Appendix 6

Air Ventilation Assessment (Expert Evaluation)

Prepared by

Ramboll Hong Kong Limited

PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 107 AND ADJOINING GOVERNMENT LAND, FUNG KAT HEUNG, YUEN LONG

AIR VENTILATION ASSESSMENT (EXPERT EVALUATION)

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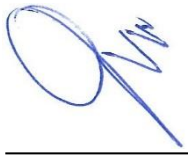
Signed	
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APPENDIX

Appendix 1 The Master Layout Plan of the Proposed Scheme

1. INTRODUCTION

1.1 Project Background

1.1.1 The Application Site at various lots in D.D. 107 and adjoining government land, Fung Kat Heung, Yuen Long is to be developed for residential development (Proposed Development). It is primarily zoned as "Industrial (Group D)" ("I(D)") with a minor portion of it falling within "Residential (Group A)" ("R(A)") and "Agriculture" ("AGR") under the Approved Kam Tin North Outline Zoning Plan (OZP) No. S/YL-KTN/11. (hereafter "OZP No. S/YL-KTN/11)

1.1.2 Ramboll Hong Kong Limited has been commissioned to prepare the Air Ventilation Assessment – Expert Evaluation (AVA-EE report) for the Proposed Development. The AVA-EE report will assess the air ventilation issues of the Application Site and the surrounding area.

1.2 Objective

1.2.1 This AVA-EE report has been prepared to identify opportunity and good design features that can be practicably adopted in the Proposed Scheme from air ventilation standpoint and evaluate if there would be any impact on the overall air ventilation performance of the assessment area by comparing the Proposed Scheme with the Baseline Scheme.

1.3 Application Site and its Environs

1.3.1 The Application Site of about 7,290m^2 is situated over 400m to the east of Tsing Long Highway, Yuen Long. It is located in Fung Kat Heung and currently bounded by access roads on north and east sides. The Application Site is currently used as open parking area mainly for heavy goods vehicle.

1.3.2 It is noted that Sha Po Public Housing Development (SPPRH) is planned to the immediate west of the Application Site and planned to be completed by 2031 which is 1 year before the tentative completion date of the Proposed Development. An engineering feasibility study (EFS) of the proposed SPPRH was submitted as one of the supporting documents for the OZP amendment (RNTPC Paper No. 9/22). Its findings have been referenced where appropriate (hereafter "EFS"). The proposed building height of SPPRH are ranging from +151mPD to +183mPD.

1.3.3 **Figure 1** shows the location of the Application Site and its environs.

1.4 Baseline Scheme

1.4.1 The Baseline Scheme refers to the existing site condition. The Application Site is mainly occupied by open parking area.

1.5 Proposed Scheme

1.5.1 The Proposed Scheme comprises two residential towers (T1 & T2) of 47 and 49 residential floors (excluding 1-storey refuge floor) and one clubhouse block (with 1 storey aboveground). The building height (BH) for the T1 and T2 are not more than +150mPD and +156mPD respectively, while the low-rise clubhouse block with elevation of +10.5mPD are proposed at the western corner of the site boundary. Underground carpark will be provided in the basement of the Proposed Scheme.

1.5.2 Design measures have been adopted to enhance air ventilation performance of the Proposed Scheme. This is a podium-free development. There is a building separation of 15m between T1 & T2 which could serve as air path and promoting wind penetration across the Application Site. There are more building setbacks from the northern and

southern site boundaries. The indicative layout plan of the Proposed Scheme is shown in **Appendix 1**.

2. SITE WIND AVAILABILITY DATA

2.1 Site Wind Availability Data From RAMS

2.1.1 According to the Planning Department's website, a meso-scale Regional Atmospheric Modelling System (RAMS) was used to produce a simulated 10-year wind climate at the horizontal resolution of 0.5 km x 0.5 km covering the whole territory of Hong Kong. The simulated wind data represents the annual, winter and summer wind condition at various levels, e.g. 300 m, and 500 m above terrain.

2.1.2 The RAMS data of the grid (X: 056, Y:073) has been extracted from the Site Wind Availability Data of Planning Department's website as the Application Site falls into the grid.

2.1.3 Among the wind roses with respect to different heights (200, 300 or 500m) available, the 200 m site wind availability data represents wind data that takes into account the topographical effect around the Application Site. Therefore, a lower level of wind roses at 200 m height is selected to study the prevailing wind condition as it represents the incoming wind to the Application Site and considers the influence on the prevailing winds by the surrounding topography.

2.1.4 According to the wind roses at 200 m altitude, annual prevailing wind directions for the Application Site are NNE, E, and ESE whereas summer prevailing wind directions are SSE, S, and SSW. **Figure 2** shows the relevant wind roses diagrams representing the frequency and wind speed distribution at 200m height in annual and summer conditions. The wind frequency data is provided in **Table 2.1** below.

Table 2.1 Summary of RAMS Data and Wind Direction at 200m

	(X: 056, Y: 073)	
Wind Direction	**Probability for Annual Condition (%)**	**Probability for Summer Condition (%)**
N	3.4%	1.7%
NNE	**13.8%**	1.9%
NE	8.1%	1.6%
ENE	7.0%	2.6%
E	**17.0%**	8.8%
ESE	**10.9%**	7.0%
SE	5.6%	6.7%
SSE	6.4%	**11.1%**
S	9.8%	**21.5%**
SSW	6.3%	**15.2%**
SW	3.1%	7.6%
WSW	1.8%	3.9%
W	2.3%	4.6%
WNW	1.7%	2.8%
NW	1.4%	1.8%
NNW	1.4%	1.2%

Note: Bolded characters highlighted in grey represent the selected prevailing wind directions for evaluation.

2.2 Topography

2.2.1 The Application Site is bounded by the local access road branched off from Fung Kat Heung Road. The topography of the Application Site and surrounding is generally flat. Under the existing wind condition, it is expected that annual and summer prevailing winds can penetrate the Application Site and reach its downwind areas thus existing site wind availability and immediate surrounding is anticipated to be satisfactory. To the further east side of the Application Site is Kai Kung Leng (about 3 km) with hilly topography (up to about 300mPD). Kai Kung Leng is expected to block a portion of the incoming prevailing E wind to the Application Site due to the Application Site being located at the foothill of the mountain and to its west. There may be some slight sheltering effect that would affect incoming northeastern and eastern site wind availability. Hence, the existing topography around the Application Site would have slightly reduced the wind availability to the Application Site.

2.3 Building Morphology

2.3.1 The Application Site is mainly surrounded by low-rise developments in the immediate vicinity, e.g. Sha Po Tsuen (~+7.4 to 17.8mPD), Miu Kwok Monastery (~+22mPD), Fung Kat Heung (~+16.6 to 33.6mPD). Under the existing wind condition, the building density of the surrounding is considered low. The surrounding areas are low-rise industrial buildings and some temporary building structures, especially in the eastern side of the Application Site. Although there is generally little gap between existing blocks in the surroundings, wind flowing over the building blocks and then reaching pedestrian level later is possible. Potential building blockage effect due to the surrounding existing are considered low.

2.3.2 All noise barriers, elevated structures, planned and committed development, if any, are considered in this report. According to published information in Statutory Planning Portal under the Town Planning Board regarding planned / committed developments in the surrounding area, to the immediate northwest and west of the Application Site is proposed Sha Po Public Housing Development (SPPRH). High-rise building is proposed in SPPRH (maximum building height of +185mPD from EFS). In the SPPRH, there are two clusters of buildings respectively on north and south sides, leaving the central part of the site occupied with lower building mass so that such lower building mass can allow prevailing E wind penetration over them. For buildings of SPPRH nearby the Application Site, larger building separation between T9 and T10 can allow summer SSE & S wind, and annual prevailing ESE wind penetration (as indicated in the EFS). The building setback nearby the Application Site within SPPRH would also promote annual E and NNE wind penetration (i.e. flowing around the development). Since SPPRH is generally on downwind side of the Application Site with respect to identified prevailing wind directions, it is anticipated that the development would create minimal wind blockage to wind flow to the Application Site.

2.3.3 The building height information of these identified developments was extracted from Geo-Reference Database (BG1000) provided by Survey and Mapping Office/ Lands Department.

2.4 Summary of Existing Site Wind Availability

2.4.1 According to the wind availability data from RAMS, the summarised annual wind directions of the Application Site include NNE, E, and ESE directions. While in summer wind condition, the prevailing winds mainly come from SSE, S, and SSW directions.

2.4.2 The surrounding topography would result in slight influence to prevailing E wind availability. The existing low-rise industrial buildings in the surroundings will not have

significant impact on the wind availability to the Application Site at pedestrian level. It is anticipated that the surrounding traffic network and open areas would be the main air corridor under both annual and summer condition, including Fung Kat Heung Road and Sha Po Tsuen Road. Fung Kat Heung Road, as well as planned road network of SPPRH would facilitate prevailing E, NNE, and ESE wind flow. Low-rise development is scattered around and located at the upwind areas under annual E and ESE wind, summer prevailing SSE, S and SSW wind direction so that prevailing wind is expected to flow atop these building blocks before reaching the Application Site. Due to the low-rise nature, it should impose only some minor and insignificant obstruction to wind flow. The planned high-rise SPPRH is on downwind side of the Application Site under most identified prevailing wind directions so that there is no significant impact as well.

2.4.3 **Figure 3** and **Figure 4** show the annual and summer prevailing wind directions under the Baseline Scheme.

3. EXPERT EVALUATION OF AIR VENTILATION PERFORMANCE OF THE PROPOSED DEVELOPMENT

3.1 Important Pedestrian Areas

3.1.1 Important surrounding areas that the public would often access have been identified as the following:

- Roads surrounding the Application Site (Fung Kat Heung Road, Sha Po Tsuen Road)
- Open space; and
- Nearby residential and industrial developments.

3.2 Evaluation of Merit/Demerit of Design Features of the Proposed Development

3.2.1 Under the Proposed Scheme, various good design features are beneficial to air ventilation such as separation of building from site boundary, optimal building disposition and alignment, and building separation advantageous to prevailing wind penetration are incorporated.

- A sensible building design with no podium is adopted to minimise building footprint at grade and thus minimise possible wind blockage.
- Building separation of 15m is proposed between towers. This separation facilitates wind penetration mainly from annual or summer prevailing wind directions to benefit its downwind areas. The separation is aligned for penetration of annual prevailing E and ESE wind.
- Building setback from the boundaries of the Application Site with open spaces created will facilitate wind penetration to flow around the building mass of the development and benefit its surrounding areas.

3.2.2 Further discussion of the scheme based on the good design features above is included below.

Air corridors/ Air paths

3.2.3 **Figure 3** and **Figure 4** illustrate the prevailing winds from annual and summer wind directions for the Baseline Scheme. **Figure 5** and **Figure 6** illustrate the prevailing winds from annual and summer wind directions for the Proposed Scheme.

3.2.4 Nearest wind corridor from the Application Site is along Fung Kat Heung Road which may allow E wind penetration. Fung Kat Heung Road is considered the major wind corridor to facilitate wind flow. The road is to the north of the Application Site with some separation, and the prevailing wind would not directly reach the Application Site through this wind corridor. Therefore, the ventilation of the Application Site would mainly come from the wind flowing atop the low-rise building in the immediate vicinity. The development of the Application Site would not disturb wind flow along this wind corridor.

3.2.5 Under the Proposed Scheme, annual and summer prevailing wind would flow through the proposed open spaces and landscape area of the Application Site towards the downwind areas. Moreover, annual prevailing E and ESE wind would flow through the building separation of 15m between residential towers and flow atop of the low-rise clubhouse block (+10.5mPD) to reach the SPPRH to the immediate west of the Application Site. The E wind would further penetrate through the building separation between T9 and T11 of SPPRH whereas ESE wind would further penetrate through the

building separation between T9 and T10 of SPPRH to reach further area within SPPRH. Therefore, the air ventilation impact of the Proposed Development on SPPRH is already minimised. It is anticipated that no significant unfavourable impact in terms of wind environment would occur.

Building Disposition and Development Permeability

3.2.6 Building separation of 15m is proposed between the residential towers will facilitate E, ESE wind penetration and further flow atop the low-rise clubhouse (+10.5mPD) to the downwind area. Furthermore, the two residential towers are situated about the centre of the Application Site, leaving a relatively large open spaces and dedicated for landscape use on north, east and south sides. The open spaces would allow all identified prevailing wind directions to flow across the Application Site to provide wind availability for the surroundings.

Building Height

3.2.7 The proposed maximum building height of the Proposed Scheme at +156mPD is higher than surrounding existing building context but lower than the planned SPPRH. Theoretically, the Proposed Scheme with higher building height would result in more wind blockage impact and it is difficult for wind to pass over the building and come to the pedestrian level when compared to the Baseline Scheme. Instead, it is much easier for wind to flow around the building and reach the downwind area so as to minimise wake area. Since there are only two towers proposed and they are separated by 15m, there is no wall effect and it is already easier for wind to flow around the building at pedestrian area. Therefore, the adverse effect due to higher building height is minimised as well. Moreover, the maximum building height of SPPRH (+185mPD) is higher than that of the Proposed Scheme. Under prevailing E and ESE wind, the ventilation impact at the further west of surroundings would be dictated by the building orientation and deposition of SPPRH. Moreover, the proposed building setback from the eastern site boundary would promote NNE, S and SSE wind flow at pedestrian level. The ventilation impact to the downwind area due to higher building height is expected to be minimal.

3.3 Directional Analysis of the development

3.3.1 As discussed in **Sections 2.1** to **2.3**, winds from NNE, E, and ESE directions are annual prevailing winds whereas winds from SSE, S, and SSW are dominant in the summer. The following appraises the situation with respect to the Proposed Scheme.

NNE Wind

3.3.2 Under annual prevailing NNE wind direction, T10 of SPPRH is partially on upwind side of the Application Site and would slightly block some wind flow. The higher building height of Tower 2 would further block the NNE wind flow. As Tower 1 and Tower 2 are aligned along NNE wind direction, the potential blockage impact is already minimised. The NNE wind can flow through the proposed open spaces on the eastern side of the Application Site towards further south of the surroundings. There is notable separation between T10 of SPPRH and Tower 1 of the Proposed Scheme. It is anticipated some NNE wind flow at lower level would travel on the western side of the Proposed Development and further flow atop the low-rise clubhouse block (+10.5mPD) towards the south of the surrounding area. Therefore, under annual prevailing NNE wind, air ventilation impact on the downwind area is minimised.

E and ESE Wind

3.3.3 The annual prevailing E and ESE wind would flow atop the low-rise industrial development on upwind area and towards the Application Site. The proposed building separation of 15m between residential towers of the Proposed Development allow direct wind penetration from prevailing E and ESE wind direction. The wind would then flow atop the low-rise clubhouse block (+10.5mPD) towards the southern side of the Proposed Development. Therefore, the wind availability at the downwind area such as SPPRH would be benefited. The ESE wind would continue to flow through SPPRH given that the building separation between T9 and T10 of SPPRH is welcoming the ESE wind penetration. Likewise, E wind would continue to flow through SPPRH through building separation between T9 and T11. It is considered that adverse air ventilation impact at the downwind area would be insignificant under prevailing E and ESE wind condition.

SSE and S Wind

3.3.4 The summer prevailing SSE and S wind would flow atop low-rise residential development (e.g Sha Po Tsuen and other temporary structures) on the southern side of the surroundings. In the EFS for SPPRH, building separation between T9 and T10 can allow wind penetration to downwind area. The Proposed Development maintains setback from southern boundary (with southern side dedicated as open space) so that such air path will not be blocked. T10 of the SPPRH is just behind Tower 2 under SSE and S wind. There is minimal or no additional blockage impact due to Tower 2. Tower 1 would impose some blockage impact. But given that the area to the east is generally unoccupied, it is easier for wind to flow around Tower 1 to further downwind area. The potential building blockage under SSE wind is already minimised. It is anticipated that the wind availability at the downwind area would not be significantly impacted.

SSW wind

3.3.5 Under summer prevailing SSW wind condition, wind would also flow atop of the low-rise development in the upwind area to enter the Application Site. Similar to the situation under NNE wind, as Tower 1 and Tower 2 are aligned along SSW wind direction, the potential blockage impact is already minimised. SSW wind can flow around towers on the east side to downwind area or through the building separation between the residential towers of the Proposed Development and T10 of SPPRH. Low-rise clubhouse block (+10.5mPD) is proposed at the western corner of the Application Site and incoming SSW wind is expected to flow above it towards the downwind area. Therefore, under summer prevailing SSW wind, air ventilation impact on the downwind area is minimised.

3.4 Summary of Relative Air Ventilation Performance

3.4.1 The air ventilation performance of the Baseline Scheme and the Proposed Scheme has been appraised. Under the Proposed Scheme, higher maximum building height (+156mPD) is proposed with air ventilation design measures of building disposition and alignment, building separation and building setback between towers and site boundary with open space created.

3.4.2 Building separation of 15m between two residential towers are aligned to annual prevailing E and ESE wind directions that will facilitate wind flow across the Proposed Development. Besides, the building setback between Tower 2 and southern site boundary also facilitate the prevailing SSE and S wind flow. The building alignment with NNE/SSW axis can minimise blockage under prevailing NNE and SSW wind flow. In addition, the proposed open space could facilitate wind flow from all prevailing wind directions and penetrate the Proposed Development towards the downwind areas.

3.4.3 Overall, various good design measures have been incorporated so that the Proposed Scheme is considered unlikely to impose significant and worsened impacts on the surrounding areas in air ventilation perspective when compared with the Baseline Scheme.

4. CONCLUSION

4.1.1 A qualitative assessment on the air ventilation performance of the Proposed Development has been carried out.

4.1.2 According to the findings of this AVA-EE, the annual prevailing wind comes from NNE, E, and ESE directions while the summer prevailing wind comes from SSE, S, and SSW directions. Good design features of the Proposed Development include building disposition and alignment, building separation of 15m between two residential towers, and building setback from site boundaries with open spaces created are provided to maintain good air ventilation performance.

4.1.3 After considering the potential air ventilation impacts on the Application Site under all prevailing wind directions, it is considered that the Proposed Scheme with the design measures incorporated would unlikely impose significant and worsened air ventilation impacts on the surrounding as compared with the Baseline Scheme.

Figures

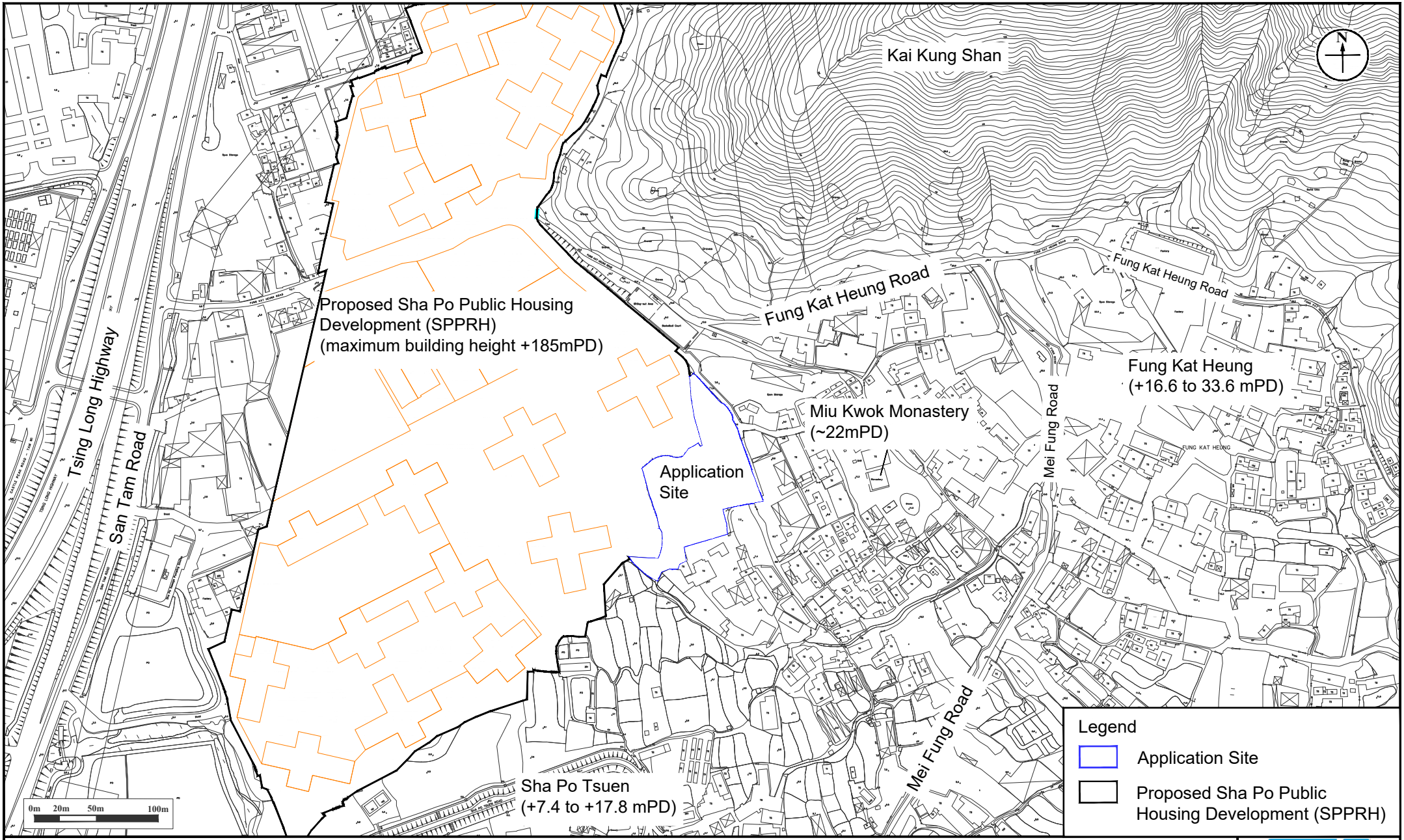

Figure: 1

Title: Location of the Application Site and its Environs

Project: Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land, Fung Kat Heung, Yuen Long

RAMBOLL

Drawn by:	MK
Checked by:	CC
Rev.:	1.0
Date:	Mar 2024

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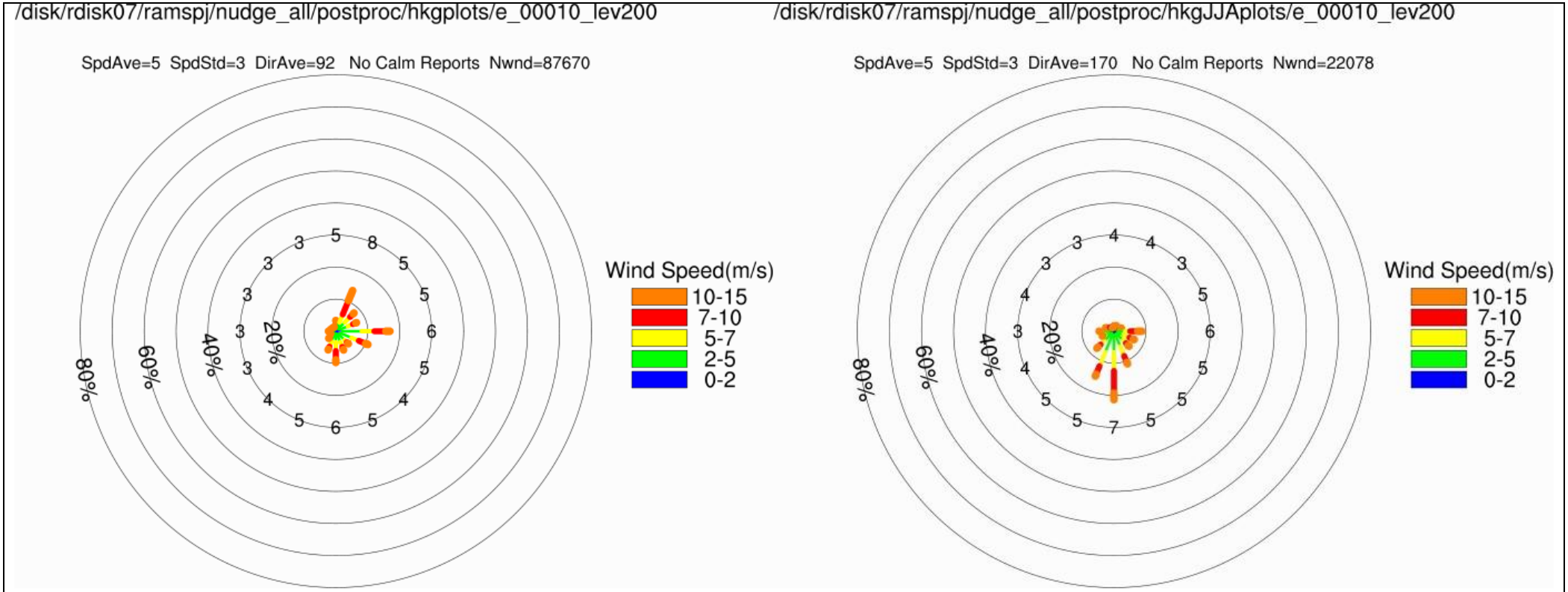

Annual Wind

Summer Wind

Figure: 2	RAMBOLL
Title: Windrose Diagram representing V∞ of the Area under Concern at 200m above ground (X:056, Y:073)	Drawn by: MK Checked by: CC
Project: Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land, Fung Kat Heung, Yuen Long	Rev.: 1.0 Date: March 2024

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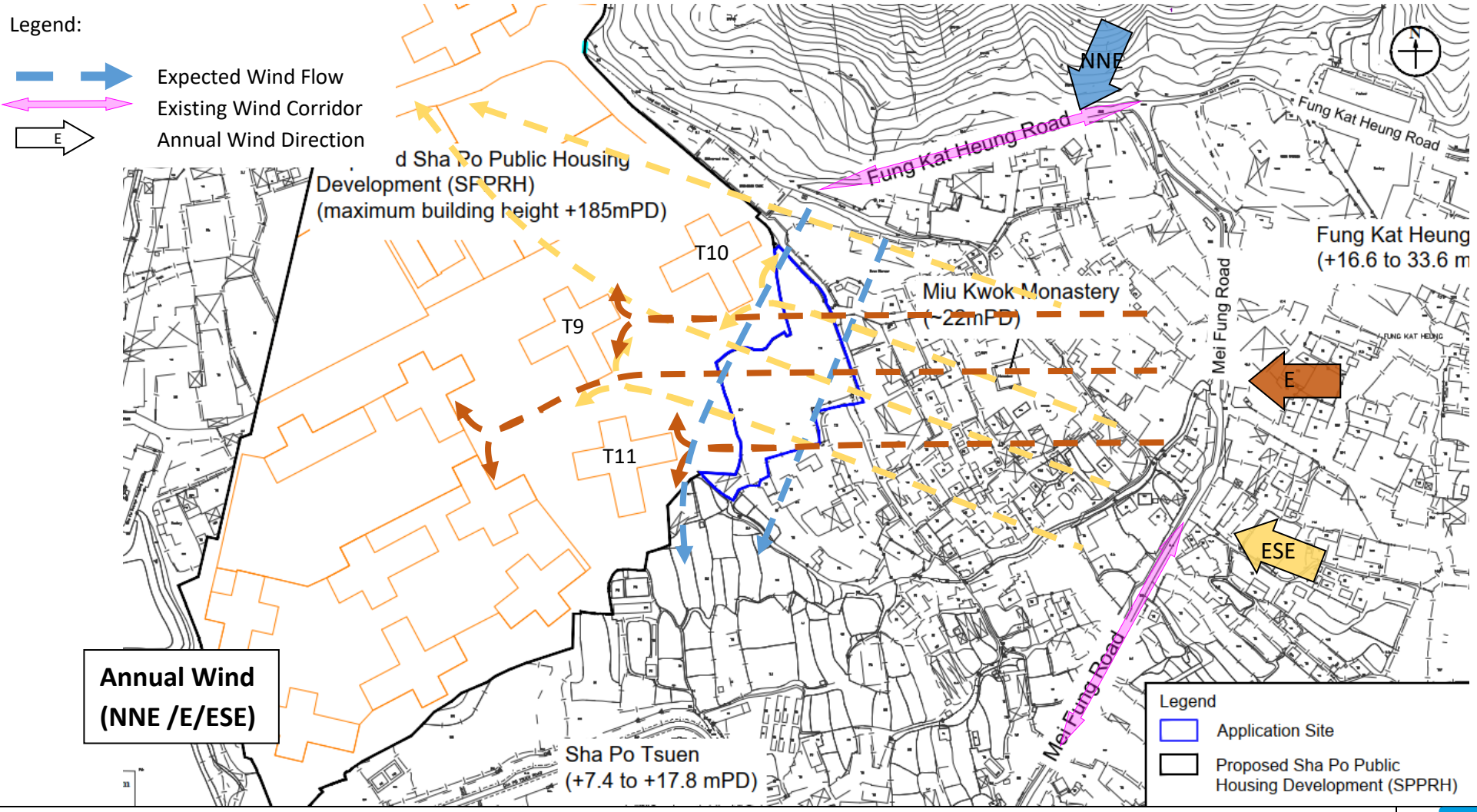

Figure: 3	RAMBOLL
Title: Illustration of Wind Flow from Annual Wind Directions for Baseline Scheme	Drawn by: MK Checked by: CC
Project: Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land, Fung Kat Heung, Yuen Long	Rev.: 1.0 Date: Mar 2024

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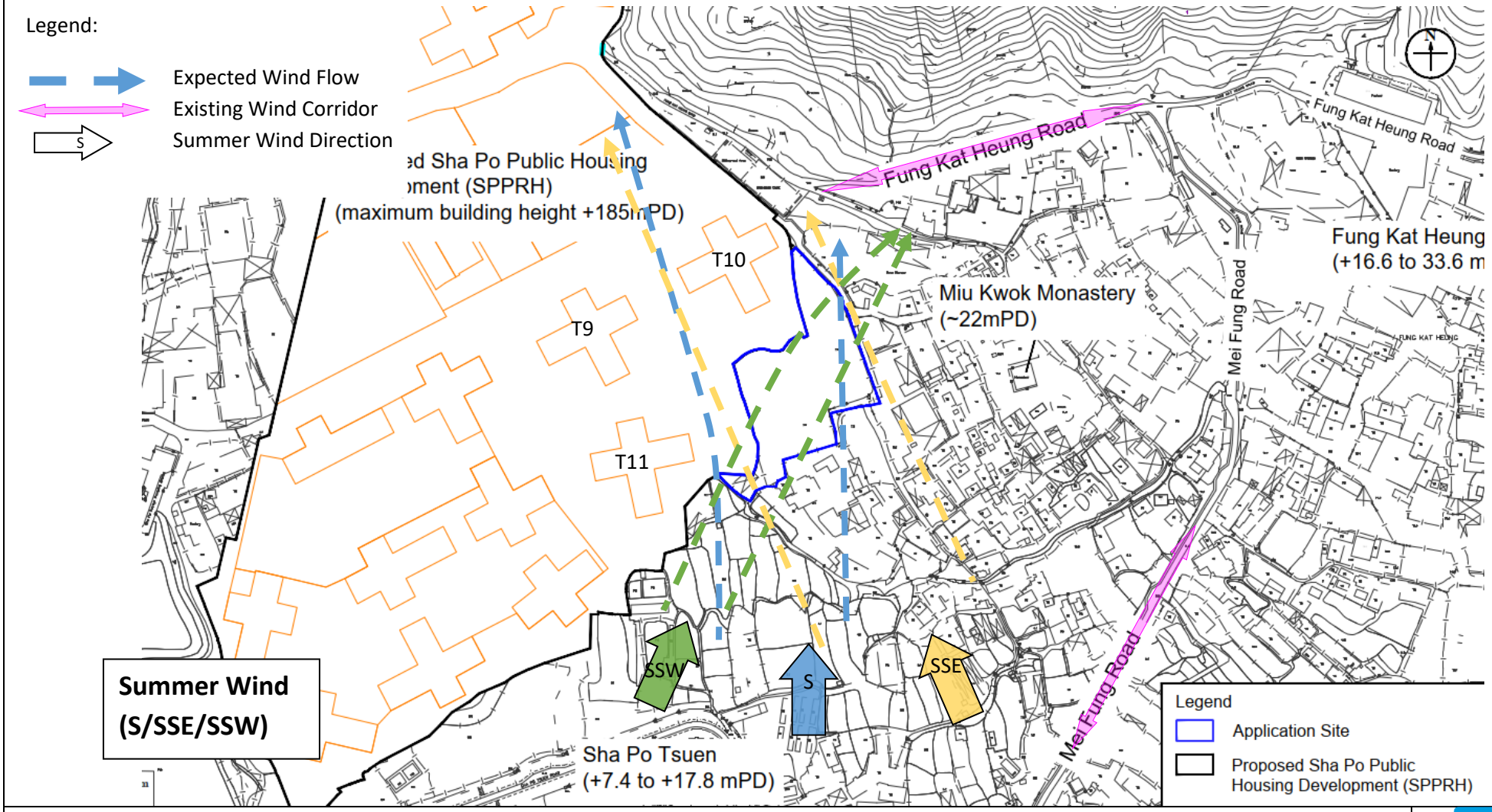

Figure: 4	RAMBOLL
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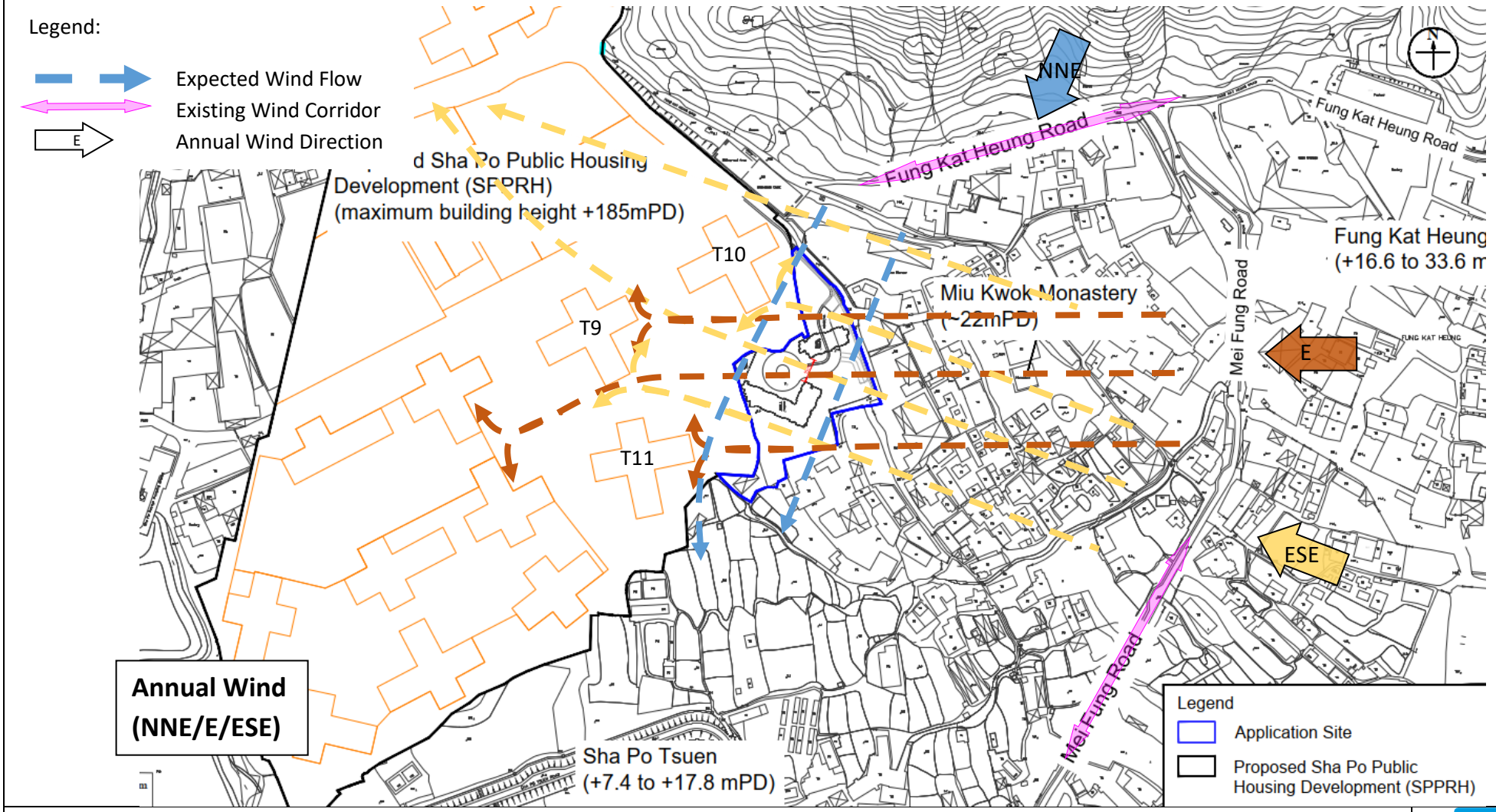

Figure: 5	RAMBOLL
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Project: Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land, Fung Kat Heung, Yuen Long	Rev.: 1.0 Date: May 2024

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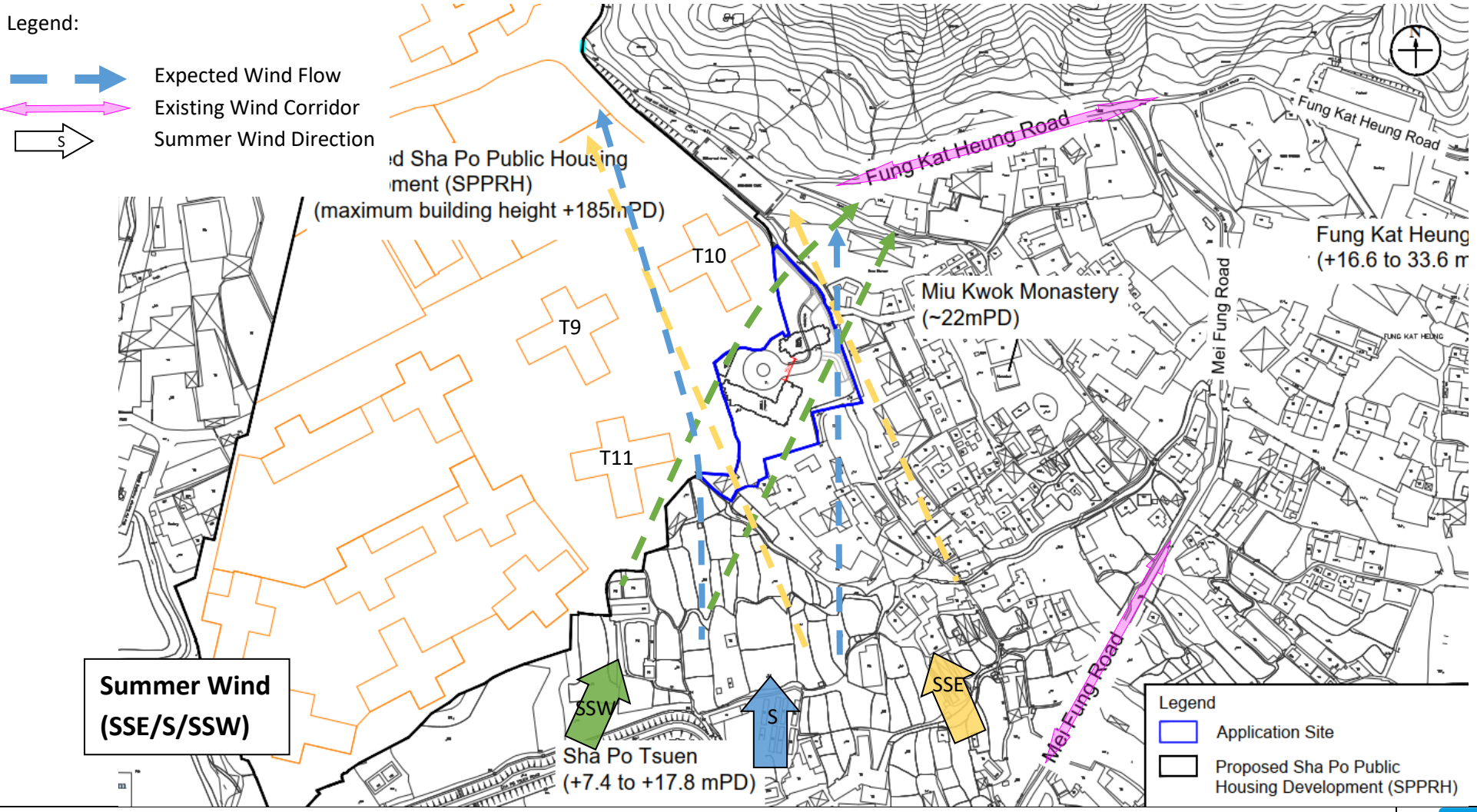

Figure: 6	RAMBOLL
Title: Illustration of Wind Flow from Summer Wind Directions for Proposed Scheme	Drawn by: MK Checked by: CC
Project: Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land, Fung Kat Heung, Yuen Long	Rev.: 1.0 Date: May 2024

Appendix 1

The Master Layout Plan of the Proposed Scheme

LEGENDS:

Site Boundary

Third Party Lot to be Acquired

Driveway / EVA

N

CLUBHOUSE
10.5mPD

TOWER 2
156.0mPD

TOWER 1
150.0mPD

7.0

15000

15m

5000

DRIVEWAY/EVA

SEWAGE TREATMENT PLANT ROOM

Road

Ramp

裕昌園

露天貨倉
Open Storage

Proposed Residential Development at Various Lots in D.D. 107 and Adjoining Government Land , Fung Kat Heung, Yuen Long.

MASTER LAYOUT PLAN (1:500)