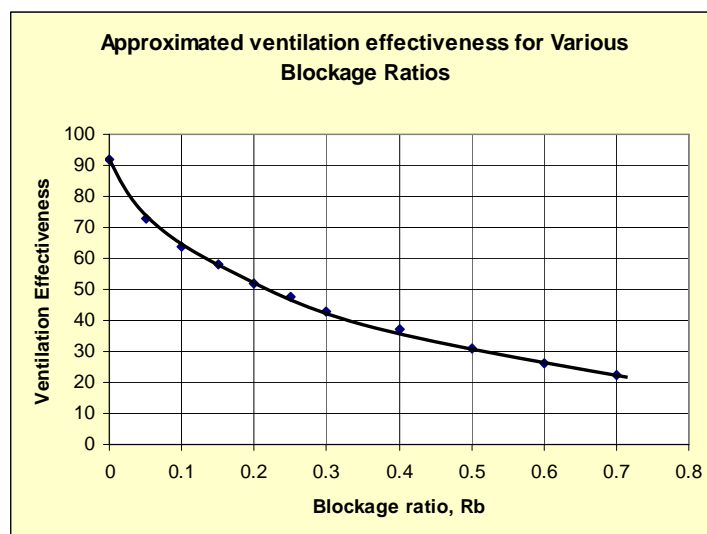


Figure 18 Relationship between Blockage Ratio and Approximate Ventilation Effectiveness (Brown and DeKay, 2000)

If the height limit is to be maintained at 30 storeys (about 100m) then the buildings in the southern side of Castle Peak Road should be shorter by at least 15m (about 5 storeys) than those in the northern side. The conditions along Castle Peak Road would be improved if skimming flow is minimized by widening the gap between buildings and developments; and building height is irregular and steps up towards north as shown in Figure 19. The scatter of “Open Space” sites (without building) and “G/IC” sites (restricted to a maximum of 8 storeys) in the town centre is a good example of this, however, the condition will be improved if more of these are included in the town centre.

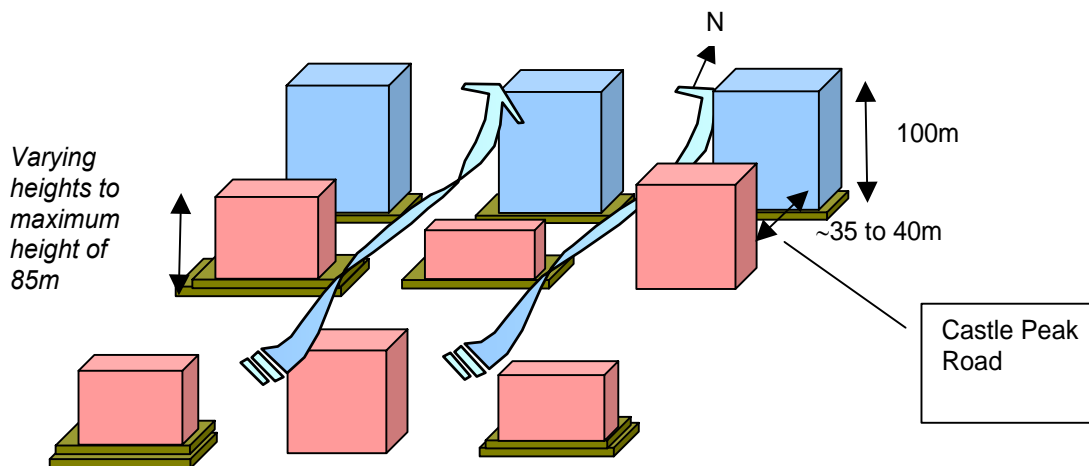


Figure 19 Alternative layout for Yuen Long Town Centre if buildings are around 100m in height

#### 5.5 OTHER AREAS

There are no major difference between the existing scenario and planned scenario in the northern area and southern area, the distribution of maximum height and plot ratio of the planned scenario are similar to that of the existing scenario.

The northern and southern parts of the project area are mainly flat land with low rise developments, open space and green belts, except for a few developments. These individual tall buildings are far apart and will not significantly impede the breezeways from reaching southwards. In other words, the north-easterlies and southerlies have good access through towards Yuen Long town centre. The building height restrictions of 3 storeys for the three “G/IC(1)” sites in Area 14 is considered appropriate. Higher buildings in these sites may affect the wind condition of the nearby villagers.

#### 5.6 KEY POINTS

The key points between the existing and the planned scenarios are highlighted in Table 2. The majority of the developments in the planned scenario would not cause noticeable negative impacts to the existing wind environment. However, it is important to note that the layout and arrangement (building disposition) of developments are only indicative in the planned scenario in Figure 13, the main points which would affect the existing wind environment negatively are not restricted to building height and plot ratio, but also the relative arrangement, layout and site coverage. These conditions are listed in Table 2 below. It is therefore important to observe these observations for future developments in the planned scenario.

Key Points	Zoning	Maximum Plot Ratio	Maximum Building Height (no. of storeys)	Comments
Area 14	R(B)	PR3.5 Site coverage 50%	25 excluding basement carpark	Likely to have no significant negative impact, if recommendation in Figure 14 is observed for "courtyards".
Area 13	R(A)1	PR5/9.5	25	Likely to have no significant negative impact, if recommendation in Figure 14 is observed for "courtyards".
South of Yuen Long Park	R(B)	PR3.5 Site coverage 50%	25 excluding basement carpark	Likely to have no significant negative impact, if recommendation in Figure 14 is observed for "courtyards". The impact on the wind environment will be more likely to be internal to the development.
Around Grand Del Sol	R(B)	PR3.5 Site coverage 50%	25 excluding basement carpark	Likely to have no significant negative impact, if recommendation in Figure 14 is observed for "courtyards". The impact on the wind environment will be more likely to be internal to the development.
Tai Kiu Tsuen on Tai Kiu Road	CDA	PR 5/9.5	none	Avoid large podium in the area; Decrease height of podium and increase permeability in podium; Introduce stepped podium. An initial AVA is required to demonstrate the planned development does not have a negative effect on wind environment.
School buildings in Area 13	R(A)1	PR5/9.5	25	Likely to have no significant negative impact, if low rise (<40m) and spaced apart
Plot bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road	R(A)	PR5/9.5	30	It is likely to have no significant negative impact, if: There is no podium or stepped podium is set back by approximately 5m from the street; Buildings arranged with breezeways through the plot; Buildings do not form a wind screen. An initial AVA is required to demonstrate the planned development does not have a negative impact of the wind environment.
Buildings in area 7 (in particular for developments highlighted in Figure 20)	OU Business	PR5	15	Likely to have no significant negative impact, if:  No podium or stepped podium with set-back of approximately 5m for the three sites shown as A to C in Figure 20.  Avoid slab type building facing north-easterlies. (See Figure 16).

Table 2 Comparison between Existing and Planned Scenarios

Key Points	Zoning	Maximum Plot Ratio	Maximum Building Height (no. of storeys)	Comments
GIC sites in town centre	GIC		8	The height restriction of these GIC sites in town centre is similar to that at the same locations in the existing scenario, and does not have negative impacts.
GIC(1) sites in outer skirt at Areas 14 and 16	GIC (1)		3 (8 for 'Hospitals' and 'School' uses)	The height restriction of these GIC(1) sites in outer skirt of town is similar to that at the same locations in the existing scenario, and does not have negative impacts.
Dah Chong Hong Motor Services Ltd., Po Yip Street (Site D on Figure 20)	R(B)1	PR3	25 storeys excluding basement carpark	Likely to have no significant negative impact if tower orientation and build form do not block north-easterlies, or easterlies.
Clusters of development in town centre	R(A)	PR5/9.5	30	Some negative impact to environment, in particular if there are consecutive massive and tall buildings in the future. Minimise by:  Limiting podium height and encouraging set-back from street. Refer to Figures 15 (a) and (c).  Reduce maximum height of the buildings. See recommendation in Figure 17.  Widen gap between buildings.  Decrease building height on southern side of Castle Peak Road and introduce distribution of irregular heights. See Figure 19.

Table 2 Comparison between Existing and Planned Scenarios (contd.)

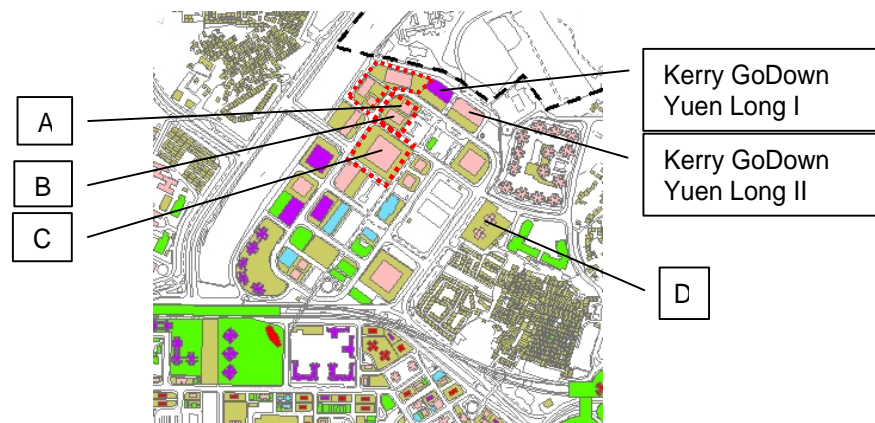


Figure 20 Buildings in Area 7 (Highlighted by red dashed line)

Note: Building Blocks are indicative



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## 5.7 FURTHER STUDY

The sensitivity of the YOHO Town development to the existing wind environment leads to the requirement of mitigation. However, these developments are already committed and the initial CFD study could only be beneficial to the air ventilation if there is opportunity to implement the mitigation strategies. For the remaining area with proposed developments of relatively low (50m) heights and fair spacing, it is not envisaged that the air ventilation would be significantly impacted.

For the town centre developments along Castle Road and its vicinity, initial AVA study is not envisaged **IF** the recommendations of orientation and geometrical relations are observed.

For the following two areas (see Figure 11), in view of their large site area and scale of development, future developments/redevelopments, in particular with large podium, will adversely impact the wind environment in the surrounding areas. An initial air ventilation assessment is therefore recommended to assess the air ventilation impact of the proposed developments on the surrounding areas and to identify mitigation measures.

- Plot bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road; and
- Tai Kiu Tsuen on Tai Kiu Road






## 6 Conclusions

The expert evaluation concludes that for the existing scenario (existing plus approved/committed developments).


- The YOHO Town development and the West Rail Yuen Long Station development adversely affect breezeways. The “gateway” development becomes a gate which blocks oncoming wind towards the town centre, including the prevailing wind of north-easterlies and easterlies. Since some of these are built and planning permission has been granted for the future phases, no more developments of this scale should be erected in the vicinity.
- The combination of village type, open space and green buffer areas amount to approximately 35% of the project area. This cluster of breezeways should be maintained.
- The developments along the southern skirt such as in the vicinity of Sereno Verde would enjoy ample breeze in their homes. However, the future development schemes of similar height should pay attention to the dimension of “courtyard” and inter-building spacing to minimise skimming flow. The recommended “courtyard” spacing is already found in some of the developments and seems feasible in future developments.
- The alignment of the streets and roads allow penetration of breeze towards the town centre from the south. The existing developments of varying heights (from 15 m to over 100m) to the south of the Castle Peak Road do not significantly impede the breezeways reaching the busiest road of the project area.
- For the area north of Castle Peak Road, there is no significant obstacle to southerlies from going northwards. The industrial area will have ample access of wind.
- The northern part of the project area is mainly flat land with low rise developments, open space and green belts, except for a few developments. These individual tall buildings are far apart and will not significantly impede the breezeways from reaching southwards. In other words, the north-easterlies have good access through towards Yuen Long town centre.
- The knoll north of YOHO town in the area will benefit the wind penetration towards the town centre and must be preserved and should not be built upon. This is a key channel for the north-easterlies. Similarly the knoll in the industrial zone of the project area should also be preserved.



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- South of Ma Tong Road, the low plot ratios and building heights do not significantly impede the easterlies blowing over the southern part of the project area.

For the development restrictions under the OZP as illustrated in the planned scenario, the following conclusions and improvement measures are suggested:


- There would be no likely significant negative impact in Areas 14, 13 and south of Yuen Long Park, and around Grand Del Sol, if skimming flow is minimised. See Figure 14. If this recommendation is not followed, it is likely that the negative impact of the wind environment would be internal to the development.
- The proposed landscape corridor in Area 13 is a key breezeway in the planned scenario, especially with the adjacent development zoned under R(A)1. This key wind corridor should be kept free of developments.
- Avoid large podium, decrease podium height, introduce set-back, or step form to podiums, or increase permeability in podiums for developments in Tai Kiu Tsuen “CDA” site on Tai Kiu Road (see Figure 11). An initial air ventilation assessment is required to verify the impacts on the wind environment and recommend mitigation measures as appropriate.
- There would be no likely significant negative impact if the plot bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road, i.e. the “R(A)” site at Area 4 (see Figure 11), has no podium or if the podium is stepped and set back from the street; and the buildings are arranged in line with breezeways without wind screen effects. An initial air ventilation assessment is required to verify the impacts on the wind environment and recommend mitigation measures as appropriate.
- Avoid large podium, decrease podium height, introduce set-back, or step form to podiums, or increase permeability in podiums for developments in Area 7, Tung Tau Industrial Area. This is particularly important for the three developments on Wang Yip Street West as they are in the “courtyard” of Area 7 and the “core” would be relatively built up as compared to the existing scenario. See Figure 20 (sites A to C). The impacts will likely to be felt by local pedestrians and users.
- There would be no likely significant negative impact for buildings in area 7 and the plot adjacent to Kerry GoDown on Tak Yip Road (see Figure 20), if there is no podium or if the podium is permeable; and if slab type buildings facing north-easterlies are avoided.
- Ideally, there should be no podiums for future developments along Castle Peak Road as the buildings will be already in close proximity of each other. The width of Castle Peak Road is approximately 25m, the buildings including podium, along this road should be set



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back to maximise the width of the canyon to approximately 35 to 40m.

- Narrow alleys of the north-south direction between the buildings on Castle Peak Road will restrict the air ventilation in the space. Should there be podiums in the narrow alleys on either the northern or southern side of the Castle Peak Road, the buildings above the podium should be set back by approximately 5 m to widen these narrow canyons. The ventilation in the narrow alleys on either side of the Castle Peak Road will be improved if the adjacent buildings are spaced further apart. For example, take an alley of 10m wide, if the buildings are set back from the boundary by approximately 5 m on either side, the spacing between these adjacent buildings will be increased to approximately 20m to 30m.
- Build forms and permeable podiums can also help to encourage wind to reach the street and disperse pollutants and heat.
- Negative wind effect will be possible if the adjacent lots in the town centre along Castle Peak Road are amalgamated and redeveloped to consecutive massive and tall buildings of uniform height of 30 storeys (about 100m). However, it is recognised that it is not feasible to build such massive buildings for the existing consecutive small lots, based on the current plot ratio restriction on Outline Zoning Plan and site coverage restriction on Building (Planning) Regulations. Besides, land assembly problem will render large scale site amalgamation unlikely.
- Indicative proportions of those future massive and tall developments in the town centre along Castle Peak Road and its vicinity are provided. To mitigate potential adverse impact, the height of those buildings is preferably to be lowered to approximately 85m (about 25 storeys). If the height limit is to be maintained at 30 storeys (about 100m), then the buildings in the southern side of Castle Peak Road should be shorter by at least 15m (about 5 storeys) than those in the northern side. An indicative layout that would minimise the reduction of breezeway through positioning of the tower with respect to the podium is provided.
- The conditions along Castle Peak Road would be improved if skimming flow is minimised by widening the gap of buildings abutting the same road to a total of 35m to 40m; and introducing irregular building height stepping towards the north direction. See Figure 19. The “O” and low-rise “G/IC” sites in the town centre already create irregular heights.
- The sensitivity of the YOHO Town development to the existing wind environment leads to the requirement of mitigation. However, these developments are already committed and the initial air ventilation assessment could only be beneficial to the air ventilation if there is opportunity to implement the mitigation strategies. For the remaining area with proposed developments of relatively low



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(50m) heights and fair spacing, it is not envisaged that the air ventilation would be significantly impacted.

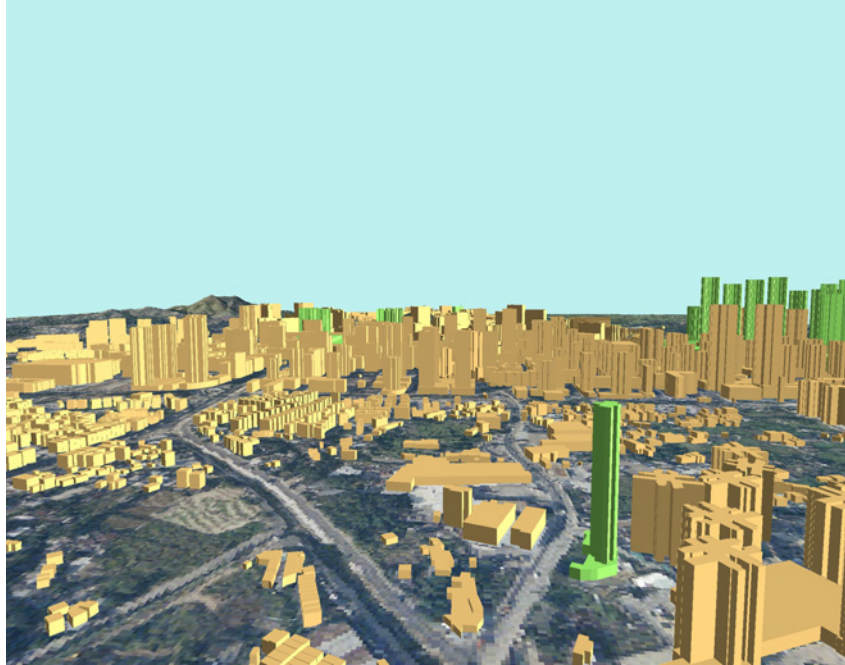
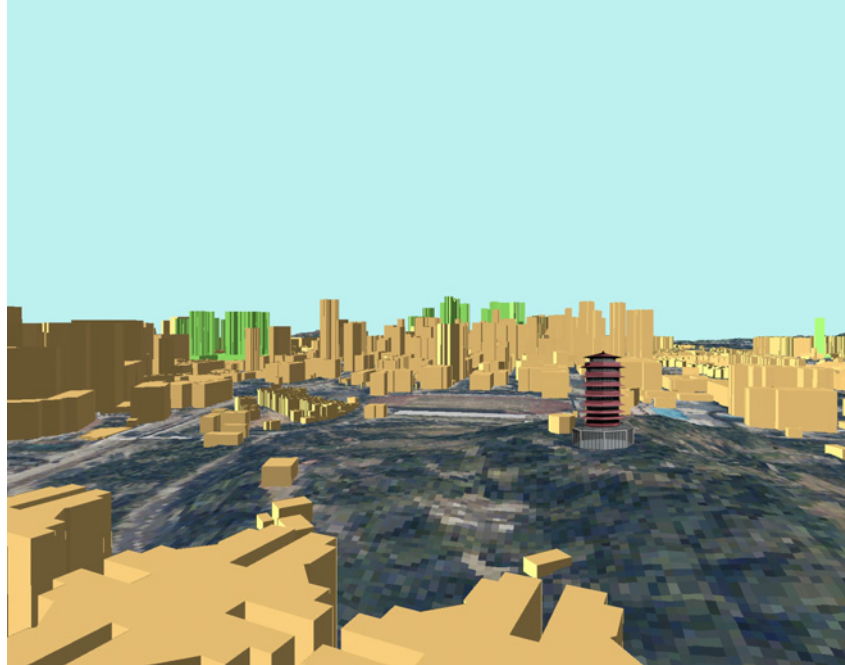
- For the town centre developments along Castle Road and its vicinity, initial air ventilation assessment is not envisaged **IF** the recommendations of orientation and geometrical relations are observed.
- For the following two sites, in view of their large site area and scale of development, future developments/redevelopments, in particular with large podium, will adversely impact the wind environment in the surrounding areas. An initial air ventilation assessment is recommended (see Figure 11):
  - The “R(A)” site bounded by Tai Kiu Road, Yuen Long On Ning Road, Wang Chau Road, Yuen Long On Lok Road; and
  - The “CDA” site at Tai Kiu Tsuen on Tai Kiu Road.



## 7 References

Sun, Wind and Light, Brown, G. Z. and DeKay, M, Wiley, 2000



## 8 APPENDIX A

Location	Existing Scenario	Location	Existing Scenario
3		4	

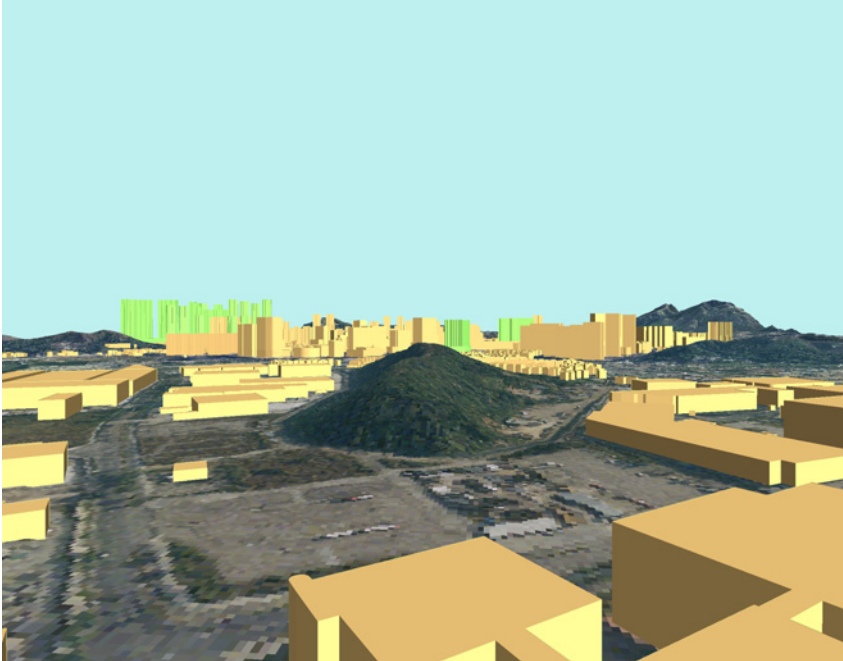
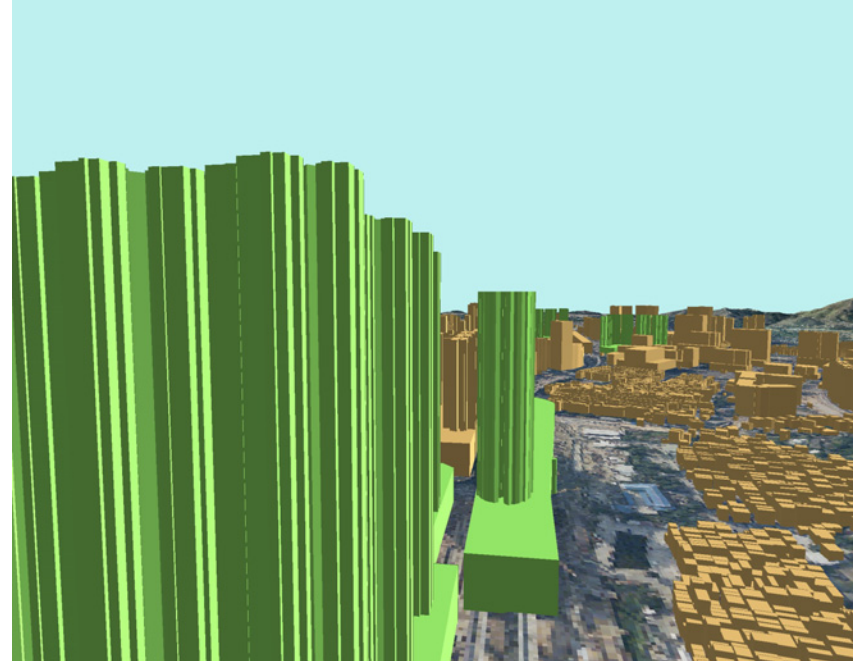
	Existing development
	Committed development

*Figure A1 View Towards Town Centre from Location 3 in Figure 1*

*Figure A2 View Towards Town Centre from Location 4 in Figure 1*





Location	Existing Scenario	Location	Existing Scenario
5		6	



	Existing development
	Committed development

Figure A3 View Towards Town Centre from Location 5 in Figure 1

Figure A4 View Towards Town Centre from Location 6 in Figure 1