
Appendix D

Air Ventilation Assessment – Expert Evaluation

Prepared for

Coral Ching Limited

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**SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE
TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL
(GROUP C)2" ZONE TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF
PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TUNG
CHUNG AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND**

AIR VENTILATION ASSESSMENT - EXPERT EVALUATION

In association with

Llewelyn Davies Hong Kong Ltd

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1. INTRODUCTION

1.1 Project Background

- 1.1.1 Ramboll Hong Kong Ltd. has been commissioned by the Applicant to conduct an Air Ventilation Assessment (AVA) in support of a S12A Planning Application for rezoning of a housing site (or called "Application Site") from "Residential (Group C) 2" ("R(C)2") zone to "Residential (Group B)" ("R(B)") zone.
- 1.1.2 The subject housing site is located at various lots in D.D. 1 TC and adjoining government land, Lantau. It is a roadside housing site near the planned Tung Chung West (TCW) MTR Station. There are also existing and planned public housing estates near the site.
- 1.1.3 In view of its close proximity to MTR station and a public housing development, the subject housing site is proposed to be rezoned from "R(C)2" to "R(B)" to enable a medium density residential development to provide more flat supply in line with the government policy. Under the rezoning proposal, the domestic plot ratio (DPR) of the site will be slightly increased from 1.0 to 2.1. Some supporting local commercial and transport facilities will also be provided on the site with a non-domestic plot ratio (NPR) of about 0.22. The proposed development will have a building height ranging from 6 to 22 domestic storeys above 1- to 3-storey podium. The maximum building height of the proposed development will not exceed 100mPD, compared to around 130mPD to 170mPD permissible for the adjacent public housing sites.

1.2 Objectives

- 1.2.1 This AVA – Expert Evaluation (EE) contains a qualitative assessment of the potential ventilation impact of the proposed change in the development intensity of the subject housing site on the future pedestrian wind environment by comparing it with the Baseline Scheme (design in compliance with the OZP requirements).

1.3 Application Site and its Environs

- 1.3.1 **Figure 1.1** shows the location of the Application Site and the surrounding environs.
- 1.3.2 The Application Site with an area of around 33,808 m² is located in the Tung Chung West New Town Extension (TCWNTE). Currently the Application Site mostly falls within Residential Group C R(C)2 zone in the Approved Tung Chung Valley OZP No. S/I-TCV/2.
- 1.3.3 The Application Site in its existing condition consists of sparse village houses, open spaces used for vehicle parking, and a few temporary structures for commercial usage. A paved hiking trail leading to the Tung O Ancient Trail is also present within the Application Site.

1.4 Baseline Scheme

- 1.4.1 **Figure 1.2** illustrates the conditions of the Baseline Scheme to be compared with the Proposed Scheme when evaluating the potential change of the air ventilation impact brought by the proposed development. The Baseline Scheme structures are derived based on the current zone restrictions in the OZP No. S/I-TCV/2 and guideline from the Buildings Department, that is subject to a maximum building height of +20 mPD, securing a minimum site coverage of greenery at 30%, and maintaining a plot ratio of 1.

1.4.2 The Baseline Scheme consists of 30 low-rise residential blocks with the maximum building height being +20 mPD as per the approved OZP. This notional MLP is adopted as the Baseline Scheme of the AVA study.

1.5 Proposed Scheme

1.5.1 **Figure 1.2** illustrates the proposed developments under the Proposed Scheme. The proposed development will comprise 9 residential blocks with building height ranging from +37.4 mPD to +99.4 mPD and a site coverage area of no more than 33.3%. Some ancillary / supporting uses e.g. residents' clubhouse, transport layby and local retail facilities are provided in the podium under the residential towers. There is a 20m-wide east-to-west building gap in the middle of the Application Site aligned to Yu Tung Road and a transport layby is also provided on G/F of the commercial podium underneath T7, T8 and T9.

1.5.2 **Appendix 1** shows the layout and building height of the proposed development.

2. SITE WIND AVAILABILITY

2.1 Regional Atmospheric Modelling System (RAMS)

2.1.1 According to the Planning Department's website, a meso-scale Regional Atmospheric Modeling 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 conditions at various levels, i.e. 200 m, 300 m, and 500 m above the terrain.

2.1.2 The RAMS data of the grid (X: 030 Y: 033) and (X: 030 Y: 034) has been extracted from the Site Wind Availability Data of the Planning Department's website.

2.1.3 Based on the wind roses with 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.

Figure 2.1 shows the relevant wind rose diagram (at 200 m) representing the frequency and wind speed distribution of the district concerned for both summer and annual conditions. According to the RAMS wind availability data, the annual wind directions of the area are mainly in the ESE, E, and S. While the summer prevailing wind directions were found to be S, SSE, and SSW.

2.1.4 **Table 2.1** summarises the simulated wind availability data including the probability of occurrence.

Table 2.1 Summary of RAMS Data and Wind Direction

Wind Direction	% of Annual Occurrence (X: 30 Y: 33)	% of Summer Occurrence (X: 30 Y: 33)	% of Annual Occurrence (X: 30 Y: 34)	% of Summer Occurrence (X: 30 Y: 34)
0° (N)	3.8%	1.5%	3.4%	1.3%
22.5° (NNE)	8.4%	1.6%	7.6%	1.5%
45° (NE)	8.6%	1.6%	9.4%	2.0%
67.5° (ENE)	6.1%	1.9%	7.7%	2.2%
90° (E)	13.4%	6.6%	14.0%	6.8%
112.5° (ESE)	12.4%	8.1%	12.5%	8.6%
135° (SE)	8.0%	8.1%	7.9%	8.7%
157.5° (SSE)	9.1%	15.3%	7.6%	13.4%
180° (S)	9.5%	19.2%	9.4%	19.2%
202.5° (SSW)	6.3%	15.1%	5.9%	14.2%
225° (SW)	2.6%	6.4%	2.7%	7.0%
247.5° (WSW)	1.6%	3.3%	1.7%	3.7%
270° (W)	2.5%	3.9%	2.9%	4.6%
292.5° (WNW)	2.2%	2.8%	2.5%	3.1%
315° (NW)	2.9%	2.7%	2.5%	2.3%
337.5° (NNW)	2.7%	1.7%	2.3%	1.4%

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

2.2 Hong Kong Observatory (HKO) Weather Data

- 2.2.1 The Hong Kong Observatory has weather stations located throughout Hong Kong which measure meteorological data of the environment. Wind roses under annual and summer conditions at Chek Lap Kok, the closest HKO station near the Application Site. However, the Chek Lap Kok Station is relatively far from the Application Site at over 3 km, as indicated in **Figure 2.3** and is expected to be influenced by the local topography and building morphology. Therefore, data from the HKO Station is not suitable for the Application Site and the RAMS data at grids (X: 030 Y: 033) and (X: 030 Y: 034) is recommended to be used for the directional analysis of the Application Site.

2.3 Topography and Building Morphology

Topography

- 2.3.1 The Application Site is surrounded by multiple high topography to the east, south, and west the area is relatively flat near the Application Site. Approximately 2.5 km to the east lies Pok To Yan, with a height of about +520 mPD. To the southeast, at a distance of 1.5 km, is the peak of Wo Liu Tun which rises to about +320 mPD. Meanwhile, Nei Lak Shan is situated around 2.5 km to the southwest, reaching a height of +750 mPD. On the other hand, to the north of the Application Site is the Tung Chung Bay which is open for wind penetration.
- 2.3.2 Easterlies and south easterlies flowing to the Application Site are anticipated to encounter Pok To Yan and Wo Liu Tun respectively and experience minor hindrance before flowing down as downwash. The far distance between the elevated topography and the Application Site is also anticipated to allow the majority of E, ESE, and SSE wind to recover before reaching the Application Site. Hence, it is believed that the topography would not affect the wind availability in the Tung Chung West area.

Building Morphology – Existing Development

- 2.3.3 There are several existing developments surrounding the Application Site. The building height information of these identified developments are extracted from Geo-Reference Database (BG1000) provided by the Survey and Mapping Office/ Lands Department and **Table 2.2** can be referred to for the building heights of the existing surrounding structures.
- 2.3.4 The Application Site is surrounded by a combination of low-rise and high-rise developments in all directions excluding the west beyond the Tung Chung River and the sea to the north. The building blockage effect due to the surrounding developments is anticipated. For example, a portion of easterly winds flowing towards the southern portion of the Application Site will encounter the Mun Wo House creating an immediate wind wake and reducing wind availability in its immediate surroundings. Similarly, prevailing summer southerly winds will encounter both Mun Hong House and Mun Tai House hindering wind flow towards the Application Site. It is also anticipated that open spaces and roads around the proposed development will act as wind corridors for the Application Site. Overall, the impact of the existing morphology is expected to be moderate.

Building Morphology – Planned Development

- 2.3.5 According to the OZP and the Recommended Outline Development Plan (RODP) of this Tung Chung West area, there are several mid to high-rise developments

surrounding the Application Site. **Table 2.2** highlights the building heights of the surrounding planned developments.

- 2.3.6 Under the Public Housing Development at Tung Chung Area 42, 46 (Application No. A/I-TCTC/67), there are several planned high-rise public housing developments located further south and southeast of the Application Site. Site Area of Area 42 is around 39,800 m² and Area 46 at around 11,100 m² and both have an permissible maximum building height of +170 mPD.
- 2.3.7 Moreover, as outlined by the RODP in the Tung Chun West EIA Report (EIA-233/2015), the vicinity of the Application Site includes a variety of mid to low-rise structures. To the east of the Application Site, Areas 66a, 66b, and 67 accommodate mid-rise commercial developments with maximum heights of +35 mPD, +25 mPD, and +20 mPD, respectively. Also in the eastern proximity, low-rise buildings dedicated to Government, Institution, or Community (GIC) uses presents in Areas 36a & 36b. To the west and southwest, Areas 81 and 91 are low-rise residential buildings, with building height restrictions set at +20 mPD and +25 mPD.
- 2.3.8 Area 81 is located downstream from prevailing annual and summer wind; hence, it is not anticipated to affect the surrounding wind environment. Additionally, Areas 36a, 36b, 66a, 66b, 67, and 91 are located upstream of the prevailing annual and summer wind directions. However, due to their low maximum building height, it is anticipated that prevailing annual and summer winds may skim over these planned structures and reach the Application Site. Wind blockage is anticipated from the high-rise developments proposed within Areas 42 and 46. Incoming southerly and southeasterly winds may experience blockage upon encountering the high-rise developments of the planned areas. Nevertheless, the layout plan under the Public Housing Development at Tung Chung Area 42 and 46 indicates that the planned development has incorporated mitigation measures such as building setbacks and building gaps to allow wind flow to reach further downstream areas. Therefore, taking into consideration the various planned developments, potential wind blockage produced by these planned structures is considered to be moderate.

Table 2.2 Building Height of the Surrounding Developments

Name of Development	Building Height (mPD)	Location relative to the Application Site
Yat Tung Estate	+121.3 to +123.9	Northeast
Mun Wo House	+126.0	East
Hong Chi Shiu Pong Morninghope School	+21.6	Southeast
Mun Tai House	+102.4	Southeast
Mun Hong House	+127.2	Southeast
Mun Shun House	+126.8	Southeast
Wong Ka Wai Village Houses	+12.0 to +25.7	Southeast
Ha Ling Pei Village Houses	+11.4 to +23.4	Southeast
Sheung Ling Pei Village Houses	+15.4 to +28.8	Southeast
Tung Chung Service Reservoir	+17.0 to +27.2	Southeast
YMCA of Hong Kong Christian College	+40.3	South
Caritas Charles Vath College	+40.4	South

Name of Development	Building Height (mPD)	Location relative to the Application Site
Ngau Au Village Houses	+17.0 to +27.2	Southwest
TCWNTE Area 36e (District Open Space)	N/A	North
TCWNTE Area 68	Maximum of 1 story	Northeast
TCWNTE Area 36a	Maximum of 4 stories	East
TCWNTE Area 36b	+15	East
TCWNTE Area 66a	+35	East
TCWNTE Area 66b	+25	East
TCWNTE Area 67	+20	East
TCWNTE Area 42	+131 to +168	Southeast
TCWNTE Area 46	+163 to +166	Southeast
TCWNTE Area 91	+25	Southwest
TCWNTE Area 81	+20	West

2.4 Summary of Existing Site Wind Availability

- 2.4.1 RAMS wind data is recommended to be used for further directional analysis due to its consideration of the topographical features of the Application Site. According to the RAMS wind availability data, the annual wind directions of the area are mainly from the E direction E (13.4% & 14%), ESE (12.4% & 12.5%), and S (9.5% & 9.4%). Owing to the existing and planned building morphology E and ESE wind is anticipated to be hindered by the structures under Mun Tung Estate and the planned developments in Area 42 and 46 of the Tung Chung West New Town extension, decreasing wind availability at the southern half of the Application Site. Meanwhile, the northern half of the Application Site may experience minor pedestrian wind blockage from the proposed developments under Areas 66a, 66b, and 67 of the Tung Chung West New Town Development. However, as there is some distance between the Application Site and the aforementioned structures it is anticipated that prevailing annual wind may reach the Application Site as leftover wind.
- 2.4.2 For summer winds, the prevailing wind directions were found to be S (19.2%), SSE (15.3% & 13.4%), and SSW (15.1% & 14.2%). Prevailing summer southeasterly winds are expected to be inhibited by the high-rise structures of Mun Tung Estate and the planned developments in Area 42 and 46 of the Tung Chung West New Town extension.
- 2.4.3 As the upstream areas of prevailing winds are occupied by a variation of low to high-rise developments, potential building blockage effect due to the surrounding existing and planned developments are considered to be moderate.

3. EVALUATION OF AIR VENTILATION PERFORMANCE

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

3.1.1 Good design features beneficial to air ventilation have been incorporated as far as possible into the design of the proposed development taking into account various site constraints. Mitigation measures such as provision of building setbacks, optimal building gaps, and open landscape areas are included in the design. The details of the design measures in the site layout for enhancing the air ventilation of the proposed development and the surrounding areas are summarised below and indicated in **Figure 3.1**.

- The overall layout design of the proposed development has optimised building disposition and separation of the buildings to favour incoming prevailing winds;
- The layout design maintains the 20m building gap at the centre of the Application Site required under the Approved Tung Chung Valley Outline Zoning Plan No. S/I-TCV/2 (OZP);
- The layout has arranged open landscape area throughout the entire Application Site to reduce the overall bulk of high-rise development;
- North-south building gaps of no less than 15m between building clusters in the western and eastern portions of the Application Site are provided to enhance wind flow in the Application Site through the gaps created;
- Building setbacks generally of no less than 5m from site boundary for high-rise residential towers are present in the proposed development to facilitate incoming winds to penetrate through the Application Site to downstream areas;
- Open landscape area is maximized throughout the entire Application Site and facilitates incoming winds to the buildings and pedestrians within the Application Site;
- Podium coverage and building density is reduced to minimize the impact of the proposed development; and
- Empty voids (not less than 4m in height) created from overhanging structure design are present as much as practicable to enhance potential pedestrian wind flow through the Application Site.

3.1.2 **Figure 3.2** to **Figure 3.6** illustrates the prevailing wind from both annual and summer wind directions for the Baseline and Proposed Scheme.

3.1.3 Existing wind corridors within the vicinity of the Application Site are located along the N-S axis through the embankment and estuary of the Tung Chung River, the current open space south of the Application Site, and Chung Mun Road. Along the E-W axis, existing wind corridors are present through Yu Tung Road and the northern tip of Area 42 and Chung Yat Street. Both the Baseline Scheme and the Proposed Scheme maintain the same existing wind corridors.

3.1.4 In the Approved Tung Chung Valley Outline Zoning Plan No. S/I-TCV/2, there is a 20m wide Non-building Area (NBA) at the Application Site. The design of the proposed development has allowed for such NBA at the centre of the Application Site as building gap, which acts as an air path for pedestrian and high-level eastern wind to penetrate through the Application Site. This NBA also provides a buffer zone to

reduce the overall bulk of high-rise development to minimize air ventilation impact. The roads within the Application Site also serve as local wind paths to enhance air movement along the edges of the Application Site.

- 3.1.5 The overhanging design of the high-rise blocks was designed to enhance low-level wind penetration through the Application Site. Although blockage may occur, leftover low-level winds may make use of the vacant space below the high-rise blocks to flow through the Application Site.
- 3.1.6 The proposed development included mitigation measures such as building gaps, building setbacks from the site boundary and the provision of open space within the Application Site. For building gaps, there are large building gaps with a width of not less than 15m between towers in the western and eastern portions of the Application Site allowing for N-S wind penetration through the Application Site. Other building gaps of different widths also allow passage of wind flow at the Application Site. Then for building setbacks, there are setbacks of generally not less than 5m from the site boundary for high-rise residential towers. Further building setback is also provided along the northern and southern boundary of the Application Site such as the podium in the southern portion as well as proposed access road and landscape area in the northern portion of the Application Site, which provides open space for wind to flow over and reach further downstream areas.

3.2 Assessment Methodology

- 3.2.1 As discussed in Section 2, the wind availability at the Application Site and the prevailing wind flows during annual and summer conditions are identified. It is noted that the annual prevailing wind directions for the district are from E, ESE, and S. While the summer prevailing wind directions would be from SSW, S, and SSE. The proposed development will be evaluated against the identified annual and summer prevailing wind directions and compared with the Baseline Scheme.

3.3 Wind Flow from ESE Direction

- 3.3.1 **Figure 3.2** illustrates the wind flow of the Baseline Scheme and Proposed Scheme under ESE wind direction.
- 3.3.2 ESE wind flowing down from Wo Liu Tun will encounter the planned high-rise structures within planned Area 42 of the TCWNTS and the existing high-rise towers of Mun Tung Estate, decreasing wind availability at the southern portion of the Application Site. Furthermore, ESE wind flowing towards the northern portion of the Application Site also encounters the future Commercial/Government development to the north of Yu Tung Road which will hinder pedestrian-level wind flow towards the Application Site. However, an existing wind corridor present along Chung Yat Street and the northern tip of Area 42, which is one of the sources of ESE winds in the area allows ESE wind from Wo Liu Tun along the said wind corridor to flow towards the southern portion of the Application Site.
- 3.3.3 Under the Baseline Scheme, ESE wind from Wo Liu Tun can reach the southern portion of the proposed development via the above-mentioned existing wind corridor along Chung Yat Street and the northern tip of Area 42. ESE wind from the blockage of the existing Mun Tung Estate and future Commercial/Government development to the north of the Yu Tung Road may gradually recover so that pedestrian-level ESE wind could flow along the edges of the Application Site at the northern and southern portion of the Application Site to reach further downstream areas.
- 3.3.4 For the Proposed Scheme, as mentioned above, although the southeastern portion of the Application Site is occupied by proposed high-rise developments which may

affect wind availability, when developing the Proposed Scheme due consideration has been given so that the design can respect the existing wind corridor along Chung Yat Street by providing sufficient building setback from southern site boundary line. For example, the Proposed Scheme maintains the air path at the southern portion through a podium setback design, which creates an air path not less than 15m wide. ESE wind flowing through this setback can flow beyond the Tung Chung River to reach other downwind locations such as Area 81 of the TCWNTE. Although, the Proposed Scheme has a taller building height as compared to the Baseline Scheme, other building setback have been proposed. For instance, the Proposed Scheme widens the building setback at the northern portion of the Application Site creating a wind path of no less than 15m allowing ESE wind to flow along the northern edge of the Application Site. Also, the proposed building height is still lower than the building height at the adjacent Mun Tung Estate. High-level wind can still flow over the proposed structures. Moreover, as the Application Site is adjacent to Tung Chung Stream and there is no sensitive use immediately downstream, it is expected that wind can gradually recover via the river bank and Tung Chung Stream to reach other downwind locations.

- 3.3.5 Overall, while the building height is generally higher in the Proposed Scheme, and might induce a wake in its immediate surrounding area to the west of the Application Site. The Proposed Scheme has maintained and strengthened the mitigation measures provided under the Baseline Scheme to minimise air ventilation impact via proper design and building setback. Hence, wind performance is anticipated to be comparable between the two schemes.

3.4 Wind Flow from E Direction

- 3.4.1 **Figure 3.3** illustrates the prevailing wind flow from E wind direction under the Baseline Scheme and Proposed Scheme.
- 3.4.2 Similar to ESE wind, the existing Mun Tung Estate and the future developments in the commercial and G/IC zones to the north of Yu Tung Road would limit easterly wind flow to the Application Site. Under the current condition, Yu Tung Road would serve as an existing wind corridor in the area which would reach the central portion of the Application Site. On the other hand, the existing wind corridor along Chung Yat Street would also allow certain easterly wind to reach the southern portion of the Application Site via the street and the open area/ open car park at existing Hang Chi Chiu Pang Morninghope School.
- 3.4.3 Under the Baseline Scheme, remaining E wind flowing from planned developments at of TCWNTE east of the Application Site and from Mun Tung Estate will encounter the clusters of low-rise residential blocks under the Baseline Scheme hindering pedestrian-level wind flow to further downstream areas. Nevertheless, the E wind could flow along the edges of the Application Site as well as via the building setback provided under the southern site boundary. Furthermore, the Baseline Scheme provides a 20m NBA at the centre of the Application Site to accommodate easterly wind flow from the Yu Tung Road breezeway. E wind reaching the NBA will penetrate the Application Site with a turn of no less than 15 degrees and reach further downstream areas such as the low-rise buildings in Area 81 of the TCWNTE.
- 3.4.4 The increase in building height under the Proposed Scheme is anticipated to create a wind wake at the immediate downwind locations of residential towers. Building setback from the western site boundary line is therefore adopted to allow wind to gradually recover via the space created. It should be noted that the immediate downwind location of the Application Site is the embankment and estuary of Tung Chung River and in the absence of any immediate sensitive receivers. The planned

Area 81 of the TCWNTS at further downwind location is relatively far away from the proposed development (about 126m separation distance), the provided building setback together with the large open space at the embankment and estuary of Tung Chung River, it would allow some wind to recover before reaching downstream receivers at the Area 81. The Proposed Scheme also maintains the mitigation measures proposed under the Baseline Scheme to alleviate potential air ventilation impact. For example, the Proposed Scheme maintains the building setback at the southern portion of the Application Site through the podium setback from the southern site boundary, which creates a not less than 15m air path for E wind to flow through and reach further downstream areas. Additionally, the building gaps between building clusters allows for an NBA aligning from east to west direction which is in line with the NBA proposed in the Explanatory Statement of the OZP. As compared with the Baseline Scheme, the NBA created in Proposed Scheme has been designed to align the E wind direction and without any turn. E wind flowing from existing wind corridor at Yu Tung Road would be able to flow through and penetrate through the NBA at the Application Site with little to no hinderance to ventilate the Area 81 of the TCWNTS. Furthermore, the Proposed Scheme has also provided further building setback at the northern site boundary as opposed to the Baseline Scheme, the building setback at the northern Site boundary creates an air path of no less than 15m wide allowing E wind to flow through the northern portion of the Application Site.

- 3.4.5 To sum up, although the high-rise towers under the Proposed Scheme may potentially reduce wind availability at the immediate downstream area, there are no immediate downwind sensitive receivers present. Building setback from site boundary line has been provided together with the river embankment and Tung Chung River to create a space for wind to recover. With the mitigation measures incorporated under the Proposed Scheme, notably the realignment of the NBA to better accommodate the direction of E wind, pedestrian-level E wind is expected to perform slightly better under the Proposed Scheme as compared to the Baseline Scheme.

3.5 Wind Flow from S Directions

- 3.5.1 **Figure 3.4** illustrates the wind flow of the Baseline Scheme and Proposed Scheme under S wind direction.
- 3.5.2 S wind is identified as a prevailing wind direction under both summer and annual conditions. The majority of S wind within the vicinity of the Site will come from the N-S aligned existing wind corridors such as those along Tung Chung Stream to the west and existing public road at Chung Mun Road to the east, and a slight portion of pedestrian-level southerly winds are expected to be hindered by the other existing low-rise developments to the south of the Application Site such as the YMCA of Hong Kong Christian College and planned development at Area 91 before it can arrive the Application Site. However, the majority of S wind flowing towards the Application Site will remain unhindered and can reach the Application Site.
- 3.5.3 Upon reaching the Application Site, the dense clusters of low-rise developments under the Baseline Scheme are anticipated to hinder S wind at pedestrian level, thus resulting in a decreased wind flow at immediate downstream areas to the north of the Application Site and district open space over there. High-level wind would still be able to flow around or above the building clusters due to their low-rise design.
- 3.5.4 On the other hand, for the Proposed Scheme, although the Proposed Development may likely hinder certain high-level S wind and decrease wind availability at downstream receivers, the Proposed Scheme has provided adequate building gaps

and setbacks to accommodate S wind. >5m setback from the western site boundary line combined with the open space to the west of the Application Site allows for S wind to flow along the site boundary and reach a portion of the district open space to the north. S wind may also make use of the setback of no less than 5m from the eastern site boundary in combination with existing wind corridor at Chung Mun Road to ventilate further downwind locations at the TCWNT. Furthermore, the Proposed Scheme also provides a north-south building gap of no less than 15m wide between the building clusters in the western and eastern portions of the Application Site, allowing southern winds to penetrate through.

- 3.5.5 Hence, through the provision of building gaps and building setbacks in the proposed development, the Proposed Scheme allows for more pedestrian wind penetration through the Application Site as compared to the Baseline Scheme. Therefore, it is anticipated that the proposed development would not have a negative air ventilation impact on the surrounding area under S wind.

3.6 Wind Flow from SSE Directions

- 3.6.1 **Figure 3.5** illustrates the wind flow of the Baseline Scheme and Proposed Scheme under SSE wind direction.

- 3.6.2 Currently, the SSE wind is limited within the area due to blockage by the surrounding existing developments at the southeast vicinity of the Application Site such as high-rise development at existing Mun Tung Estate and existing YMCA of Hong Kong Christian College. SSE wind is expected to flow down southeastern hilly terrains and encounter the building clusters of Mun Tung Estate. With minor SSE wind flow coming from the existing wind corridor at Chung Mun Road. With the already limited SSE wind, there may be potential impact to downstream areas such as the northern portion of Area 81 of the TCWNT.

- 3.6.3 SSE wind flowing to the Application Site is primarily hindered by the existing building morphology of Mun Tung Estate decreasing SSE wind availability at the Application Site. Under the Baseline Scheme, the proposed development is a dense cluster which would further decrease pedestrian-level wind permeability within the Application Site. Therefore, a decrease in pedestrian-level wind availability downstream of the Application Site is anticipated. However, the Baseline Scheme provides building setbacks along the northwestern and southeastern boundary for some SSE wind to skirt by the outer portions of the Application Site.

- 3.6.4 As discussed previously, the SSE wind in the area is limited due to presence of other existing developments at upwind locations. Compared to the Baseline Scheme, the design for Proposed Scheme has provided a larger building setback aligned in the direction of SSE-NNW direction along the southeast and northwest boundary. The building setback at the northeastern boundary of not less than 5m would allow SSE wind coming from the existing wind corridor at Chung Mun Road to flow along the site boundary. However, aside from the northern portion of Area 81 within the TCWNT and the western portion of the district open space, which are located to the further northeast and north of the Application Site, there are no other major immediate downstream receivers from the Application Site in the direction of SSE wind as further downstream areas extending in this direction mainly comprise of the open sea with no significant structures. As explained above, current design has already allowed building setback from eastern site boundary line to cater for these areas. Building setback has also been adopted along the western and southwestern site boundaries. With such design, any SSE wind coming along the Tung Chung River would be able to flow through and reach the Area 81 area at downwind location. Furthermore, given that wind flow within the area is already impeded by

the existing high-rise towers of Mun Tung Estate, the additional building height increase in the Proposed Scheme is not expected to substantially alter wind availability. Instead, it may facilitate the capture of more high-level SSE wind, which could then be redirected downward, enhancing pedestrian-level wind comfort to some extent.

- 3.6.5 Hence, the unfavourable impact on the surrounding areas is expected to be reduced through the design measures under the Proposed Scheme. The proposed building setback in design would allow SSE to pass through to downwind locations. Pedestrian-level air ventilation impact of the Proposed Scheme is anticipated to be comparable the Baseline Scheme and would not have a significant negative impact towards the surrounding area.

3.7 Wind Flow from SSW Directions

- 3.7.1 **Figure 3.6** illustrates the wind flow of the Baseline Scheme and Proposed Scheme under SSW wind direction.
- 3.7.2 Under summer conditions, pedestrian-level SSW wind flowing to the Application Site will encounter Ngau Au Village Houses and the planned low-rise developments at Areas 81 and 91 within the TCWNTE. The building clusters within Ngau Au Village Houses and Areas 81 and 91 would potentially hinder low-level SSW wind, lowering wind performance surrounding the Application Site. Nevertheless, existing air corridors at the embankment and estuary at Tung Chung River and Chung Mun Road would provide a path for SSW wind to reach the Application Site.
- 3.7.3 Under the Baseline Scheme, the proposed towers within the Application Site have a maximum building height of +20 mPD, similar to the building height limit of the planned developments under Area 91 of the TCWNTE. The low building height allows SSW wind flowing above the developments in Area 91 to also flow over the proposed developments to ventilate mid-rise commercial developments and the low-rise buildings dedicated to Government, Institution, or Community (GIC) uses within Areas 36a, 36b, 66a, 66b, and 67.
- 3.7.4 Under the Proposed Scheme, the design has fully considered the presence of existing corridor at Tung Chung River and adopted a building setback from the northern site boundary coupled with the proposed internal road, would create an air path of not less than 15m wide for SSW wind coming from the existing wind corridor at the west of the Application Site to ventilate the district open space. SSW wind would also be able to flow along the southern site boundary through a setback of at least 5m paired with the existing wind corridor along Chung Mun Road to reach further downstream areas such as the commercial developments and the low-rise buildings dedicated to Government, Institution, or Community (GIC) uses northeast of the Application Site. The potential air path provided by building setback not only allows SSW wind to ventilate the Application Site, but also allows SSW wind to reach further downstream areas beyond Yu Tung Road. It shall be noted that the Application Site is already setback from other adjacent commercial area and GIC uses within Areas 67, 36b, 36a, 66a, 66b by an existing open space at the northeastern boundary. It is understood the open space would be used for stormwater attenuation pond use only. As for the Proposed Scheme, further building setback from northeastern site boundary (not less than 15m wide) has also been adopted in the design and together with the existing adjacent open space over there, it can provide a large separation distance and space for wind to gradually recover before reaching the adjacent planned commercial area and GIC uses.

- 3.7.5 Overall, while the Proposed Scheme might induce a wake area in its immediate downwind locations of proposed residential towers, the proposed development has accommodated building setbacks from northeastern site boundary line. Building setbacks have also been provided in adjacent to existing wind corridors at Tung Chung River and Chung Mun Road to accommodate existing wind flow. The proposed mitigation measures allow pedestrian-level SSW wind to perform similarly to the Baseline Scheme under the Proposed Scheme and no significant adverse impact from the proposed development on the surrounding wind environment is anticipated under SSW wind with the proposed mitigation measures in place, and no significant air ventilation impact is anticipated as a result.

3.8 Summary of Relative Air Ventilation Performance

- 3.8.1 The air ventilation performance of the existing condition and the proposed development has been appraised. Under annual conditions, the proposed development would potentially increase localised wind blockage and create wind wakes in the immediate surrounding areas. In view of this, the design of the proposed development has allowed sufficient building gaps and setbacks to maintain a 20m NBA in the direction of E-W and allow prevailing annual winds to penetrate through the proposed development to reach other sensitive areas such as Area 81 of the planned TCWNTE. While under summer conditions, wind availability is expected to decrease due to the presence of the high-rise developments at Mun Tung Estate and other planned developments. Despite this, the proposed development has provided various mitigation measures such as building setbacks, north-south building gaps, low-level podiums, open landscape areas in its design in order to alleviate any potential air ventilation impact. The building setbacks provided which is coupled with existing wind corridors at Tung Chung River and Chung Mun Road, would allow wind to pass through to further downwind locations. While the north-south building gap approach can also align with the prevailing wind direction for wind to flow though the Application Site under the S wind. Consequently, with the proposed mitigation measures, it is unlikely that the proposed development will have a significant adverse impact on the surrounding wind environment.

4. CONCLUSION

- 4.1.1 The proposed rezoning of the subject roadside housing site near the planned TCW MTR Station to enable a medium-density residential development has been evaluated from an air ventilation standpoint.
- 4.1.2 According to the findings of this AVA-EE, annual prevailing wind comes from ESE, E, and S direction and summer prevailing wind comes from SSW, S, and SSE directions. Taking into consideration of the existing topography, the location of the existing built areas, planned developments and the provision of mitigation measures, it is considered that the Proposed Scheme would not have significant adverse air ventilation impact on the surrounding environment.
- 4.1.3 The proposed development has incorporated mitigation measures to improve the air ventilation performance of the proposed development as much as possible given the various site constraints. Mitigation measures such as the provision of open spaces, building setbacks generally not less than 5m from the site boundary for high-rise residential towers, building gaps (maintain the 20m building gap at the centre of the Application Site as proposed under the ES of the OZP; and a proposed north-south building gap with a width of not less than 15m between building clusters in the western and eastern portions of the Application Site), and empty voids are included in the design to improve air ventilation quality. With these design measures incorporated into the proposed development, significant adverse air ventilation impact from the proposed development on the surrounding environment and Tung Chung West area further downstream is not anticipated.

Figures

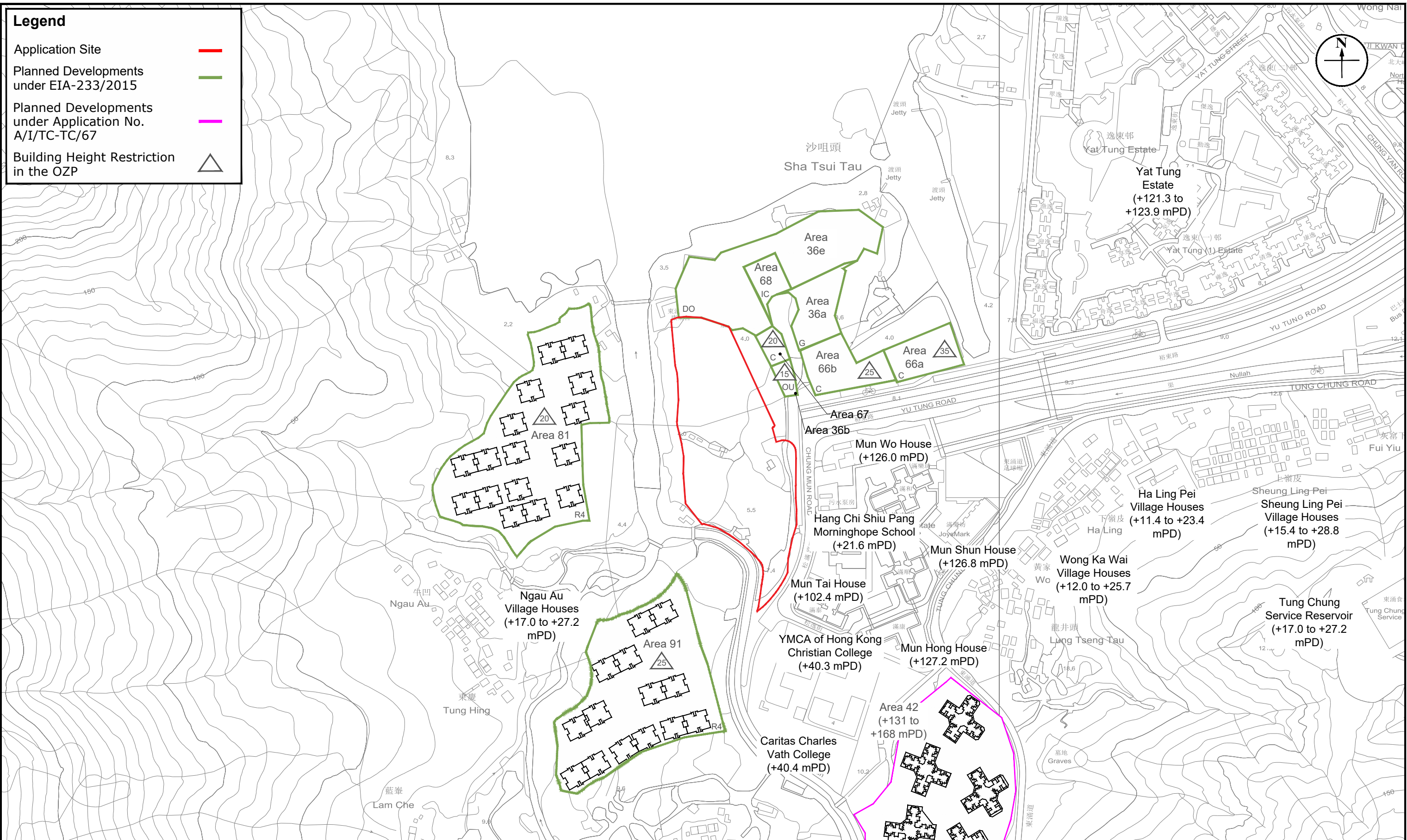


Figure: 1.1

Title: Location of Application Site and its Environ

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RAMBOLL

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Figure: 1.2

Title: Master Layout Plans of Baseline Scheme and Proposed Scheme

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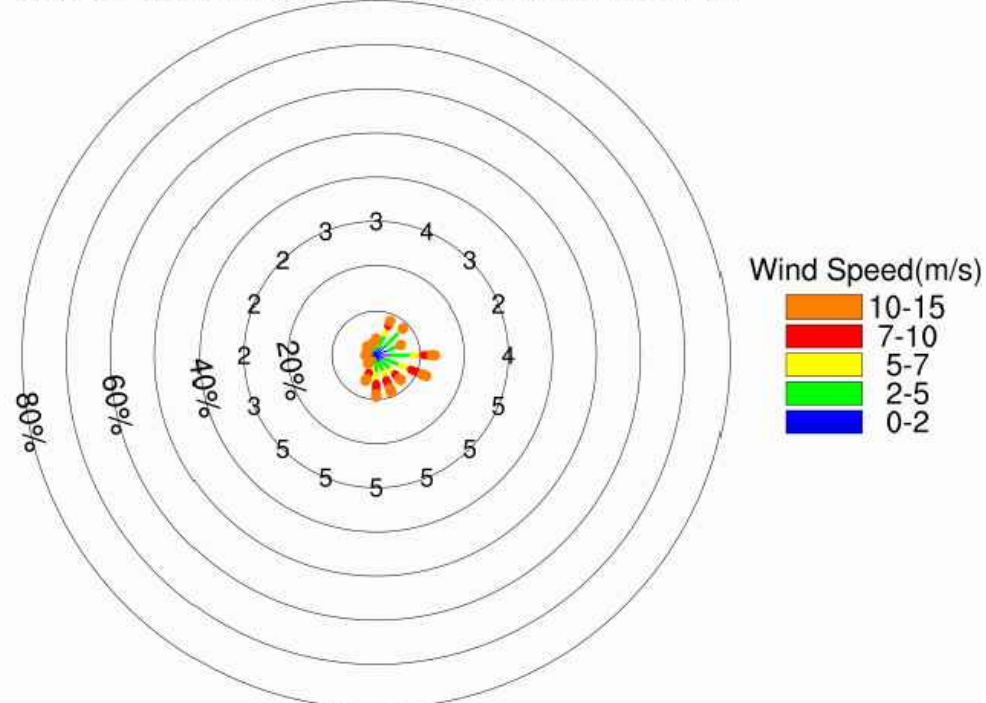
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 Date: Aug 2024

Annual

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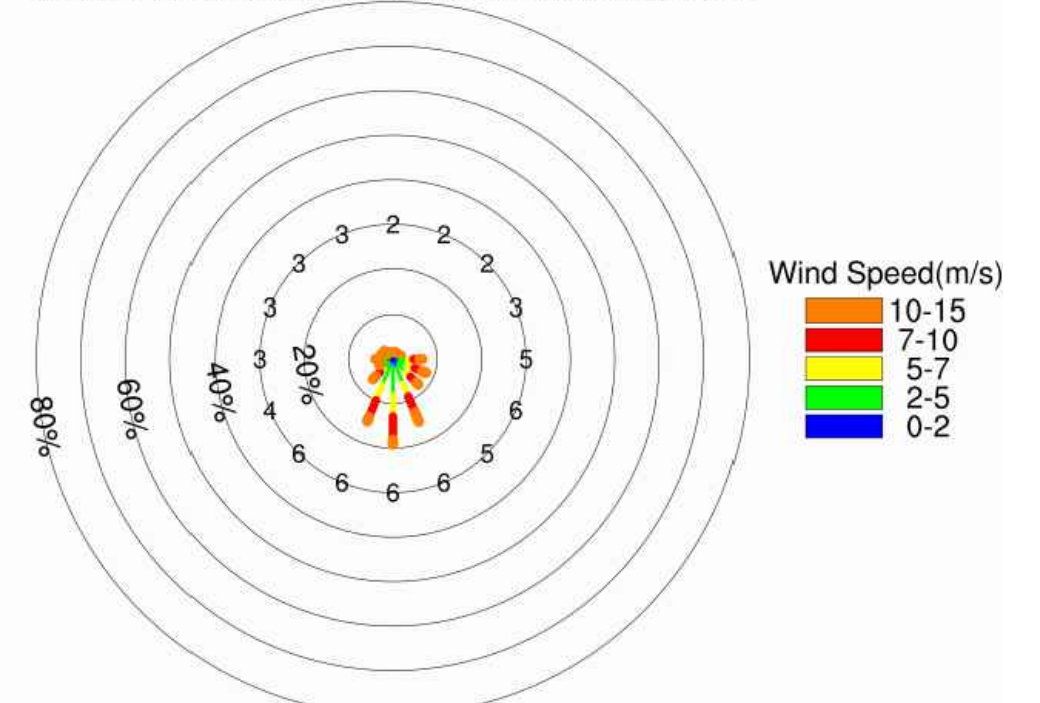


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Y: 33

Summer

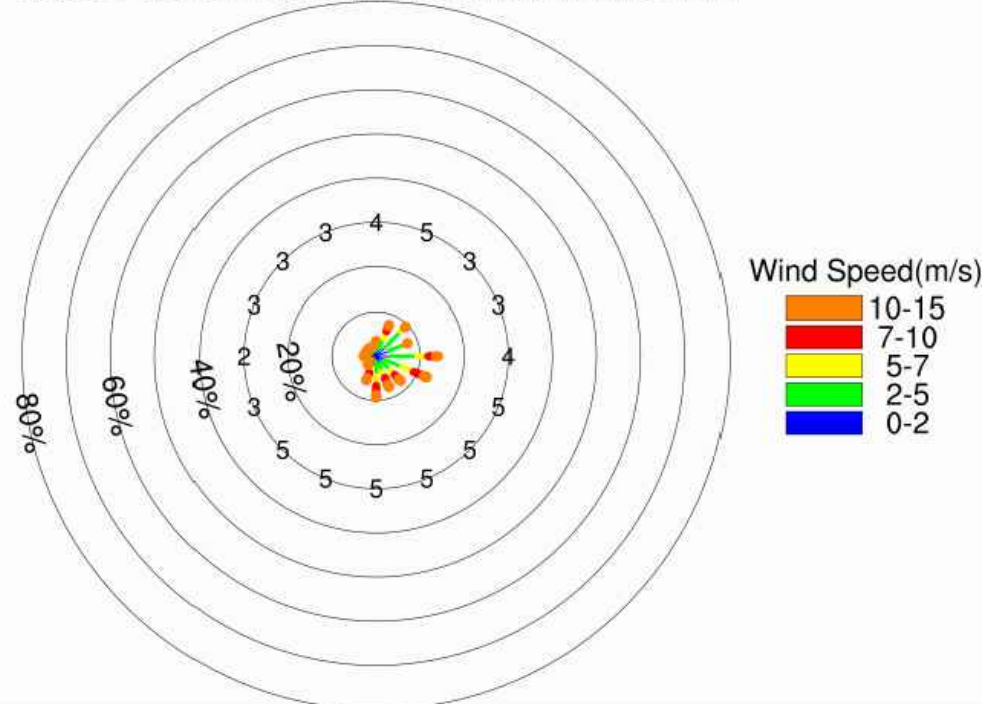
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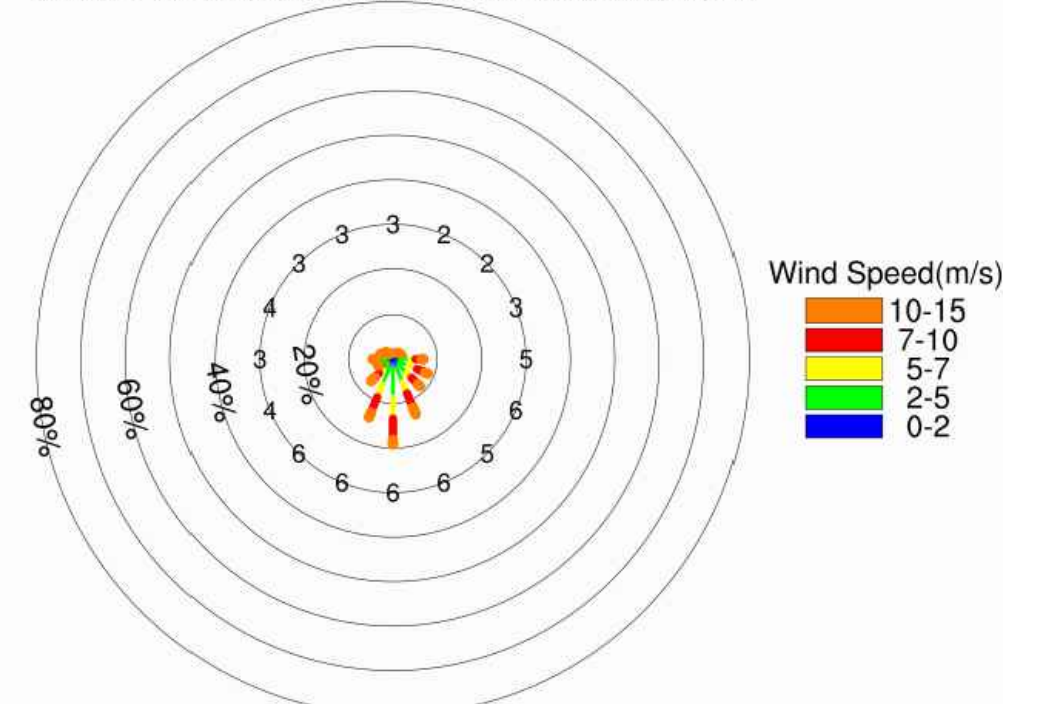


Figure: 2.1



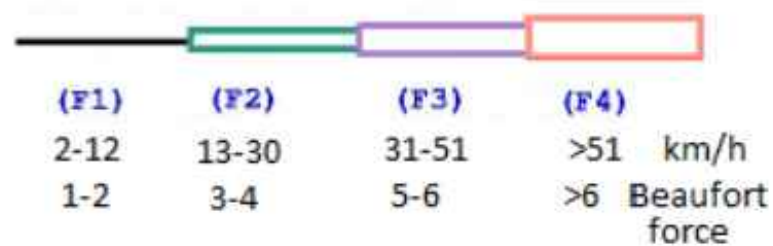
Title: RAMS Annual and Summer Wind Roses Representing V_{∞} of the Area under Concern at 200m Above Ground (X:030 Y:033) and (X:030 Y:034)

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Checked by: HN

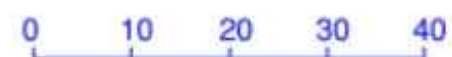
Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

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Wind Speed



Percentage Frequency



The number in the inner circle is the percentage frequency of occurrence of calm and variable winds.

Legend

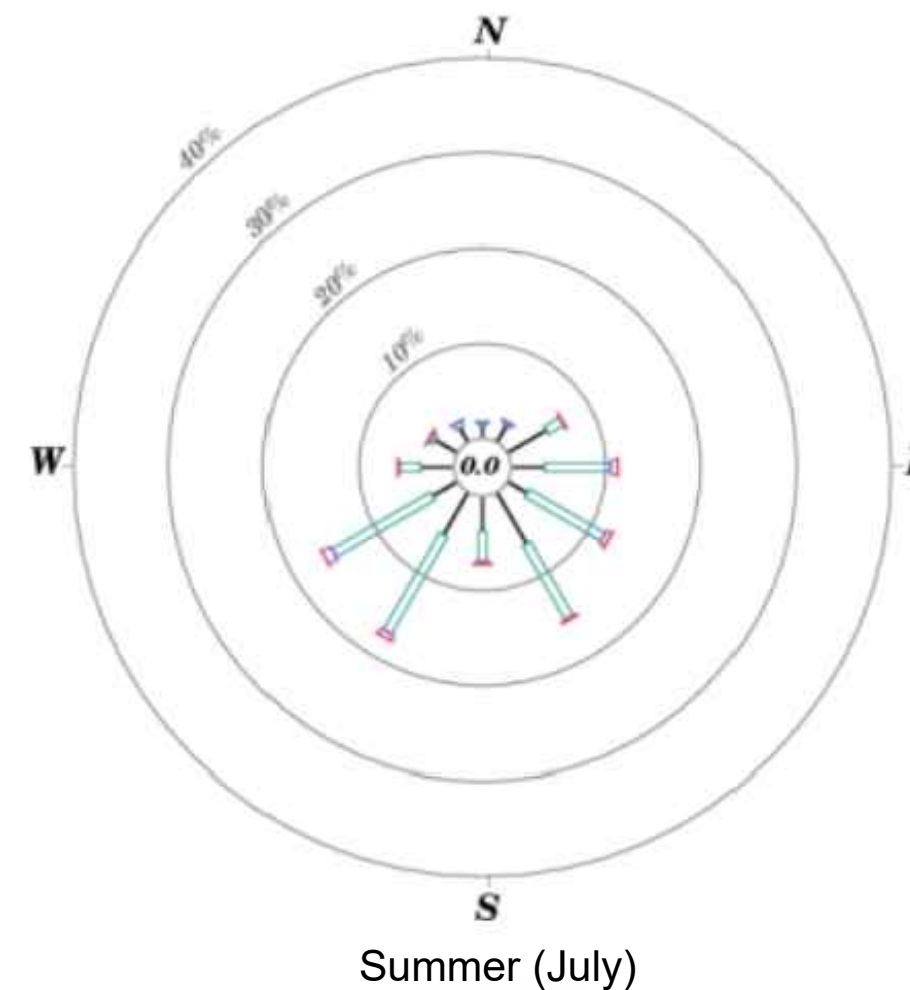
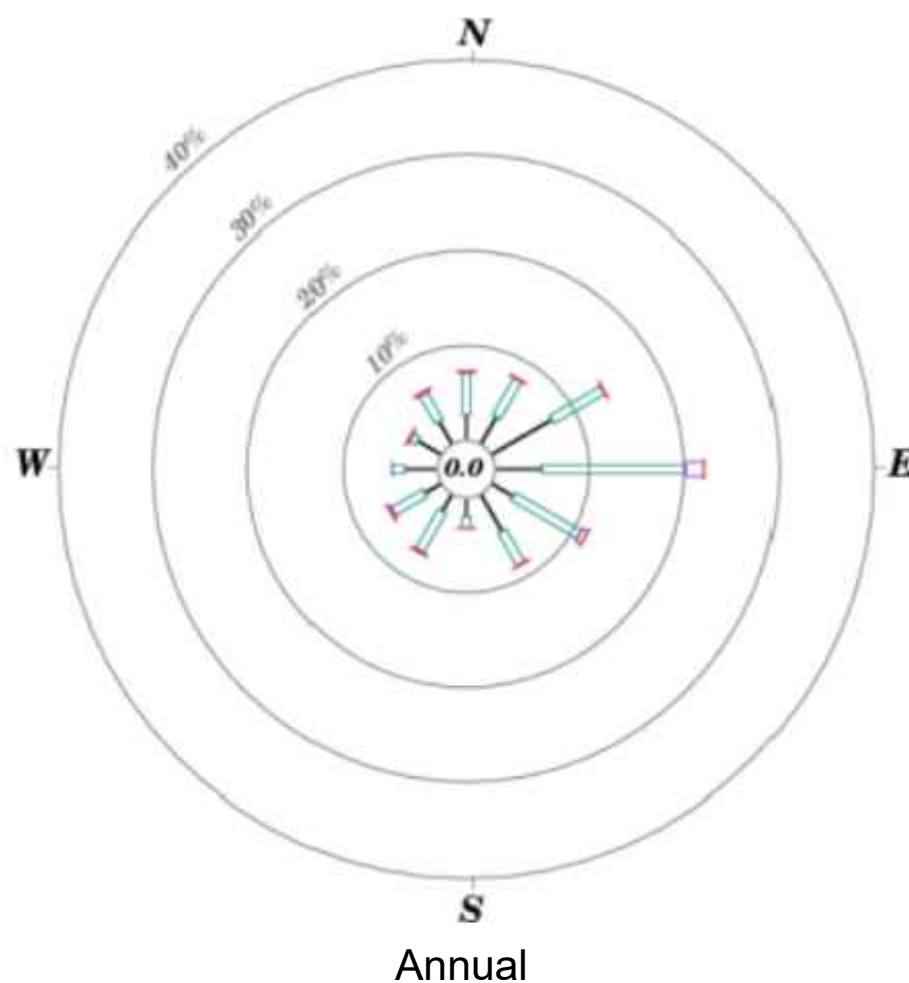


Figure: 2.2

Title: Hong Kong Observatory Hong Kong International Airport (Chek Lap Kok) Weather Station Annual and Summer (July) Wind Rose from 1986 to 2023

Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island



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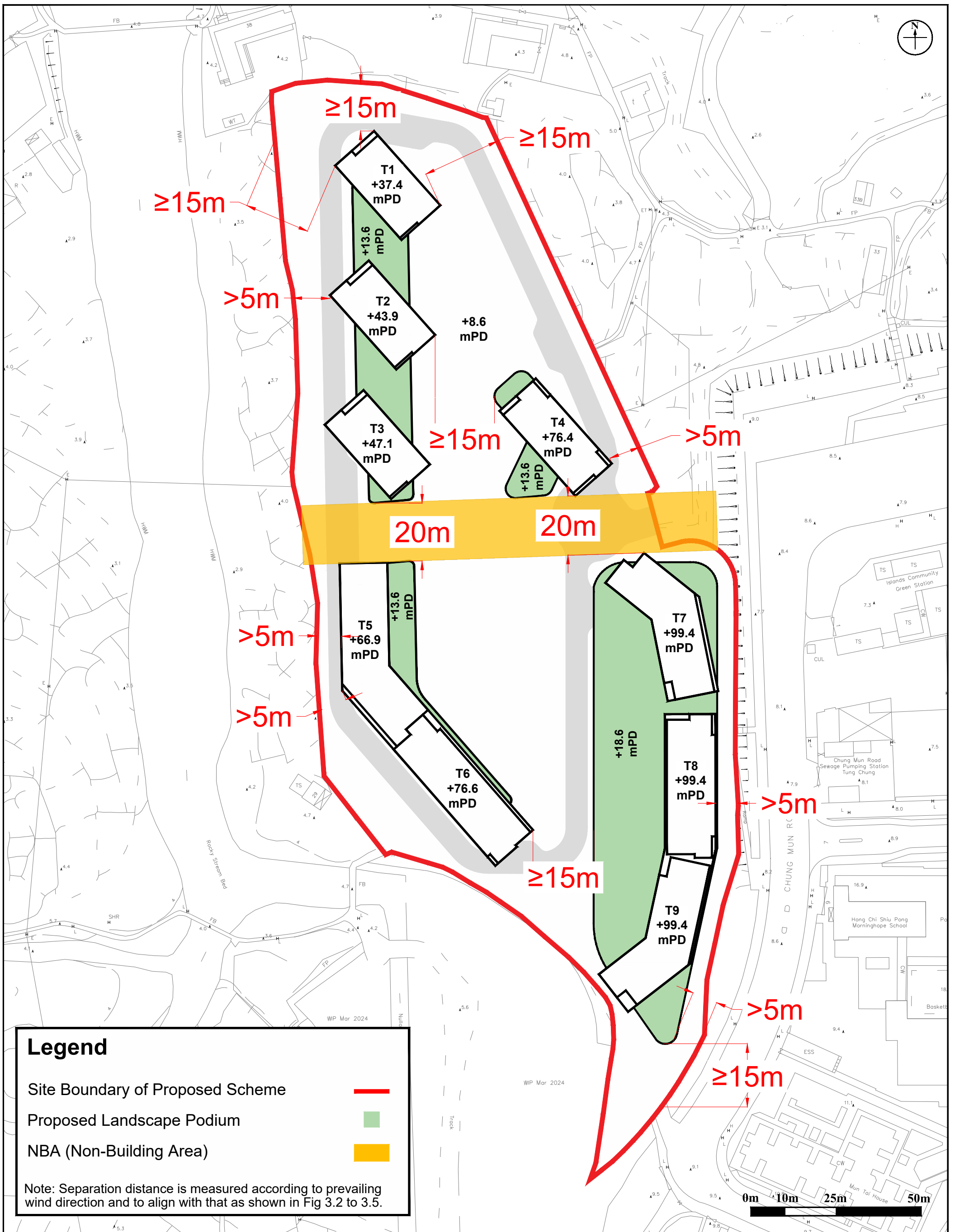


Figure: 3.1

Title: Proposed Mitigation Measures within the Proposed Development

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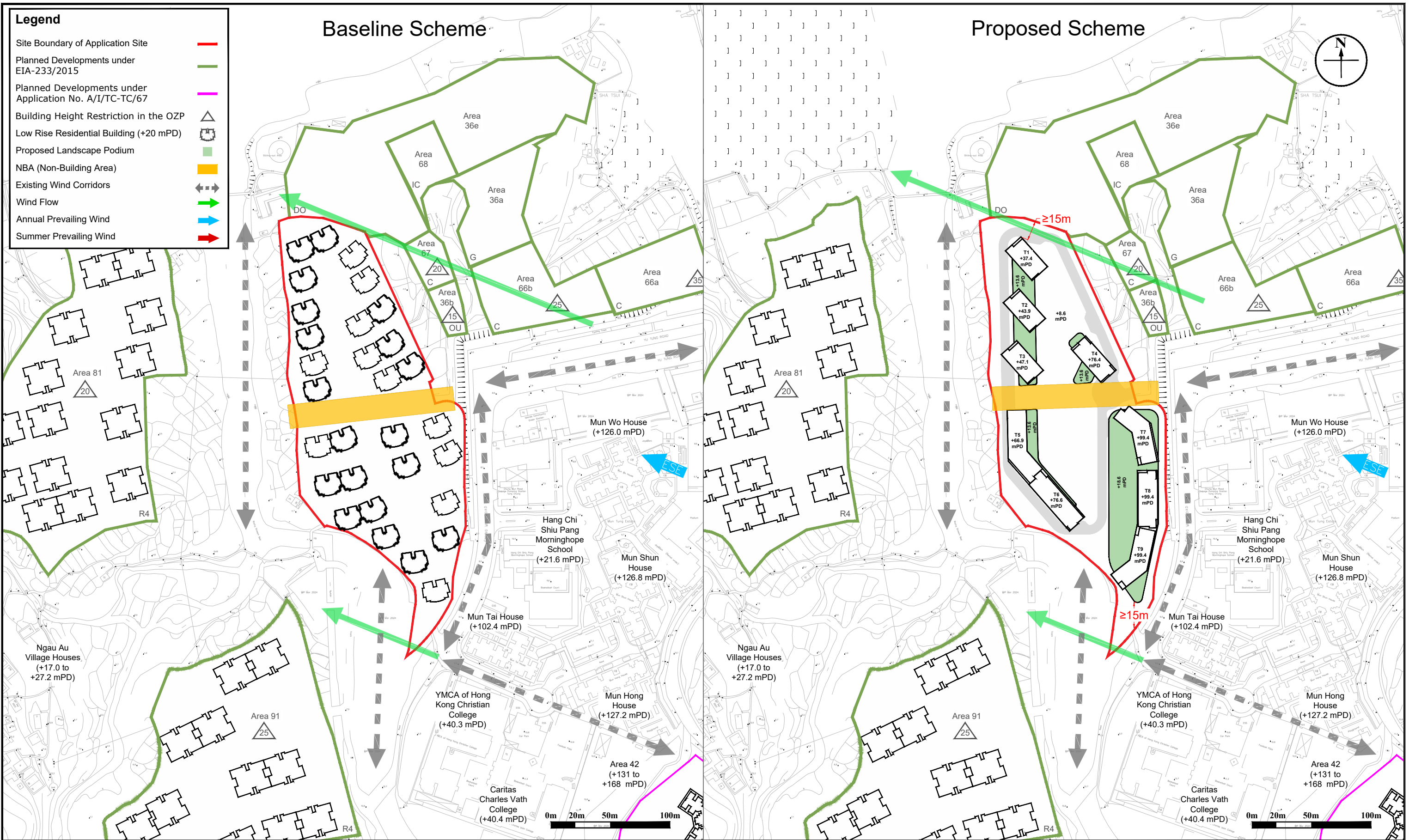


Figure: 3.2

Title: Illustration of Annual Wind Flow (ESE)

Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

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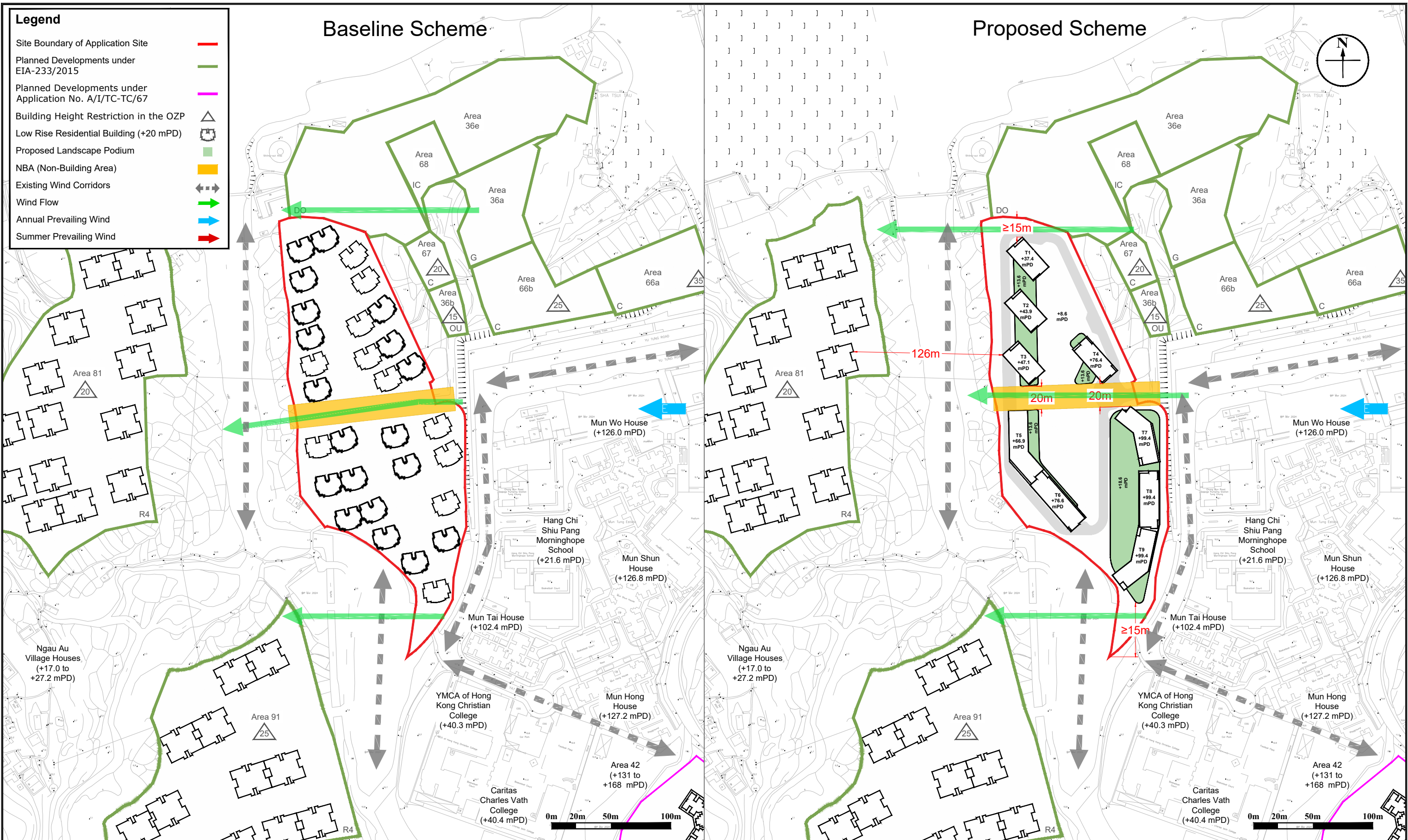


Figure: 3.3

Title: Illustration of Annual Wind Flow (E)

Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

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Figure: 3.4

Title: Illustration of Annual and Summer Wind Flow (S)

Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

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Figure: 3.5

Title: Illustration of Summer Wind Flow (SSE)

Project: Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone "Residential (Group C) 2" Zone to "Residential (Group B) " Zone Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

RAMBOLL

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Figure: 3.6

Title: Illustration of Summer Wind Flow (SSW)

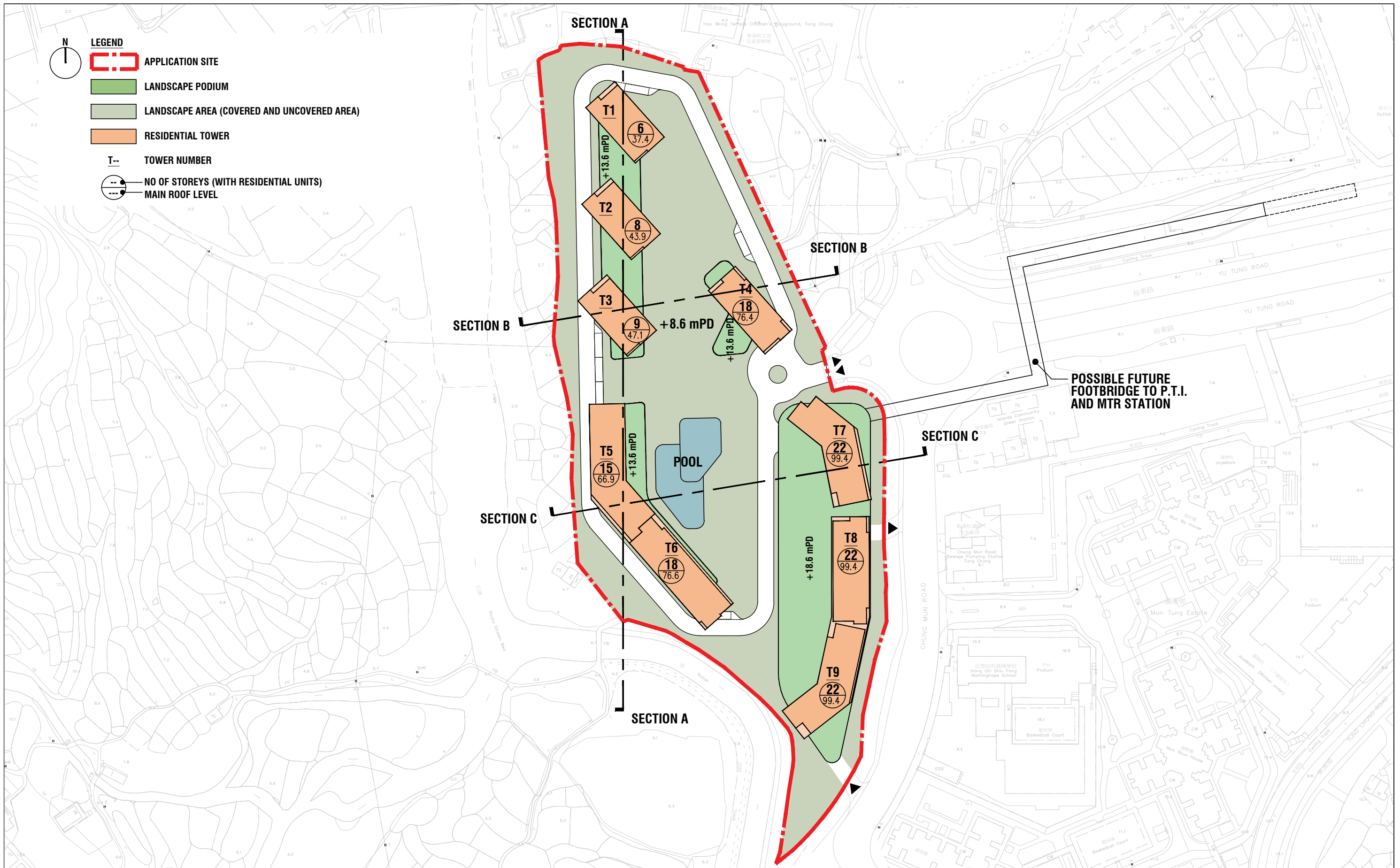
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RAMBOLL

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 Date: Aug 2024

Appendix 1





Master Layout Plan of the Proposed Scheme



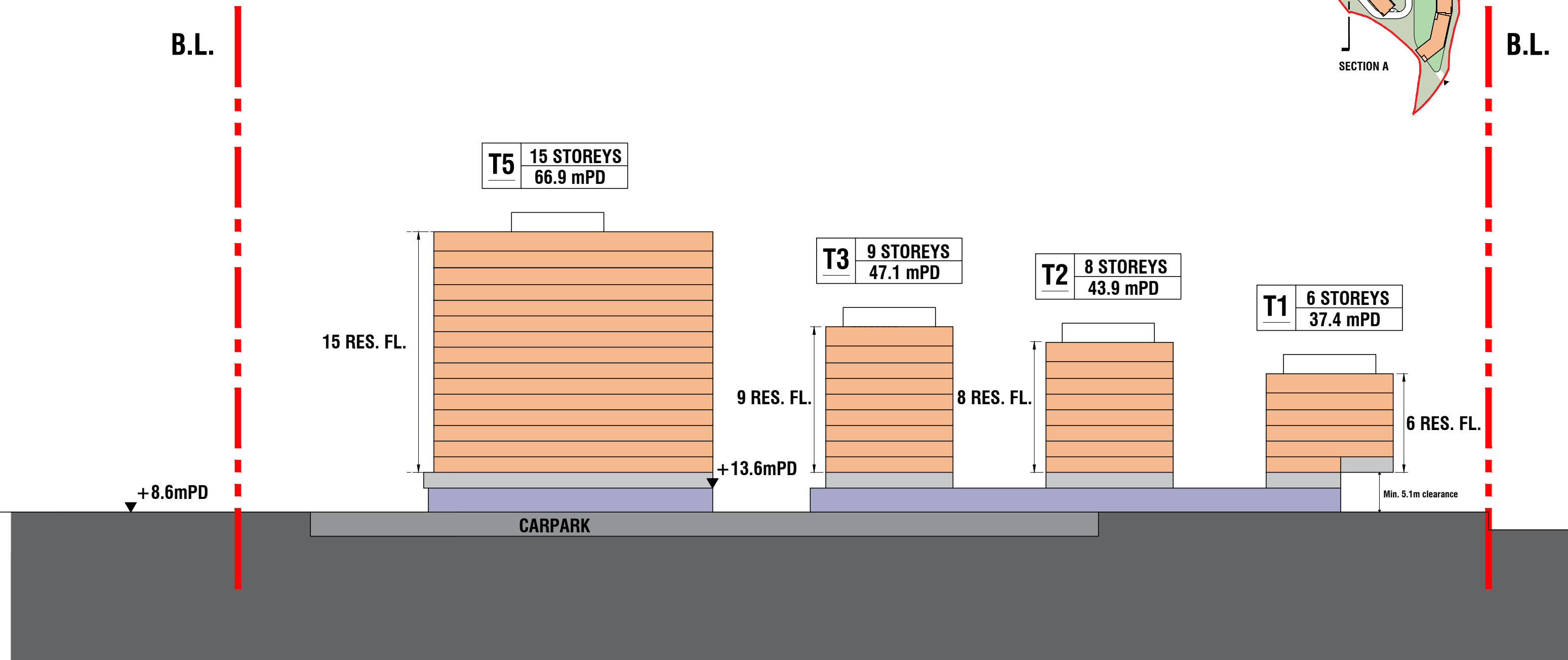
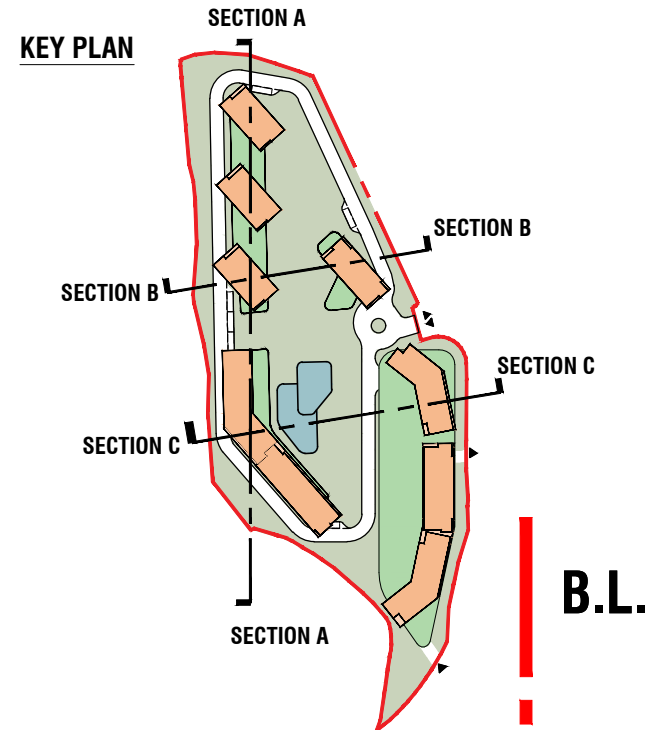
MASTER LAYOUT PLAN

SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C) 2" TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TC AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND.

LEGEND

-  APPLICATION SITE
-  RESIDENTIAL TOWER
-  PODIUM
(CLUBHOUSE/ RESIDENTIAL LOBBY/ E&M FACILITIES)
-  TRANSFER PLATE





TOWER NO.	NO OF STOREYS (WITH RESIDENTIAL UNITS) MAIN ROOF LEVEL
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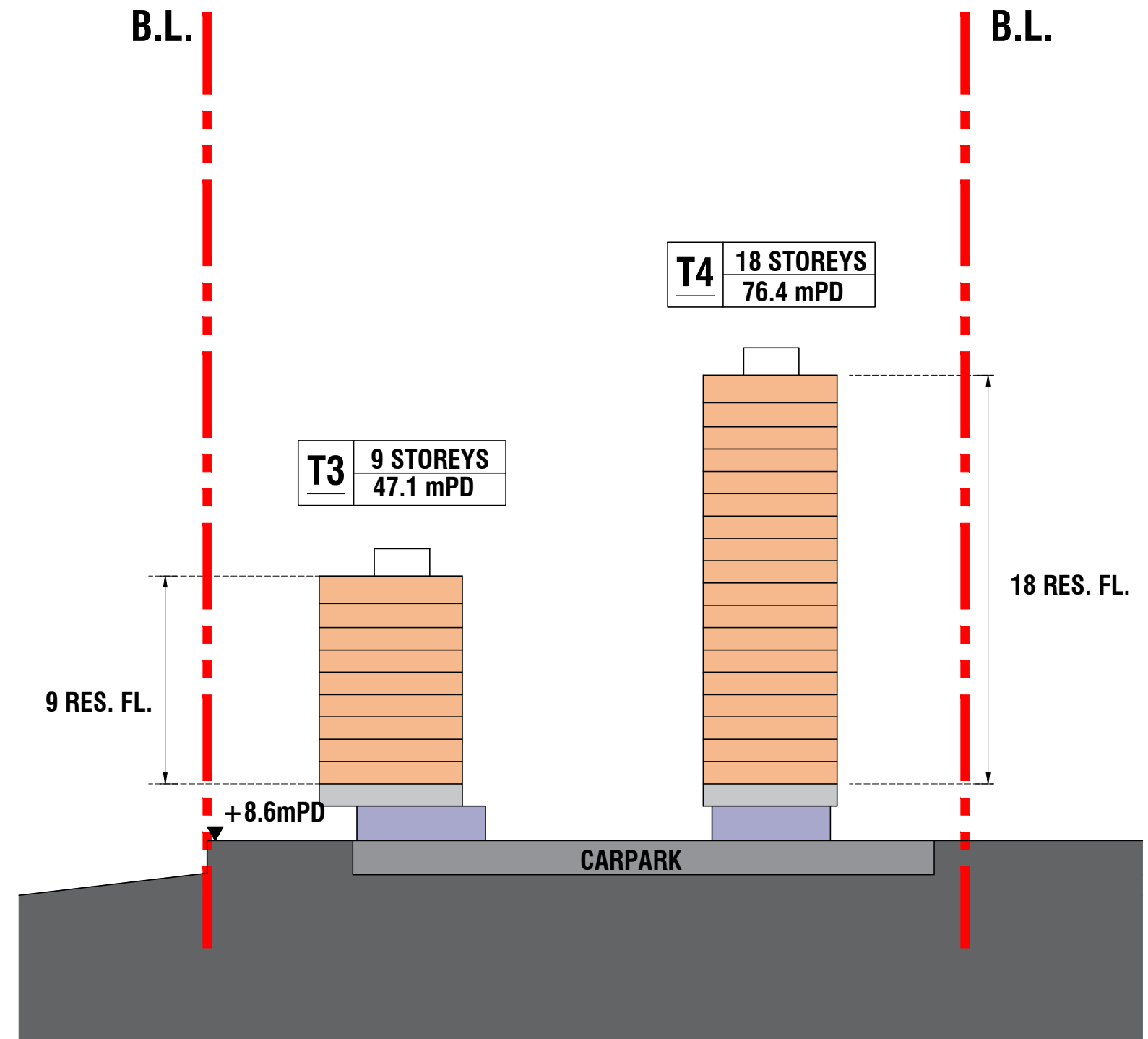
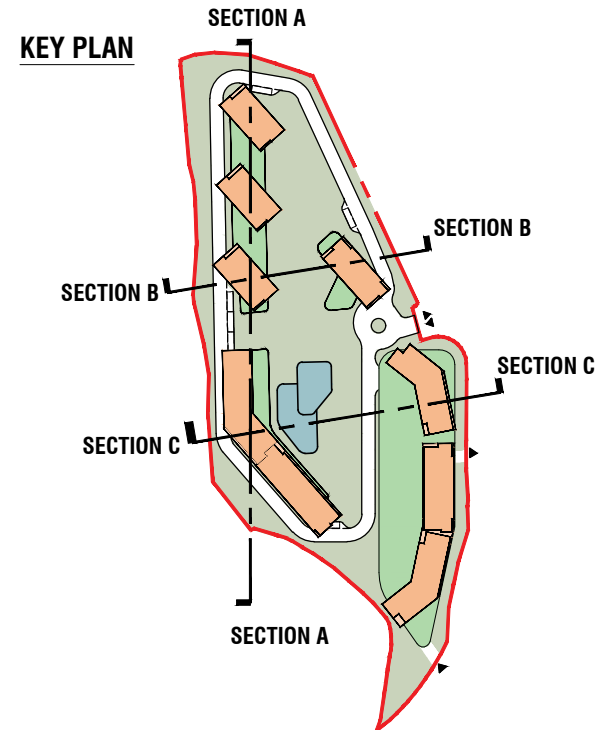
SECTION A-A

SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C) 2" TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TC AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND.

LEGEND

-  APPLICATION SITE
-  RESIDENTIAL TOWER
-  PODIUM
(CLUBHOUSE/ RESIDENTIAL LOBBY/ E&M FACILITIES)
-  TRANSFER PLATE


TOWER NO.	NO OF STOREYS (WITH RESIDENTIAL UNITS) MAIN ROOF LEVEL
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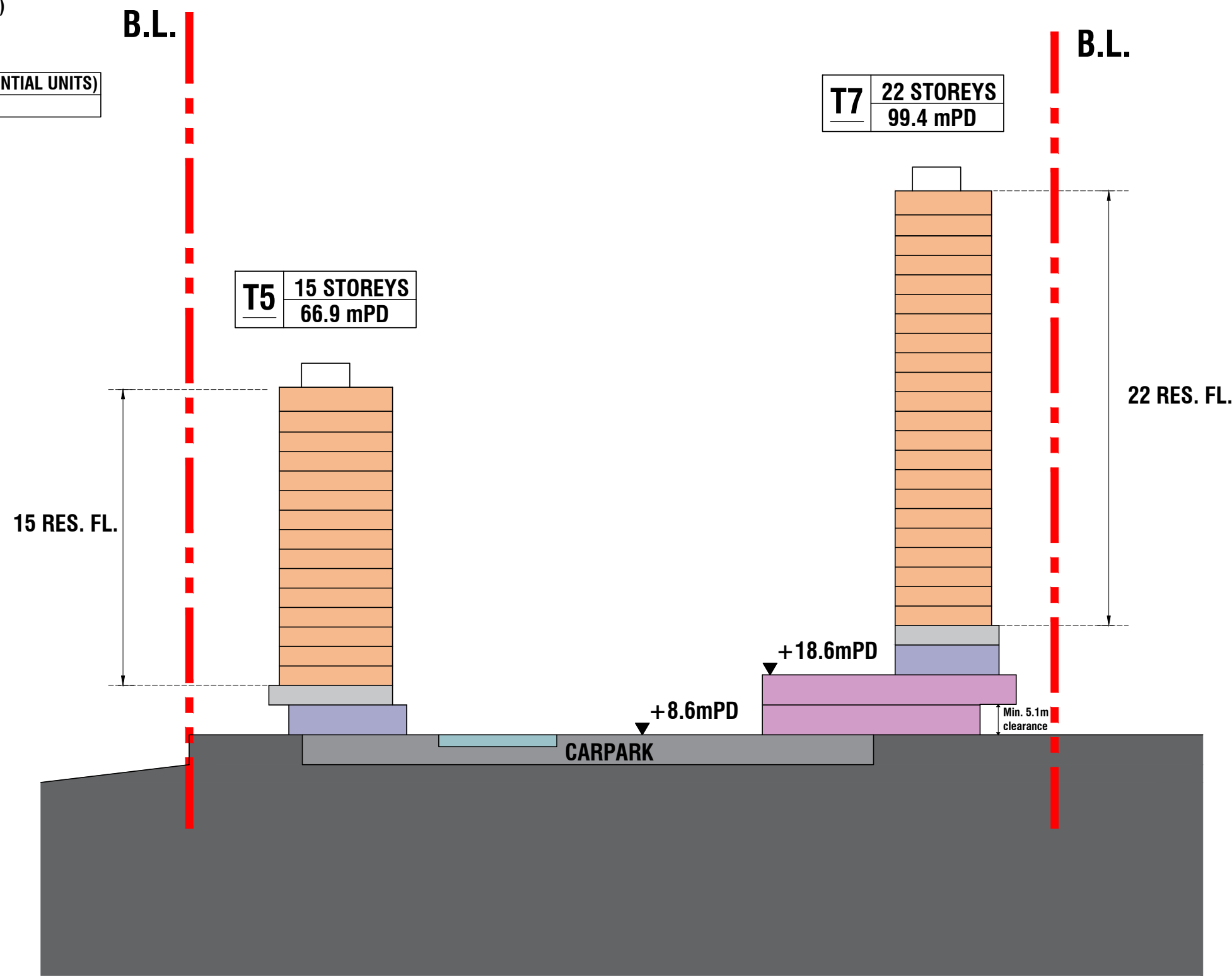
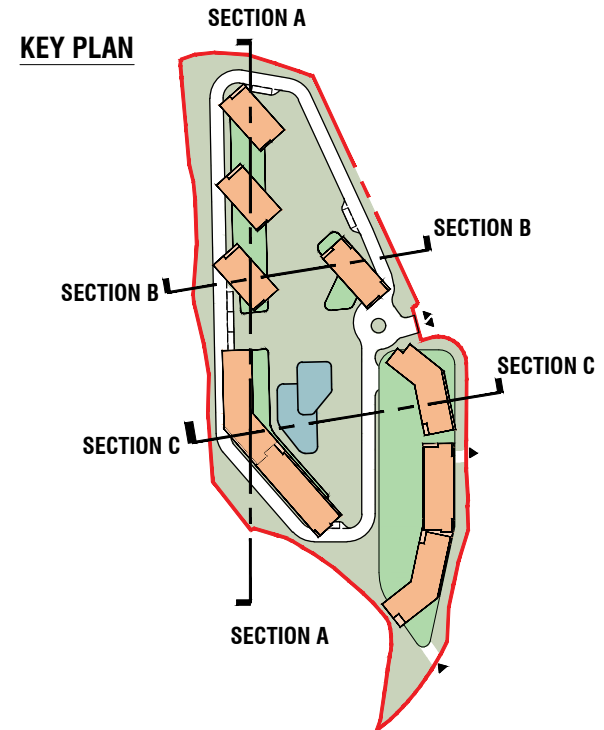
SECTION B-B

SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C) 2" TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TC AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND.

LEGEND

-  APPLICATION SITE
-  RESIDENTIAL TOWER
-  PODIUM
(CLUBHOUSE/ RESIDENTIAL LOBBY/ E&M FACILITIES)
-  PODIUM
(COMMERCIAL/ E&M FACILITIES)
-  TRANSFER PLATE

TOWER NO.	NO OF STOREYS (WITH RESIDENTIAL UNITS) MAIN ROOF LEVEL
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SECTION C-C

SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C) 2" TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TC AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND.