

**CONSULTANCY STUDY FOR AIR VENTILATION ASSESSMENT SERVICES**  
**CAT. A1 – TERM CONSULTANCY FOR EXPERT EVALUATION ON AIR VENTILATION**  
**ASSESSMENT (PLNQ A1-6/AVA 2015)**

# **AIR VENTILATION ASSESSMENT EXPERT EVALUATION REPORT**

**FOR**

**AN INSTRUCTED PROJECT FOR TAI PO**  
(PLNQ A1-6/AVA 2015)

21 March 2017

**Submitted to:**  
**Planning Department**

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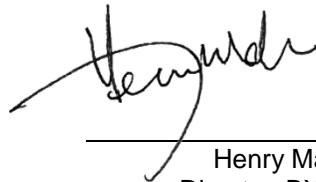
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## EXECUTIVE SUMMARY

BeeXergy Consulting Limited was commissioned by the Planning Department of Hong Kong Special Administrative Region Government to undertake an Air Ventilation Assessment (AVA) – Expert Evaluation (EE) for an instructed project for Tai Po. The current study aims to assess the preliminary air ventilation impacts of the proposed developments on their surroundings.

Project Area 1 is approximately 32,200 m<sup>2</sup> in area, currently zoned “Government, Institution or Community” (“G/IC”) on the approved Tai Po OZP No. S/TP/26 with a building height restriction of 47mPD. It is bounded by Pok Yin Road and Yau King Lane. Project Area 2 is approximately 4,500 m<sup>2</sup> in area located near Tai Po Centre. It is also zoned “G/IC” on the approved Tai Po OZP No. S/TP/26 with a building height restriction of 3 storeys. The annual and summer prevailing winds were studied in this AVA-EE using the RAMS wind data.

### Project Area 1

For Project Area 1, ENE, E and ESE winds are identified as the annual prevailing wind directions while S, SSW and SW winds are identified as the summer prevailing wind directions. It is proposed to rezone this site for private residential development with a maximum building height of 50mPD at plot ratio 3.6. The key findings are summarized below:

- Under ENE wind, the future development may create potential impact on the immediate downstream. To avoid impact created by a long continuous building façade, it is proposed to designate a non-building area (NBA) of a minimum width of 15m running in the NE/SW direction. Such NBA would facilitate penetration of ENE wind to reach the downstream areas (including Cheung Shue Tan Village).
- Under E wind, given no massive structure is expected at the northern part of the site, it is not expected that the future development with a maximum building height of 50mPD under the planned scenario would create any impact on the committed development in Area 39 which is located 300m away from Project Area 1
- Under E and ESE wind, it is expected that future development at Project Area 1 would split incoming wind into two air streams to travel along Pok Yin Road and Yau King Lane to reach the downstream area. However, a small area of The Education University of Hong Kong Sports Centre to the immediate northwest of the project area would fall into the wake of the future development and would be slightly affected. It is encouraged to increase the building permeability within Project Area 1.

- Under S, SSW and SW winds, the committed development at “R(B)6” is located at about 150m downstream from Project Area 1. The summer winds are expected to skim over the future development at Project Area 1 and reattach at pedestrian level around the committed development at “R(B)6”. In addition, provision of the NE/SW oriented NBA in the middle of Project Area 1 could avoid a long continuous building façade and facilitate wind penetration through the future development.

### Project Area 2

For Project Area 2, ENE, E and ESE winds are identified as the annual prevailing wind directions while E, ESE, SE and SSW winds are identified as the summer prevailing wind directions. It is proposed to relax the building height restriction to 8 storeys for a proposed community health centre. The key findings are summarized below:

- Under ENE and E wind conditions, given that the effective width of two existing air paths (i.e. Nam Wan Road and On Po Road) are mainly governed by the existing developments (i.e. Tai Po Mega Mall Multi-Storey Carpark and Tai Po Mega Mall) along these air paths, it is anticipated that the future development at Project Area 2 under the planned scenario would not further reduce the effective width of these air paths under the prevailing wind directions. However, the planned scenario with an increase in building height will inevitably induce a larger potential wind wake at the immediate downstream area when compared to the existing condition
- Under ESE, SE and SSW winds, it is expected that winds would skim over the future development at Project Area 2 and reattach at the open areas to the northwest and northeast of Project Area 2. No significant air ventilation impact on the developments further downstream is expected.

### Conclusion

For Project Area 1, with the provision of the NE/SW oriented NBA as well as the 10-17m drainage reserve, it is anticipated that the future development at Project Area 1 with maximum building height of 50mPD would not create significant air ventilation impact on the overall pedestrian wind environment around Project Area 1 except for slight potential impact in the immediate downstream at the sports centre under E and ESE winds.

Provided that the proposed mitigation measures (i.e. NBA) would be fulfilled as recommended in the building design for Project Area 1, there would be no major air ventilation issues. If the requirements cannot be met, further quantitative assessments should be conducted to demonstrate that the performance of any further development would be no worse off than the scenario with these measures

For Project Area 2, the increase in building height may have a slight adverse impact on the localized pedestrian wind environment. However, no major ventilation problem on the overall wind environment is anticipated and no further air ventilation assessment is required.–

All future developments at both Project Area 1 and Project Area 2 should consider the following design principles at the detailed design stage:

- ◆ Adopt building permeability equivalent to 20% to 33.3% with reference to PNAP APP-152;
- ◆ Minimize podium bulk with ground coverage of not more than 65%;
- ◆ Adopt building setback with reference to PNAP APP-152;
- ◆ Incorporate greening measures with a target of not less than 30% for sites larger than 1 ha, and not less than 20% for sites below 1 ha, preferably through tree planting at grade;
- ◆ Avoid long continuous façades; and
- ◆ Make reference to the recommendations of design measures in the Hong Kong Planning Standards and Guidelines.

## 行政摘要

香港特別行政區政府規劃署委託豐能顧問有限公司為大埔一個指定項目進行空氣通風評估 - 專家評估。本研究旨在評估擬議開發項目對其周邊地區的初步空氣流通影響。

項目 1 發展地盤面積約為 32,200 平方米，位於博研路及優景里旁，現於「大埔分區計劃大綱核准圖編號 S/TP/26」（大綱圖）被劃作「政府、機構或社區」地帶，高度限制為主水平基準上 47 米。項目 2 面積約為 4,500 平方米，位於大埔中心附近，現於大綱圖上亦被劃作「政府、機構或社區」地帶，高度限制為三層。本報告根據區域大氣模擬系統的風模擬數據研究全年及夏季盛行風環境。

### 項目 1

項目 1 的全年盛行風為東北偏東、東和東南偏東風，而夏季盛行風為南、西南偏南和西南風，現擬議把地盤改劃作私人樓宇發展，高度限制為主水平基準上 50 米，地積比率為 3.6。主要分析結果概述如下：

- 在東北偏東風下，未來的發展有可能直接對其下游地區產生潛在影響。為了避免出現過長的建築物而帶來的負面影響，建議設一東北/西南走、寬度最小為 15 米的非建築用地。這樣的非建築用地將有利於東北偏東風滲透到發展的下游地區（包括樟樹灘村）。
- 在東風下，由於預計在地盤北部將不會有大型結構物及在計劃下未來發展的最低建築高度設為主水平基準上 50 米，故預料發展不會對位於項目 1 約 300 米外的第 39 區發展產生任何影響。
- 在東和東南偏東風下，預計未來發展會將盛行風分為兩股氣流，並沿博研路和優景里前進到達其下游地區。然而，香港教育大學體育中心位於項目 1 西北面的一小片地區將落入未來的發展的風影區。因此鼓勵提高項目 1 內的建築滲透率，從而減少未來發展對附近行人風環境的影響。
- 在南，西南偏南和西南風下，附近已規劃的“R(B)6”區位於項目 1 下風位置約 150 米，這些夏季盛行風預計將會掠過項目 1，並於“R(B)6”區重新接到行人水平。此外，擬議於項目 1 中間東北/西南向的非建築用地可以避免過長的建築物，增加未來發展的風穿透性。

### 項目 2

項目 2 的全年盛行風為東北偏東、東和東南偏東風，而夏季盛行風為東、東南偏東、東南和西南偏南風，現擬議把地盤作社區健康中心，高度限制為 8 層。主要分析結果概述如下：

- 在東北偏東和東風的情況下，兩條現行風道(即南運路和安埔路)的有效寬度主要受現有發展(即大埔超級城的多層停車場及商場)影響，計劃下項目 2 的未來發展將不會進一

步縮窄這些風道在盛行風向下的有效寬度。相反與現時情況相比，建築物高度的增加將不可避免地在未來發展緊接的下游區域帶來一些潛在影響。

- 在東南偏東、東南和西南偏南風下，盛行風預期會掠過項目 2 的未來發展，並於項目 2 的西北和東北部的地方重新接回地面。預計項目 2 的未來發展將不會對其下游帶來顯著的影響。

## 結論

考慮到項目 1，將提供一條東北/西南向的非建築用地以及地盤內有一 10-17 米的排水系統專用範圍，預計建築高度為主水平基準上 50 米的未來發展將不會對周邊的整體行人風環境產生顯著的通風影響。但在東和東南偏東風下則對下游的運動中心帶來相對輕微的潛在影響。

如於項目 1 的未來發展能提供擬議的緩解措施（即非建築用地），發展將不會有重大的通風問題。如果不能滿足這個要求，則應進行進一步的空氣流動定量評估，以證明任何進一步發展相較提供緩解措施的方案，不會對附近行人風環境造成更壞的影響。

至於項目 2，雖然增加建築物的高度可能會對行人風環境造成輕微的通風影響，但預期將不會為整體行人風環境帶來通風問題。

項目 1 和項目 2 的未來設計發展可在詳細設計階段考慮以下設計原則：

- 參考 PNAP APP-152，提供建築物滲透率相當於 20%至 33.3%;
- 盡可能縮減平台，致地面覆蓋不超過 65%;
- 參考 PNAP APP-152 的建築物後移地帶;
- 大於 1 公頃的地盤需提供不低於 30%綠化覆蓋率，而 1 公頃以下的地盤則需提供不低於 20%綠化覆蓋率，並於地面種植樹木為佳;
- 避免過長的建築物; 及
- 參考“香港規劃標準與準則”中有關的良好通風設計措施的建議。



## 1 INTRODUCTION

### 1.1 PROJECT BACKGROUND

BeeXergy Consulting Limited (BXG) was commissioned by the Planning Department (PlanD) of the Hong Kong Special Administrative Region Government to undertake an Air Ventilation Assessment (AVA) – Expert Evaluation (EE) for an instructed project in Tai Po.

To meet the pressing need at housing supply, a site at Yau King Lane/Pok Yin Road in Area 39 which is currently zoned “Government, Institution or Community” (“G/IC”) on the approved Tai Po Outline Zoning Plan (OZP) No. S/TP/26 has been identified for housing development (hereby referred to as **Project Area 1**). According to the OZP, Project Area 1 is restricted to a maximum building height of 47mPD. Another “G/IC” site at On Pong Road in Tai Po Area 4 has been reserved for a proposed Community Health Centre (CHC) to meet the district needs (hereby referred to as **Project Area 2**). In order to accommodate the facilities proposed by Department of Health and Hospital Authority, the building height restriction of Project Area 2 is proposed to be relaxed from three storeys to eight storeys.

The current study aims to assess the potential air ventilation impacts of the proposed developments on the surrounding areas.

In conducting this AVA EE, the following previous AVA studies related to Project Areas 1 and 2 have been made reference to:

- Term Consultancy For Expert Evaluation on Air Ventilation Assessment for Tai Po Area (August 2010)
- Term Consultancy for Expert Evaluation and Advisory Services on Air Ventilation Assessment for Pak Shek Kok (East) Central Area, Tai Po (February 2014)
- Term Consultancy For Expert Evaluation on Air Ventilation Assessment for Tai Po (May 2014)

### 1.2 OBJECTIVES

The objectives of this study are to (i) review the existing wind environment of Project Areas 1 and 2 and their surroundings and (ii) assess qualitatively the potential air ventilation impacts of the proposed developments on the surroundings using the methodology of AVA, based on the “Housing Planning and Lands Bureau – Technical Circular No. 1/06, Environment, Transport and Works Bureau – Technical Circular No. 1/06” issued on 19th July 2006 (the Technical Circular) and “*Technical Guide for Air Ventilation Assessment for Development in Hong Kong – Annex A*” (the Technical Guide) of the Technical Circular.

### 1.3 STUDY TASKS

The major task of this study is to carry out an AVA EE on the characteristics of the site wind availability data of the project areas and assessment of the wind performance under the existing development situation and the proposed building design option in a qualitative way. The AVA EE will also cover the following tasks:

- Review the existing wind environment of Project Areas 1 and 2 and their surroundings
- Assess qualitatively the potential air ventilation impacts of the proposed private housing and CHC developments on their surroundings
- Identify major breezeway(s), air-path(s), problematic area(s)
- Evaluate the potential localized wind impacts of the proposed private housing and CHC developments in their surroundings
- Identify if there are any wind stagnation and wind amplification causing uncomfortable and unsafe wind environment
- Recommend improvement and mitigation measures
- Recommend if any further study is necessary

## 2 SITE CHARACTERISTICS

Project Area 1 is approximately 32,200 m<sup>2</sup> in area, currently zoned “G/IC” with a building height restriction of 47mPD on the approved Tai Po OZP No. S/TP/26. Figure 1 shows the location of Project Area 1 and its surrounding area.

It is bounded by Pok Yin Road and Yau King Lane and surrounded by a mix of low-to-medium density residential developments (i.e. Providence Peak, Providence Bay, The Graces – Providence Bay, Mayfair By The Sea and Cheung Shue Tan Village) and various GIC uses (i.e. Lo Kwee Seong Integrated Biomedical Sciences Building and The Education University of Hong Kong Sports Centre) as shown in Figure 1.

The Education University of Hong Kong Sports Centre is located to the north of Project Area 1. To the east are the Integrated Biomedical Sciences Building, the vacant site of extension area of the Chinese University of Hong Kong and committed developments in “R(B)5 and “R(B)6” zones. To the southwest of Project Area 1 are a stormwater pumping station, an open-air public car park and Cheung Shue Tan Village. To the further west is the residential development of Deerhill Villas, Deerhill Avenue and Deerhill Tower of Deerhill Bay with maximum building height of 88mPD, 70mPD and 113mPD respectively as well as the proposed mid-rise development in Area 39 with a maximum plot ratio of 1.2 and maximum building heights of 55 mPD at the northern portion and 65 mPD at the southern portion under application No. Y/TP/24 approved on 28 October, 2016. To the northeast across Tolo Highway are medium-density residential developments of Pak Shek Kok (i.e. namely Providence Peak with maximum building height of 51mPD). The ground elevation of Project Area 1 is relatively flat and constant at approximately 7.0mPD. Table 1 shows the building height of the existing and planned developments around Project Area 1.

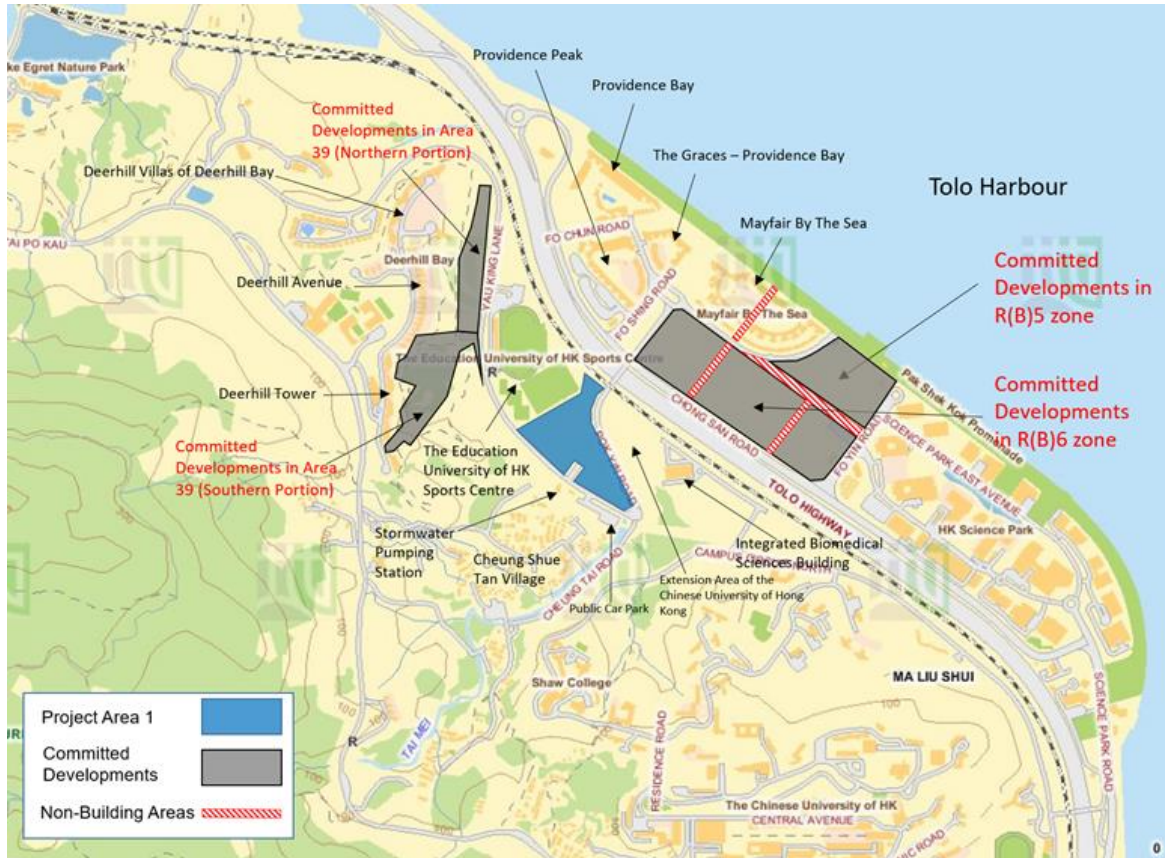


Figure 1 Location of Project Area 1

Table 1 Building Height for Existing and Planned Developments around Project Area 1

Name of Surrounding Developments	Maximum Building Height (mPD)
Cheung Shue Tan Village	33
Lo Kwee Seong Integrated Biomedical Sciences Building	47
Providence Peak	51
Providence Bay	36
The Graces – Providence Bay	36
Mayfair By The Sea	51
The Education University of Hong Kong Sports Centre	21
Sewage Pumping Station and Storm Water Pump House	13
Deerhill Villas of Deerhill Bay	88
Deerhill Avenue of Deerhill Bay	70
Deerhill Tower of Deerhill Bay	113
HK Science Park	54
Proposed Development in Area 39 (Northern Portion)	55
Proposed Development in Area 39 (Southern Portion)	65
Committed Development in “R(B)5” Zone	52
Committed Development in “R(B)6” Zone	65



Project Area 2 is approximately 4,500 m<sup>2</sup> in area, currently zoned “G/IC” with a building height restriction of 3 storeys on the approved Tai Po OZP No. S/TP/26. Figure 2 shows the location of Project Area 2 and its surroundings. It is located near Tai Po Centre and abuts Nam Wan Road,

Project Area 2 is surrounded by a mix of high-rise residential developments and various GIC uses. A multi-storey carpark with maximum building height of 44mPD adjoins the site to the west. To the south and further west are high-density high-rise residential developments, namely Tai Po Centre with maximum building height of 85mPD and Tai Po Plaza with maximum building height of 106mPD. To the north are Tai Yuen Estate with maximum building height of 75mPD and Carmel Pak U Secondary School with maximum building height of 21mPD. To the east across Nam Wan Road is Sun Hing Garden with maximum building height of 101mPD whilst to the southeast is Tai Po Police Station. To the northeast of the project area is a relatively open area. The ground elevation of Project Area 2 is flat and constant at approximately 6.5mPD. Table 2 shows the building height of the existing and planned developments around Project Area 2.



Figure 2 Location of Project Area 2 (Source: Planning Department)

**Table 2 Building Height for Existing and Planned Developments around Project Area 2**

<b>Name of Surrounding Developments</b>	<b>Maximum Building Height (mPD)</b>
Multi-storey Car Park (West of Project Area 2)	44
Tai Po Centre	85
Tai Po Plaza	106
Tai Yuen Estate	75
Carmel Pak U Secondary School	21
Sun Hing Garden	101
Tai Po Police Station	69

### 3 SITE WIND AVAILABILITY

The characteristic of the site wind availability should be identified in order to investigate the wind performance of Project Areas 1 and 2. Site wind availability data could be used to assess the wind characteristics in terms of the magnitude and frequency of approaching wind from each wind direction. There are two sources of site wind data for both project areas including the nearby Hong Kong Observatory (HKO) Station – Tai Po Weather Station (Station Code: TP) and simulated Regional Atmospheric Modelling System (RAMS) wind data. No experimental site wind data from wind tunnel test is available for Tai Po.

#### 3.1 HONG KONG OBSERVATORY

The prevailing wind direction for each month measured at the closest weather station – Tai Po Weather Station from the Hong Kong Observatory is tabulated in Table 3. The HKO weather station is located around 3km and 2km away from Project Area 1 and Project Area 2 respectively. Figure 3 below shows the location of Tai Po Weather Station.

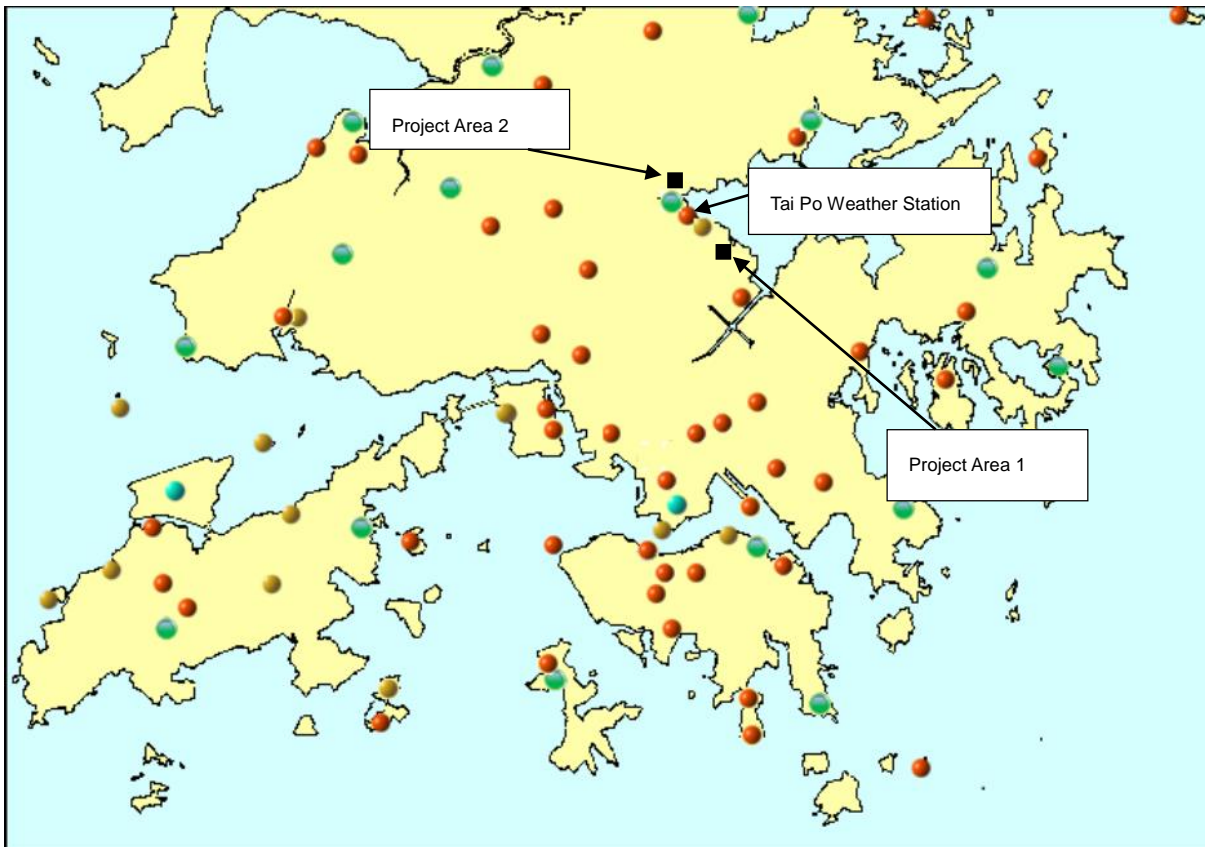


Figure 3 Location of Tai Po Weather Station (Source: Hong Kong Observatory)

From Table 3, NE wind is the annual prevailing wind direction while the WSW wind is the summer prevailing wind direction.

**Table 3 Monthly Wind Direction Recorded at Tai Po Weather Station**

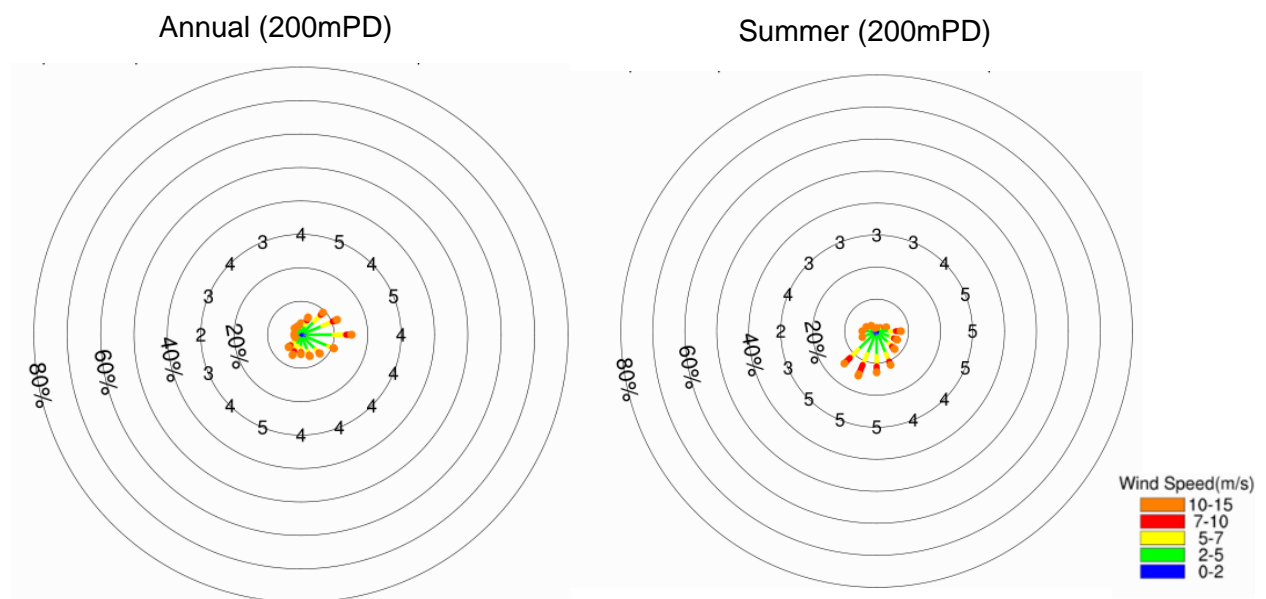
Month		Prevailing Wind Direction (°)
January		040
February		050
March		050
April		050
May		080
<b>June</b>	<b>(Summer)</b>	240
<b>July</b>		260
<b>August</b>		260
September		040
October		040
November		040
December		040
<b>Annual</b>		050



### 3.2 RAMS WIND DATA

A set of wind availability data of the Territory for AVA study is available at Planning Department's Website<sup>1</sup> by RAMS simulation

The wind availability data at 200mPD obtained from the grid of (X086, Y066) for the RAMS simulation covers Project Area 1 and is shown in Figure 4.



**Figure 4 Wind Roses for the Project Area 1 (X086, Y066) by RAMS Wind Data**

Table 4 Prevailing Wind Frequency of Project Area 1 by RAMS Wind Data

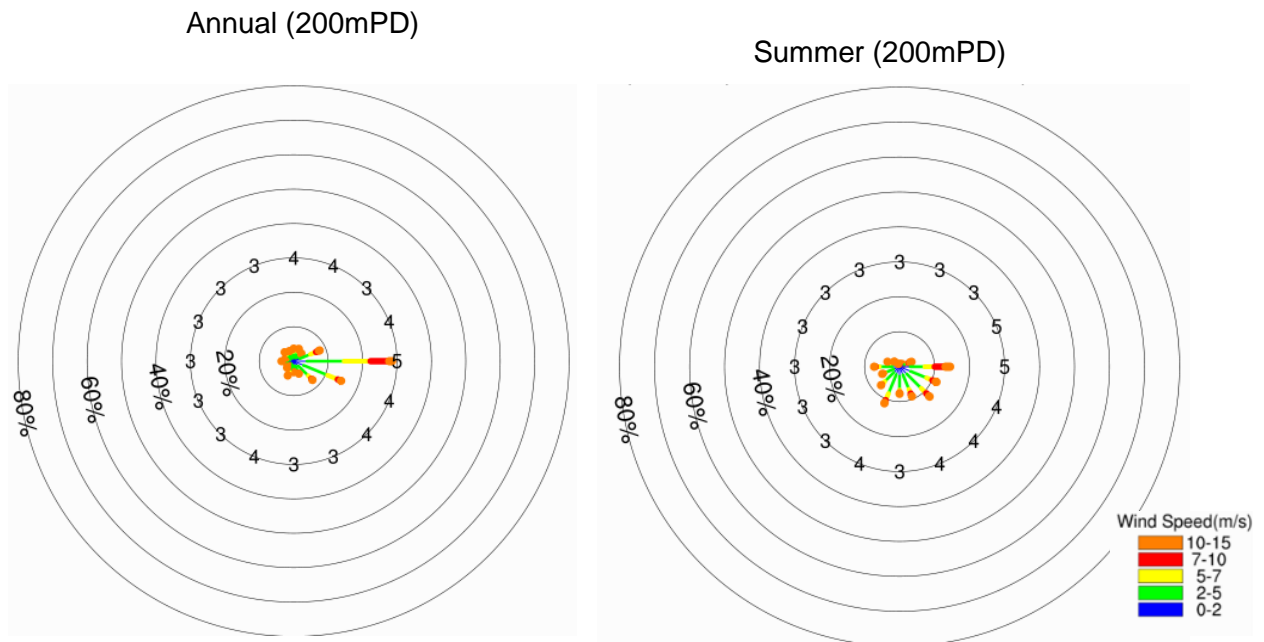
Prevailing Wind	Annual			Summer		
Wind Direction	ENE	E	ESE	S	SSW	SW
Wind Frequency	11.8%	15.2%	10.8%	12.9 %	15.1%	14.3%

According to the RAMS wind data of Project Area 1, ENE, E and ESE winds contribute to 11.8%, 15.2% and 10.8% of the annual wind frequency respectively while S, SSW and SW winds contribute to 12.9%, 15.1% and 14.3% of the summer wind frequency respectively.

Hence, ENE, E and ESE winds are identified as the annual prevailing wind direction while S, SSW and SW winds are identified as the summer prevailing wind direction for Project Area 1.

<sup>1</sup> [http://www.pland.gov.hk/pland\\_en/info\\_serv/site\\_wind/site\\_wind/index.html](http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html)

The wind availability data at 200mPD obtained from the grid of (X080, Y072) for the RAMS simulation covers Project Area 2 and is shown in Figure 5.



**Figure 5 Wind Roses for the Project Area 2 (X080, Y072) by RAMS Wind Data**

**Table 5 Prevailing Wind Frequency of Project Area 2 by RAMS Wind Data**

Prevailing Wind	Annual			Summer			
Wind Direction	ENE	E	ESE	E	ESE	SE	SSW
Wind Frequency	8.3%	28.7%	15.0%	14.6 %	11.5%	12.2%	11.4%

According to the RAMS wind data of Project Area 2, ENE, E and ESE winds contribute to 8.3%, 28.7% and 15.0% of the annual wind frequency respectively while the E, ESE, SE and SSW winds contribute to 14.6%, 11.5%, 12.2% and 11.4% of the summer wind frequency respectively.

Hence, ENE, E and ESE winds are identified as the annual prevailing wind direction while E, ESE, SE and SSW winds are identified as the summer prevailing wind direction for Project Area 2.

### 3.3 SITE WIND AVAILABILITY FOR CURRENT STUDY

These two sets of wind data have been studied. The wind data from the closest HKO weather station and RAMS wind data indicate the prevailing wind directions and are tabulated in Table 6.

Since the closest HKO weather station is relatively far from both project areas and the RAMS wind data is obtained at the locations of both project areas, RAMS wind data would be adopted as the basis of study for Project Area 1 and Project Area 2. Table 6 is a summary of the prevailing wind directions for the project areas.

**Table 6 Prevailing wind directions for Project Areas 1 and 2**

<b>Prevailing Wind Direction</b>	<b>HKO</b>	<b>RAMS (Project Area 1)</b>	<b>RAMS (Project Area 2)</b>
<b>Annual</b>	NE	ENE,E,ESE	ENE,E,ESE
<b>Summer</b>	WSW	S,SSW,SW	E,ESE,SE,SSW

#### 4 ASSESSMENT OF EXISTING CONDITION OF PROJECT AREA 1 WITH COMMITTED DEVELOPMENTS

As mentioned, Project Area 1 is located on a relatively flat area currently zoned “G/IC”. At present, the area is vacant but development with a maximum building height of 47mPD is allowed. It is surrounded by a mix of low-to-medium density residential developments and various GIC uses. With consideration of the existing topographical condition, the wind environments under both annual and summer conditions are qualitatively assessed below based on the wind data presented in Section 3. Under annual wind condition, the prevailing winds are mainly from ENE, E and ESE. Under summer wind condition, the prevailing winds are mainly from S, SSW and SW. Tolo Harbour is located approximately 500m to the northeast of Project Area 1. Between the harbour and Project Area 1, three sites are zoned “Residential (Group B)4” (“R(B)4”) (i.e. Mayfair By the Sea), “R(B)5” and “R(B)6” on the approved Pak Shek Kok (East) OZP No. S/PSK/13, upon which developments are required to provide non-building areas (NBAs) to facilitate wind penetration. Three NBAs each of 15m wide designated in these sites will allow annual wind to reach Project Area 1. Tai Po Kau Nature Reserve of approximately 300mPD in height is situated at the upstream of the summer prevailing wind entrance area. The topography may slightly divert the incoming south-westerly wind and affect the summer wind availability of Project Area 1.

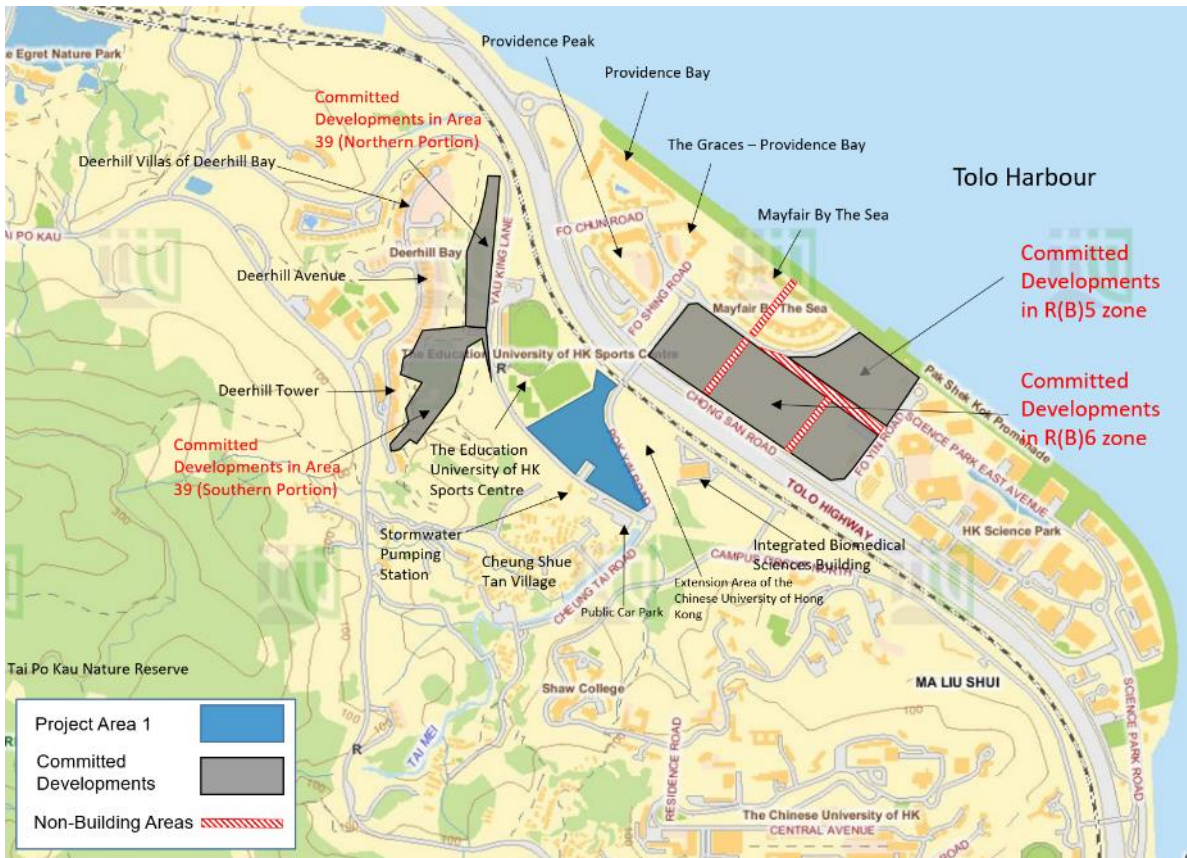


Figure 6 Location plan



#### 4.1 ENE WIND

ENE wind is one of the annual prevailing winds for Project Area 1. Figure 7 illustrates that the incoming ENE wind from Tolo Harbour is diverted southwards by the residential development, The Graces – Providence Bay, and may be able to reach Project Area 1 as well as The Education University of Hong Kong Sports Centre via Fo Shing Road and Pok Yin Road. It is also expected that some ENE wind would travel along the NBAs within Mayfair by the Sea and the future developments in “R(B)6” zone to reach Project Area 1 (blue arrows). Another airstream would pass through the building separations of HK Science Park and reach Project Area 1 (red arrow). Considering the existing open nature of Project Area 1, ENE wind could penetrate through the site and reach its downstream area (i.e. Cheung Shue Tan Village) freely. According to the current OZP, a development of maximum building height of 47mPD could be built at Project Area 1. Considering the long site frontal length of about 305m facing NE, such notional development may affect penetration of ENE wind through the project area at the pedestrian level inducing some slight potential impact on the pedestrian wind environment in the surrounding. Higher level wind would skim over the notional development and reattach further downstream.

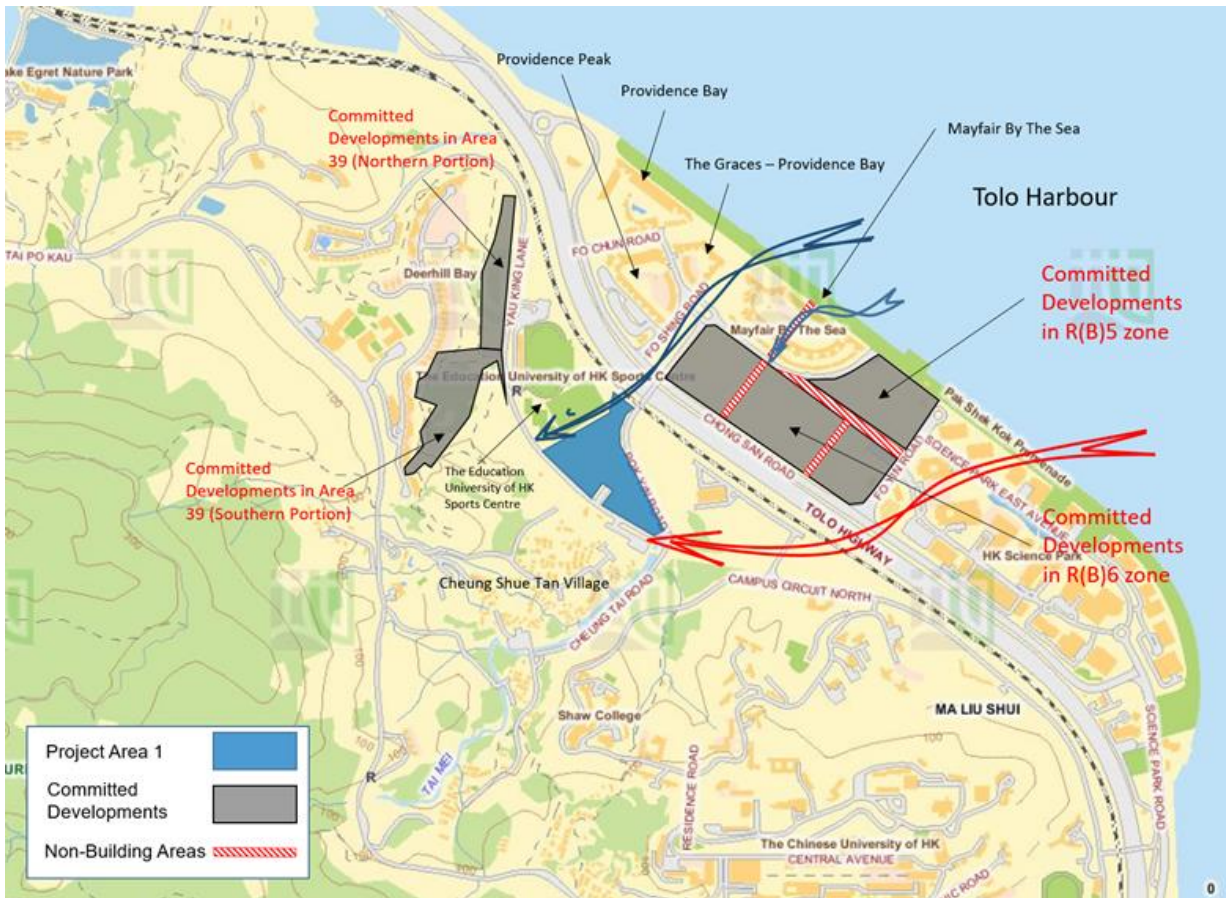
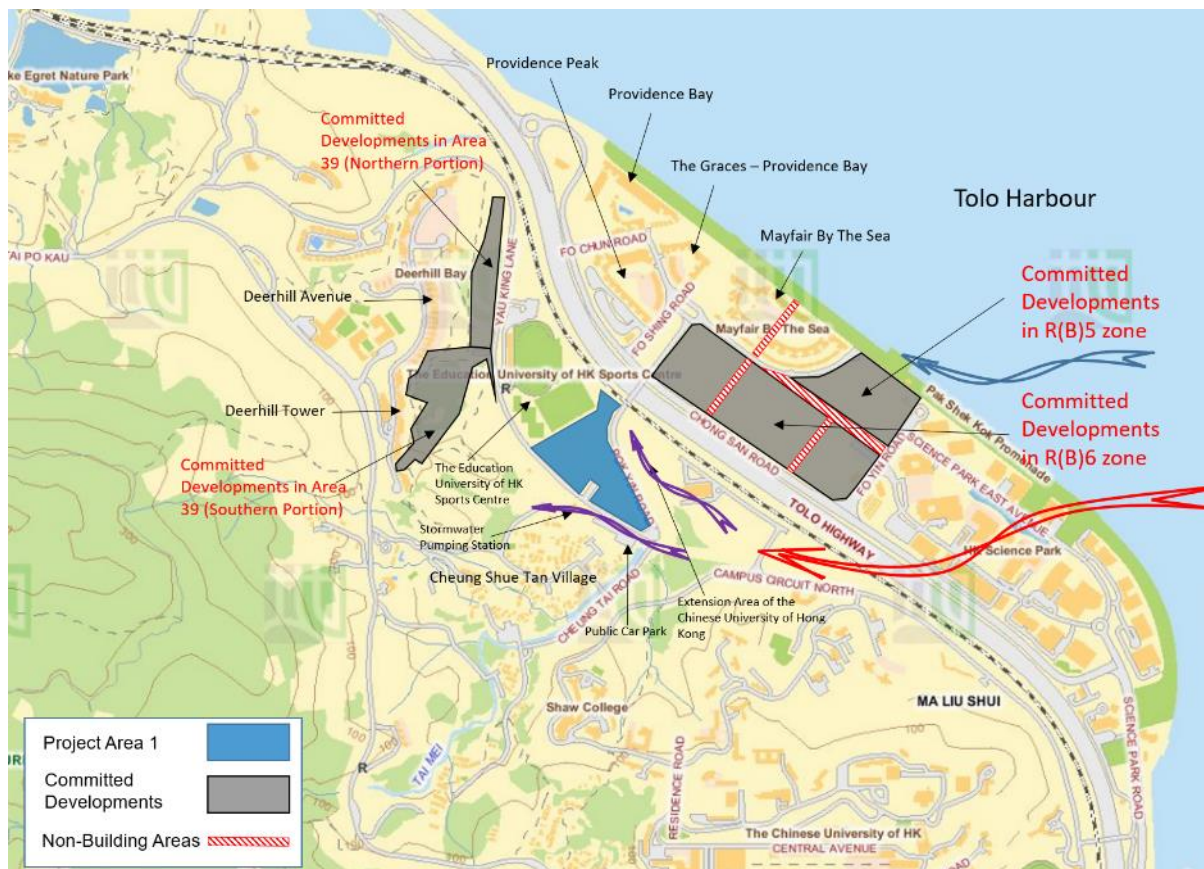


Figure 7 Major air paths under ENE wind with the presence of notional development at Project Area 1

## 4.2 E WIND

E wind is also one of the annual prevailing winds for Project Area 1. Since HK Science Park is mid-rise in nature and located approximately 650m away from Project Area 1, E wind is expected to skim over the existing building cluster of HK Science Park and reattach at low level to reach Project Area 1 (red arrow). The committed developments in “R(B)5” and “R(B)6” zones located to the east of Project Area 1 may block E wind (blue arrow). Considering the open nature of Project Area 1 and its surrounding, E wind could penetrate through the site and reach its downstream area (i.e. The Education University of Hong Kong Sports Centre and Committed Developments in Area 39) freely. The notional development with a maximum building height of 47mPD may split E wind into two air streams to travel along Pok Yin Road and Yau King Lane to reach the downstream area, i.e. The Education University of Hong Kong Sports Centre (purple arrows), while some high level E wind would skim over the notional development and reattach further downstream. However, area of The Education University of Hong Kong Sports Centre to the immediate northwest of Project Area 1 would fall into the wake of such notional development and it would be slightly affected.

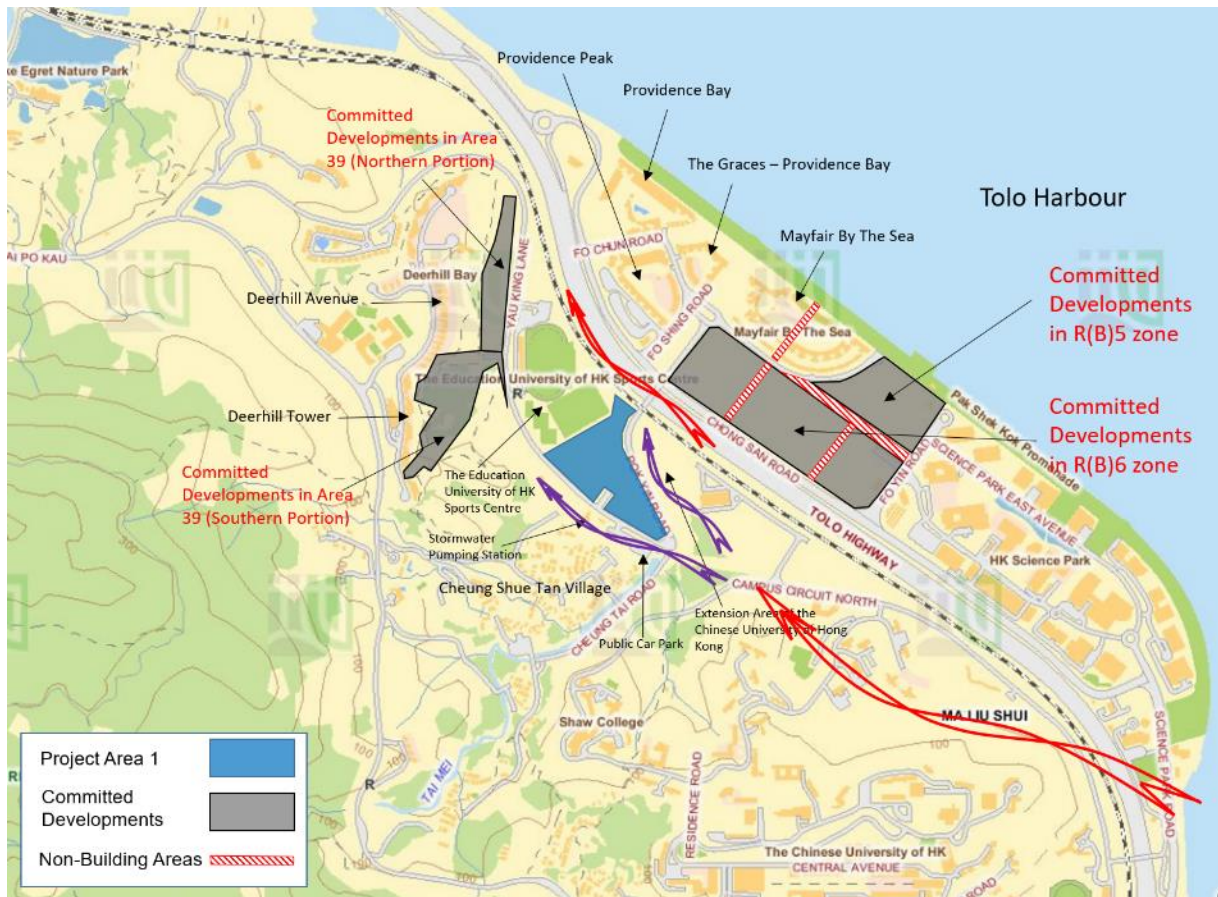


**Figure 8 Major air paths under E wind with the presence of notional development at Project Area 1**



### 4.3 ESE WIND

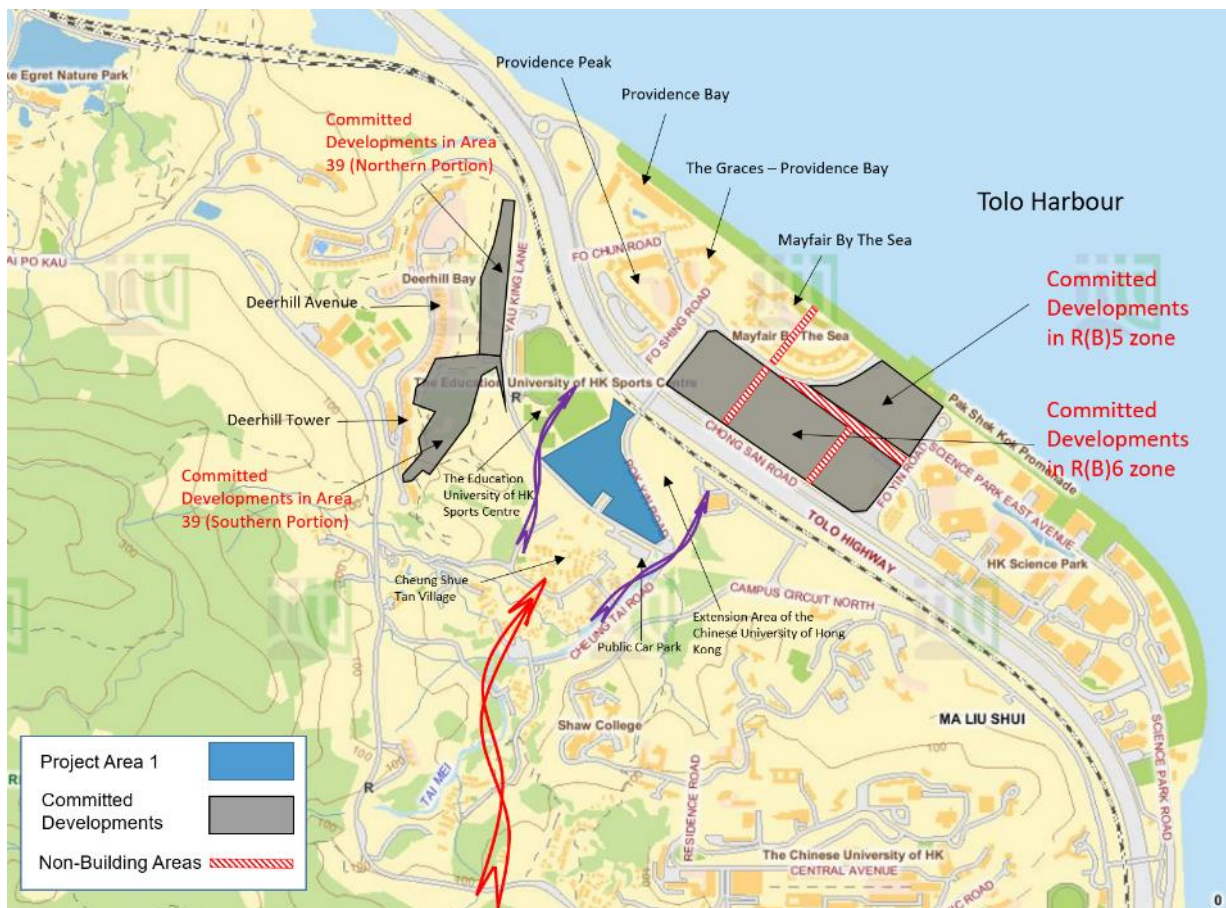
Under the annual prevailing ESE wind, Tolo Highway and Yau King Lane are the major air paths around Project Area 1. Although there are some existing buildings (The Chinese University of Hong Kong) at the hillside area of Ma Liu Shui, it is expected that ESE wind will be able to skim over these developments considering that they are low-rise buildings and are scattered. ESE wind would then reattach near the open space located to the southeast of Project Area 1. It is anticipated that the ESE wind would penetrate Project Area 1 freely. Pedestrian wind environment in the downstream area (i.e. The Education University of Hong Kong Sports Centre) of Project Area 1 could enjoy ESE wind freely. Similar to E wind, the notional development of maximum building height of 47mPD may split ESE wind into two air streams to travel along Pok Yin Road and Yau King Lane to reach the downstream area, i.e. The Education University of Hong Kong Sports Centre (purple arrows), while some higher level ESE wind would skim over the notional development and reattach further downstream. However, area of The Education University of Hong Kong Sports Centre to the immediate northwest of the project area would fall into the wake of such notional development and would be slightly affected.



**Figure 9 Major air paths under ESE wind with the presence of notional development at Project Area 1**

#### 4.4 S AND SSW WINDS

S and SSW are the major prevailing winds under summer condition. To the south of Project Area 1, Cheung Shue Tan Village is low-rise in nature. Hence, S and SSW winds are expected to skim over Cheung Shue Tan Village and reach Project Area 1. Considering the open nature of Project Area 1 and its surrounding, S wind could penetrate through the site and reach its downstream area (i.e. Providence Peak and committed development in “R(B)6”) freely. With the presence of the notional development at maximum building height of 47mPD, it is anticipated that S and SSW winds would split into two streams (purple arrows) as well as skim over such notional development to reach the downstream area (i.e. part of The Education University of Hong Kong Sports Centre, Tolo Highway and the residential developments further downstream). However, an area of The Education University of Hong Kong Sports Centre to the immediate northwest of the project area would fall into the wake of such notional development and would be slightly affected.



**Figure 10 Major air paths under S wind with the presence of notional development at Project Area 1**



### 4.5 SW WIND

Under the summer condition, prevailing SW wind, would travel through The Education University of Hong Kong Sports Centre and Cheung Tai Road around Project Area 1 (purple arrows). These winds are also expected to skim over the low-rise Cheung Shue Tan Village to reach Project Area 1. Considering the open nature of the Project Area 1 and its surrounding, SW wind could penetrate through the site and reach its downstream area (i.e. committed development in “R(B)6” zone) freely (red arrow). Under the scenario with the notional development at maximum building height of 47mPD at Project Area 1, it is anticipated that SW wind would mainly skim over such notional development to reach the downstream area (i.e. Tolo Highway and the residential developments further downstream).



**Figure 11 Major air paths under SW and SSW winds with the presence of notional development at Project Area 1**

## 5 QUALITATIVE ASSESSMENT OF EXISTING CONDITION OF PROJECT AREA 2

As mentioned, Project Area 2 is located on a relatively flat area currently zoned “G/IC” subject to a building height restriction of 3 storeys. It is surrounded by a mix of high-rise residential developments and various GIC uses.

With consideration of the existing topographical condition, the wind environments under both annual and summer conditions are qualitatively assessed below based on the wind data presented in Section 3. Under annual wind condition, the prevailing winds are mainly from ENE, E and ESE. Under summer wind condition, the prevailing winds are mainly from the E, ESE, SE and SSW.

The major air paths in the area most relevant to Project Area 2 are marked in Figure 11. According to the AVA report “*Term Consultancy For Expert Evaluation on Air Ventilation Assessment for Tai Po Area (August 2010)*” by The Chinese University of Hong Kong, Tai Po Tai Wo Road is a main breezeway for E wind and the adjacent Lam Tsuen River is another breezeway for both E and ESE winds (blue arrows). ENE, E and ESE winds would travel along On Po Road (red arrow). Nam Wan Road acts as major air path under N and SSW winds (orange arrow).

Considering Project Area 2 is currently occupied by an open-air carpark, it is anticipated that all prevailing winds are able to penetrate through the project area and reach its downstream areas freely. No air ventilation issue is expected under the existing condition for Project Area 2.

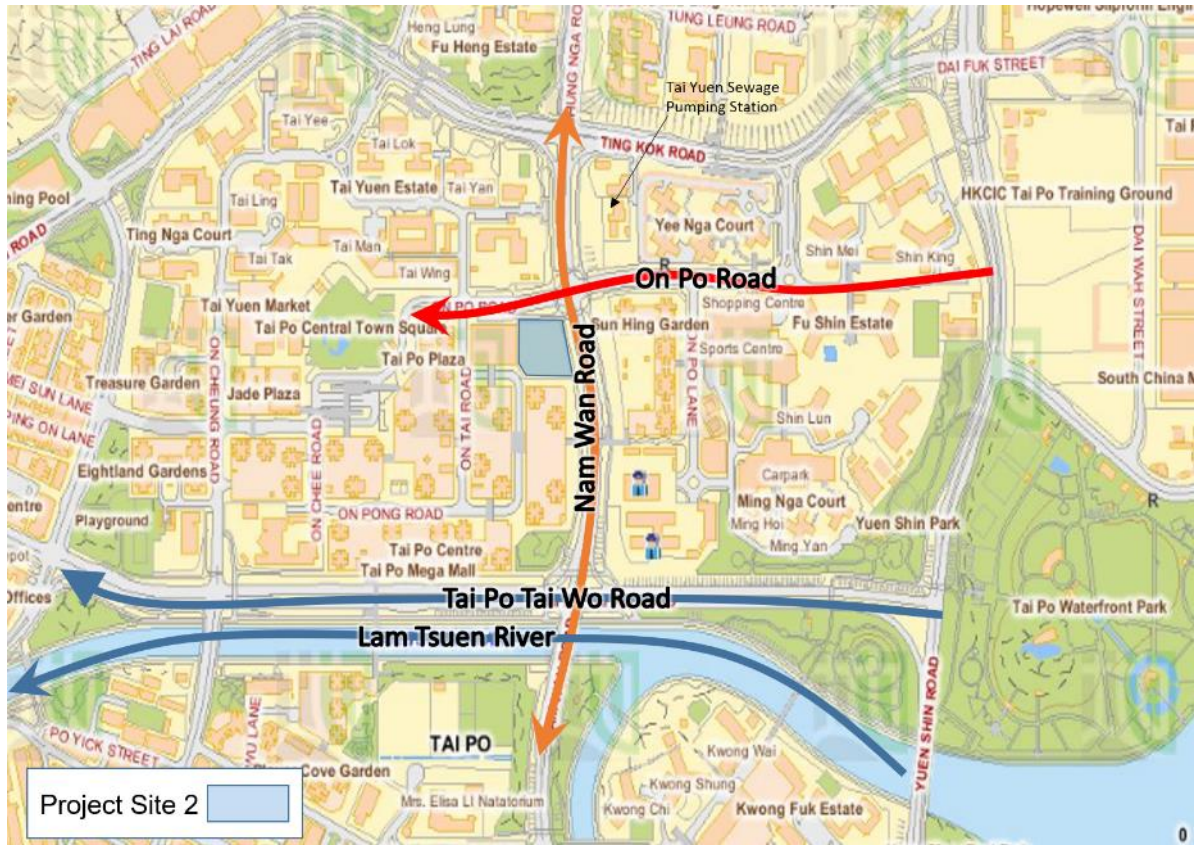


Figure 12 Major air paths under the existing wind environment



### 5.1 ENE WIND

ENE wind is one of the annual prevailing winds for Project Area 2. ENE wind would travel along Ting Kok Road and is expected to skim over the low-rise structure of Tai Yuen Sewage Pumping Station and reach Project Area 2 (blue arrow). Although On Po Road is not fully aligned with ENE wind, it is expected that wind entrance at junction of Yuen Shin Road and On Po Road would allow a portion of the ENE wind to travel along On Po Road to reach Project Area 2. According to the current OZP, a development of maximum 3 storeys could be built at Project Area 2. It is expected that some ENE wind may be able to skim over such low-rise notional development and reach On Pong Road (green arrow).

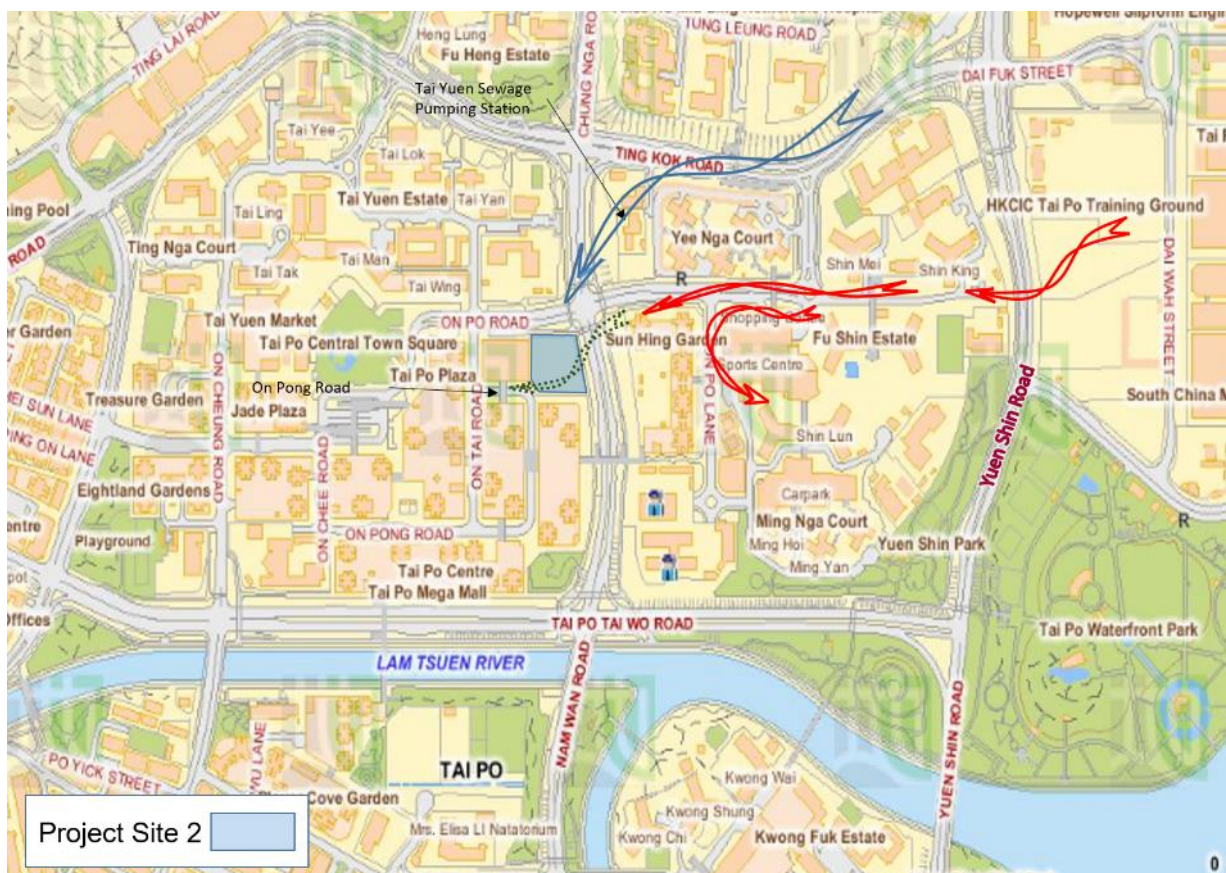


Figure 13 Major air paths under ENE wind with the presence of notional development at Project Area 2

## 5.2 E WIND

E wind is the prevailing wind for both annual and summer conditions for Project Area 2. E wind would travel along On Po Road. Project Area 2 abuts On Po Road, but it is expected that the notional 3-storey development would not affect the performance of the major air path along On Po Road under E wind (red arrow). E wind from Fu Shin Estate would be blocked by Sun Hing Garden (which reach about 100mPD) and would be diverted southwards and hence may not able to reach Project Area 2 (blue arrow).

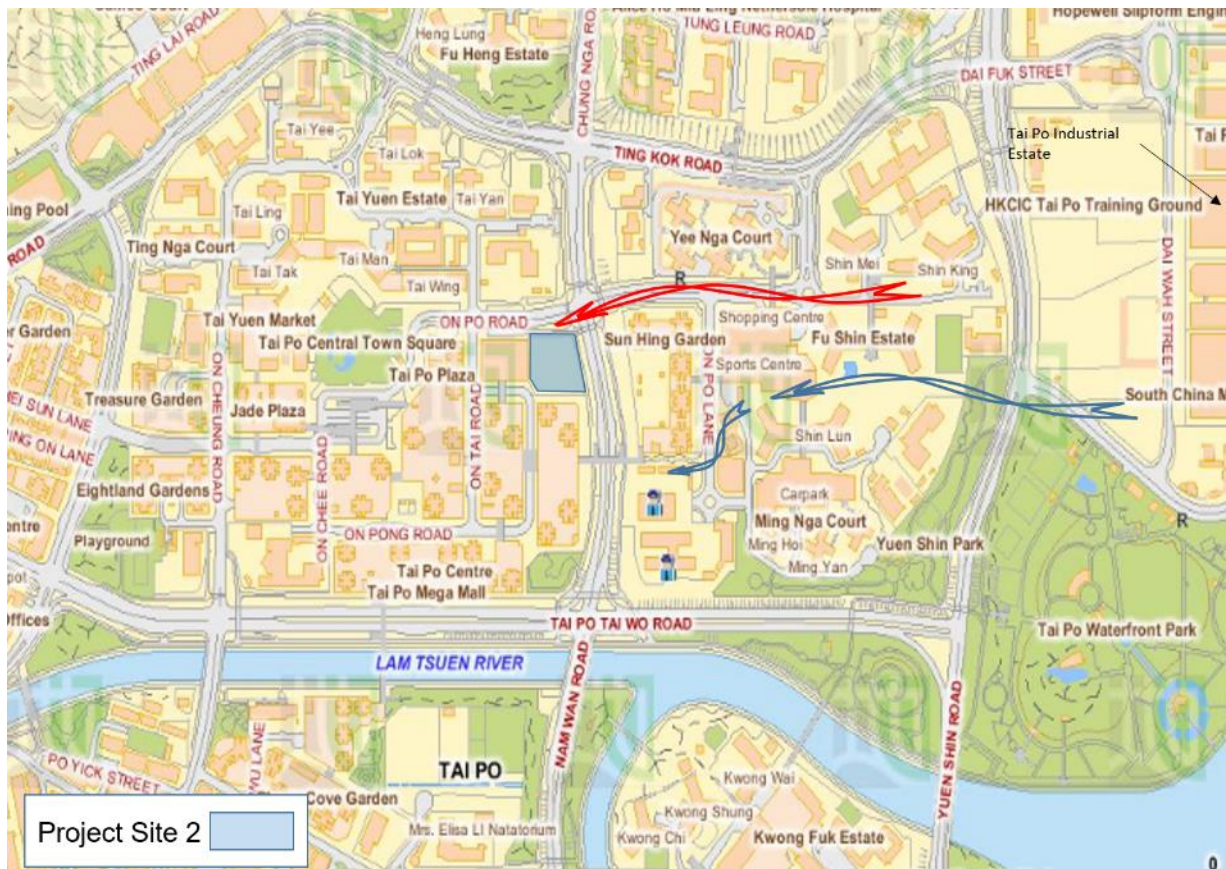


Figure 14 Major air paths under E wind with the presence of notional development at Project Area 2



### 5.3 ESE AND SE WINDS

ESE wind is the prevailing wind for both annual and summer conditions whereas SE wind is a summer prevailing wind for Project Area 2. Tai Po Waterfront Park and Yuen Shin Park would form the major wind entrance for both ESE and SE winds. Wind from Tai Po Waterfront Park is expected to pass through the gap between Tai Po Police Station and Sun Hing Garden and then travel along Nam Wan Road. The low-level wind would be diverted by Tai Po Mega Mall of Tai Po Town Centre, and then flow north to reach Project Area 2 (blue arrows). ESE and SE winds are also expected to travel through Lam Tsuen River to enter Nam Wan Road to reach Project Area 2 (red arrows). Project Area 2 abuts Nam Wan Road, but it is expected that the notional 3-storey development at the project area would not affect the performance of the major air path along Nam Wan Road.

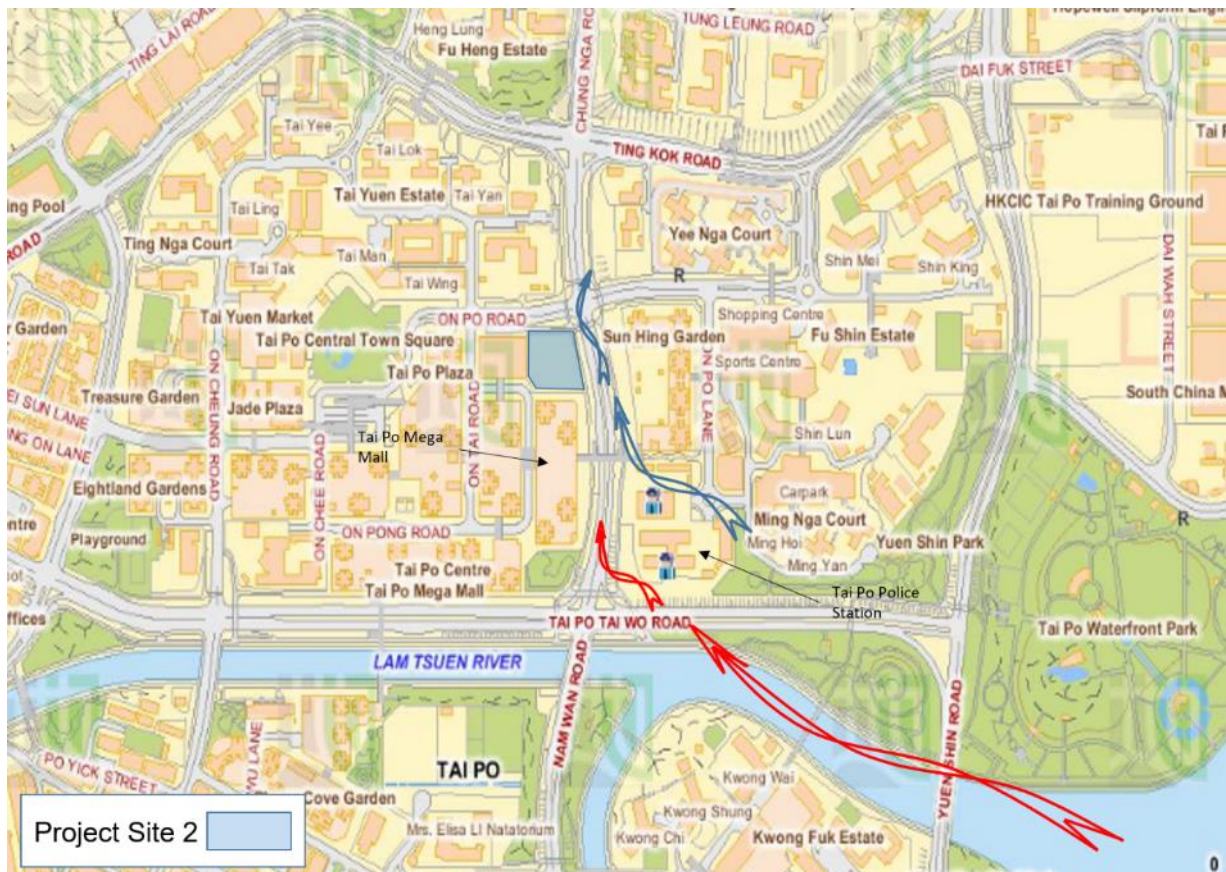


Figure 15 Major air paths under ESE and SE winds with the presence of notional development at Project Area 2

### 5.4 SSW WIND

SSW wind is one of the prevailing wind for summer conditions for Project Area 2. SSW is expected to travel through Lam Tsuen River to enter Nam Wan Road to reach Project Area 2. Project Area 2 abuts Nam Wan Road, but it is expected that the notional 3-storey development at the project area would not affect the performance of the major air path along Nam Wan Road.

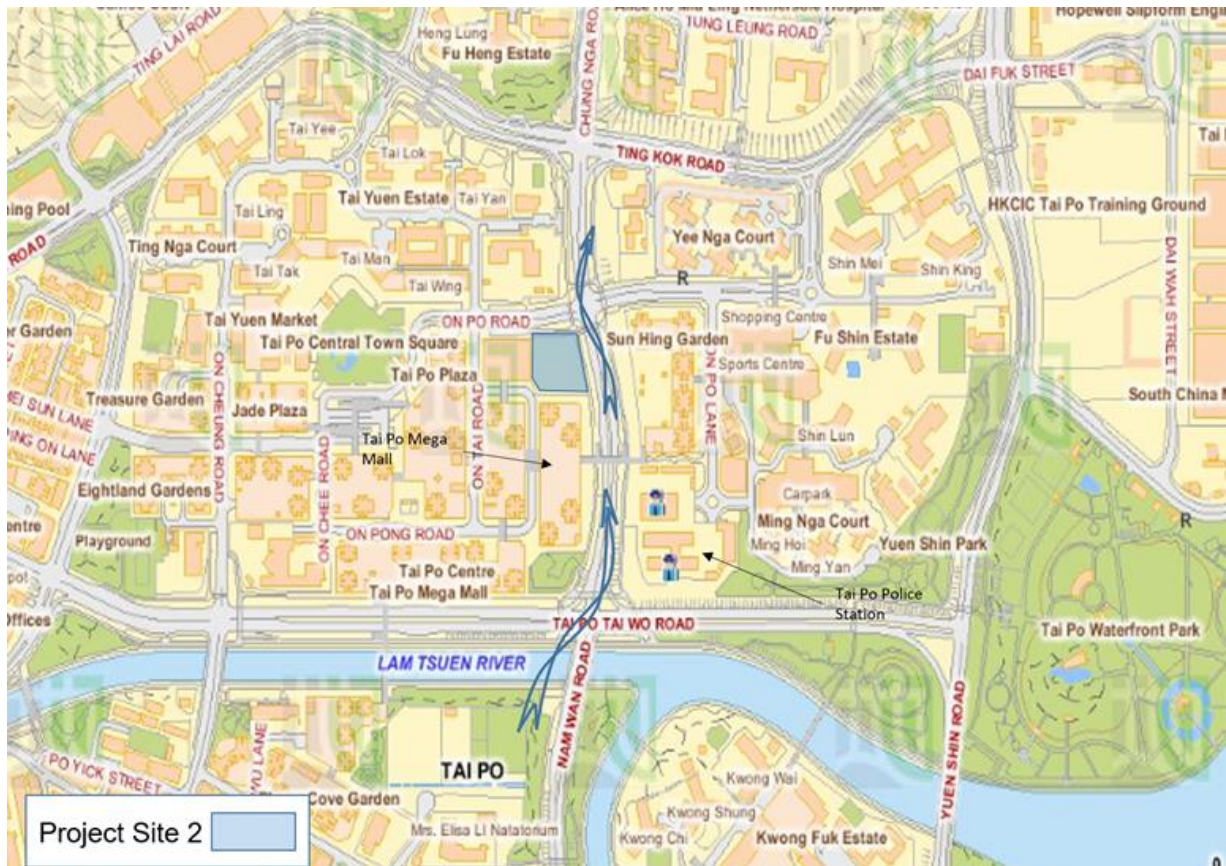


Figure 16 Major air paths under SSW wind with the presence of notional development at Project Area 2

## 6 EXPERT EVALUATION AND RECOMMENDATIONS OF THE PLANNED SCENARIO

### 6.1 PROJECT AREA 1

The planned scenario for Project Area 1 is illustrated in Figure 15. Project Area 1 has a site area of approximately 32,200m<sup>2</sup> with long frontal length of about 305m facing NE. A 10-17m wide drainage reserve, analogous to an open area, is situated along the eastern boundary of Project Area 1 (see Figure 17). It is proposed to rezone the project area for private residential development with a maximum building height of 50mPD at plot ratio 3.6.

In view of the analysis in Section 4, the future development with a maximum building height of 50mPD in Project Area 1 under the planned scenario may have some potential air ventilation on its immediate surrounding under various prevailing winds. Relevant mitigation measures should be provided.

Under ENE wind, the future development may create potential impact on the immediate downstream. In order to avoid impact created by a long continuous building façade, it is proposed to designate a non-building area (NBA) of a minimum width of 15m running in the NE/SW direction. This NBA should align with the drainage reserve in the middle of Project Area 1 (Figure 17) to connect with the proposed vehicular entrance to the project area. Such NBA would facilitate penetration of ENE wind to reach the downstream areas (including Cheung Shue Tan Village).

Considering the open nature to the east and west of Project Area 1 as well as the 10-17m wide drainage reserve along the eastern boundary of Project Area 1, it is expected that future development at Project Area 1 would split incoming E and ESE winds into two air streams to travel along Pok Yin Road and Yau King Lane to reach the downstream area (i.e. The Education University of Hong Kong Sports Centre). However, a small area of The Education University of Hong Kong Sports Centre to the immediate northwest of the project area would fall into the wake of the future development and would be slightly affected. It is encouraged to increase the building permeability within Project Area 1.

Under E wind, given no massive structure is expected at the northern part of the site, it is not expected that the future development with a maximum building height of 50mPD under the planned scenario would create any impact on the committed development in Area 39 which is located 300m away from Project Area 1.

Under S, SSW and SW winds, given that immediate downstream area of Project Area 1 is open in nature with a wide separation of about 150m from the committed development at "R(B)6" further downstream, the summer winds are expected to skim over the future



development at Project Area 1 and reattach at pedestrian level around the committed development at “R(B)6”. In addition, provision of the NE/SW oriented NBA in the middle of Project Area 1 could avoid a long continuous building façade and facilitate wind penetration through the future development. The 10-17m wide drainage reserve could further reduce the potential wake on the immediate downstream area.

Based on the above analysis, with the provision of the NE/SW oriented NBA as well as the 10-17m drainage reserve, it is anticipated that the future development at Project Area 1 with maximum building height of 50mPD would not create significant air ventilation impact on the overall pedestrian wind environment around Project Area 1 except for slight potential impact in the immediate downstream at the sports centre under E and ESE winds.

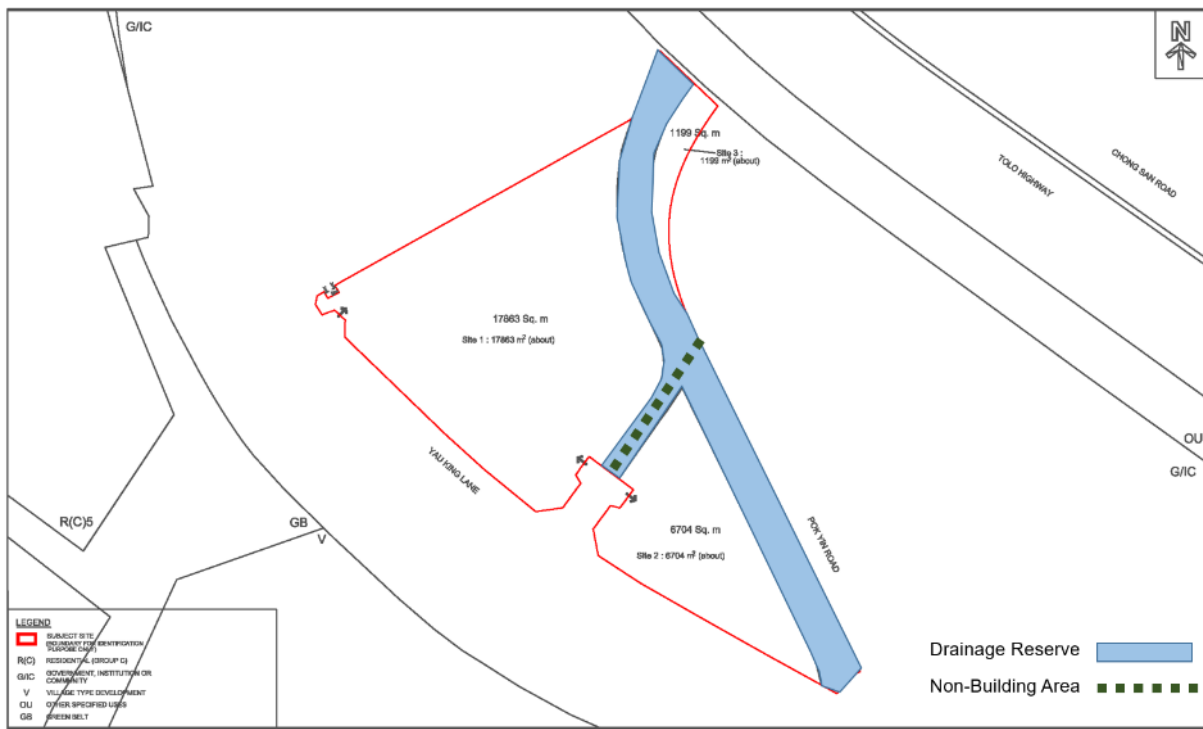


Figure 17 Site layout of Project Area 1

## 6.2 PROJECT AREA 2

Project Area 2 has a site area of approximately 4,500 m<sup>2</sup>. It is proposed to relax the building height restriction for the area from 3 storeys to 8 storeys for accommodating a proposed community health centre.

In view of the analysis in Section 4, Project Area 2 abuts two major air paths along On Po Road and Nam Wan Road. Given that the effective width of these two air paths are mainly governed by the existing developments (i.e. Tai Po Mega Mall Multi-Storey Carpark and Tai Po Mega Mall) along these air paths, it is anticipated that the future development at Project Area 2 under the planned scenario would not further reduce the effective width of these air paths under the prevailing wind directions. Rather, the planned scenario with an increase in building height will inevitably induce a larger potential wind wake at the immediate downstream area (i.e. part of On Pong Road, Tai Po Mega Mall Multi-storey Carpark and part of On Po Road) when compared to the existing condition under ENE and E wind. Under ESE, SE and SSW winds, it is expected that winds would skim over the future development at Project Area 2 and reattach at the open areas to the northwest and northeast of Project Area 2. No significant air ventilation impact on the developments further downstream is expected. In conclusion, no major ventilation issue on the overall pedestrian wind environment is anticipated under the planned scenario for Project Area 2.

## 7 FURTHER DESIGN PRINCIPLES

All future developments should consider the following design principles at the detailed design stage as the prevailing effort for improvement in urban climate.

- ◆ Adopt building permeability equivalent to 20% to 33.3% with reference to PNAP APP-152;
- ◆ Minimize podium bulk with ground coverage of not more than 65%;
- ◆ Adopt building setback with reference to PNAP APP-152;
- ◆ Incorporate greening measures with a target of not less than 30% for sites larger than 1 ha, and not less than 20% for sites below 1 ha, preferably through tree planting at grade;
- ◆ Avoid long continuous façades; and
- ◆ Make reference to the recommendations of design measures in the Hong Kong Planning Standards and Guidelines.

## 8 FURTHER QUANTITATIVE STUDY

Provided that the proposed design measures (i.e. NBA and drainage reserve) as set out in Section 6 would be fulfilled as recommended in the building design for Project Area 1, the planned scenario would not induce major air ventilation issues. If the requirements cannot be met, further quantitative assessments should be conducted to demonstrate that the performance of any future development at Project Area 1 would be no worse off than the scenario with these measures.

For Project Area 2, no further quantitative assessment is required for the planned scenario as no air ventilation issue is anticipated.

## 9 CONCLUSION

AVA EE on the wind environment for Project Area 1 and Project Area 2 at Tai Po were conducted. According to the analysis, the annual prevailing wind comes from ENE, E and ESE directions and the summer prevailing wind is from S, SSW and SW directions for Project Area 1. The annual prevailing wind comes from ENE, E and ESE directions and the summer prevailing wind is from E, ESE, SE and SSW directions for Project Area 2.

For Project Area 1, it is expected that the future development would not bring significant impact to the vicinity developed areas with the provision of mentioned mitigation measures (i.e. NBA and drainage reserve). A quantitative AVA should be conducted if the mitigation measures could not be provided in the future development. For Project Area 2, it is anticipated that the future development under the planned scenario would not create significant impact on the surrounding due to its small scale and low building height.