



Annex C

Air Ventilation Assessment (SMEC)





Air Ventilation Assessment Report – Expert Evaluation

Programme No. 67JA

Planning Application, Preliminary Environmental Review with Associated Minor Studies and Tree Removal Application, Utility Mapping, Topographical Survey and Tree Survey for Construction of Departmental Quarters for Customs and Excise Department at Tseung Kwan O Area 123 (Po Lam Road)

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1 INTRODUCTION

1.1 Background

- 1.1.1 SMEC Asia Limited (SMEC) was commissioned by Urbis Limited on behalf of the Architectural Services Department (ArchSD) in December 2015 to prepare an Air Ventilation Assessment (AVA) Report to support the Section 16 planning application for construction of new Departmental Quarters (the Project, or “Proposed Development”) for the Customs and Excise Department (C&ED) at Po Lam Road (the Site) in Tseung Kwan O Area 123. The Project is part of ArchSD Programme No. 67JA.
- 1.1.2 This AVA Report comprises an “AVA Initial Study” carried out in accordance with *Technical Circular No. 1/06* issued jointly by House, Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB) and its *Annex A – Technical Guide for Air Ventilation Assessment for Development in Hong Kong* (the “*Technical Guide*”). However, it should be noted that Planning Department (PlanD) now require use of RAMS data rather than MM5 data specified in the PlanD website.
- 1.1.3 The AVA Initial Study comprises an Expert Evaluation of the preliminary layout of the Proposed Development.
- 1.1.4 Effective mitigation measures to reduce any adverse ventilation performance issues identified will be recommended to the Designer (ArchSD) for implementation by the Contractor.

1.2 Site Description

- 1.2.1 The Site occupies an area of about 3,287m² and is located between Po Lam Road North and Po Lam Road South in Tseung Kwan Area 123, as shown on **Figure 1-1**. It is bounded by a residential development (Mau Wu Tsai Village) to the south; and Tseung Kwan O West Low Level Service Reservoir, King Ling College, and a bus terminus to the north. The Site is roughly rectangular in shape, at an elevation that rises from approximately 100mPD at the east to approximately 104mPD at the west. There is an existing vehicular access to the Site from Po Lam Road South, at the eastern end of the southern boundary.
- 1.2.2 The flat area of the Site (approximately 2,410m²) is currently paved and operated a fee-paying public car park under a Short-term Tenancy Agreement with a private operator. The remainder of the Site is unleased and unallocated Government Land.
- 1.2.3 The Site mainly falls the “Government, Institution or Community (“G/IC”) Zone on the draft Tseung Kwan O Outline Zoning Plan No. S/TKO/20 (the OZP). The development of government departmental quarters would be regarded as “flats”. According to the Notes of the OZP, “Flat” is under Column 2 of the “G/IC” and the Proposed Development would require planning permission from the Town Planning Board (TPB).
- 1.2.4 The indicative maximum plot ratio is 6.0 with a site coverage of 24% and the building height restriction as advised by ArchSD is 26 storeys (about 185mPD), although no such restriction is stated on the OZP.

1.3 Project Description

1.3.1 The Proposed Development was originally proposed in a three-tower layout and then as an current two-tower layout, as follows:

- Proposed Development (Original) comprising 3 no. residential tower blocks, each comprising 25 residential floors with 4 no. 50m² flats (H-grade units) per floor, a transfer zone and half-sunken M&E provision.
- Proposed Development (Current) comprising 2 no. residential tower blocks, comprising 25 and 26 residential floors with 6 no. 50m² flats (H-grade units) per floor, a transfer zone and half-sunken M&E provision.
- Associated facilities (for both Original and Current layouts), including:
 - Multi-function rooms
 - Outdoor children’s facilities
 - Parking spaces

1.3.2 **Appendix A** provides layout and sectional plans of the Proposed Development (Original). For layout and section plans of the Proposed Development (Current), please refer to **Figures 1.7 to 1.16 of the Planning Statement**.

1.4 Objectives of the Report

1.4.1 The objectives of this AVA Initial Study are to:

- Assess the characteristics of wind condition of the Site.
- Use graphical means to illustrate general wind flow patterns.
- Identify opportunities, obvious problem areas and good design features of both the Original and Current layouts.
- Present design recommendations for airflow and ventilation.
- Define focus of further study in next stage, if required.

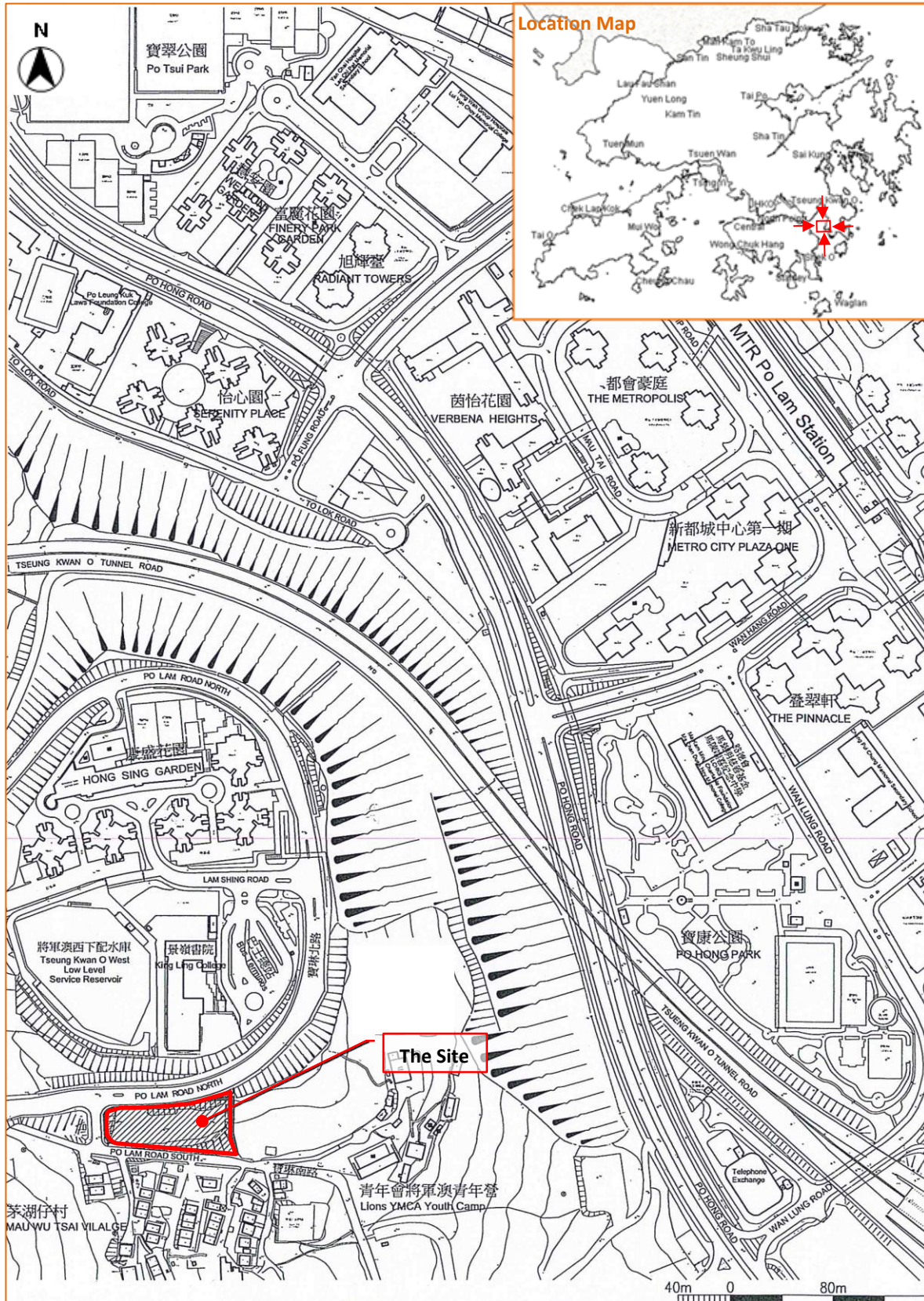
1.4.2 To achieve these objectives, an Expert Evaluation will be carried out:

- Expert Evaluation of the preliminary layout of the Proposed Development will identify wind availability; annual wind conditions; summer wind conditions; and the wind environment of the existing Site, in order to provide design recommendations to be incorporated into the final layout.

1.5 Base Case and Proposed Case

1.5.1 The Base Case is the existing Site, which is an open car park. The Proposed Case is the Proposed Development (Original) and the Proposed Development (Current), based on the final design provided by ArchSD.

Figure 1-1 Site Location and its Environs



2 EXPERT EVALUATION

2.1 Site Wind Analysis

2.1.1 In order to conduct the Expert Evaluation, it is essential to investigate the wind availability of the Site and assess the characteristics of wind entering the study area. Wind data has been obtained from the following two sources:

- “RAMS” published by PlanD in July 2015
- “Climatological Information Services” from the Hong Kong Observatory (HKO).

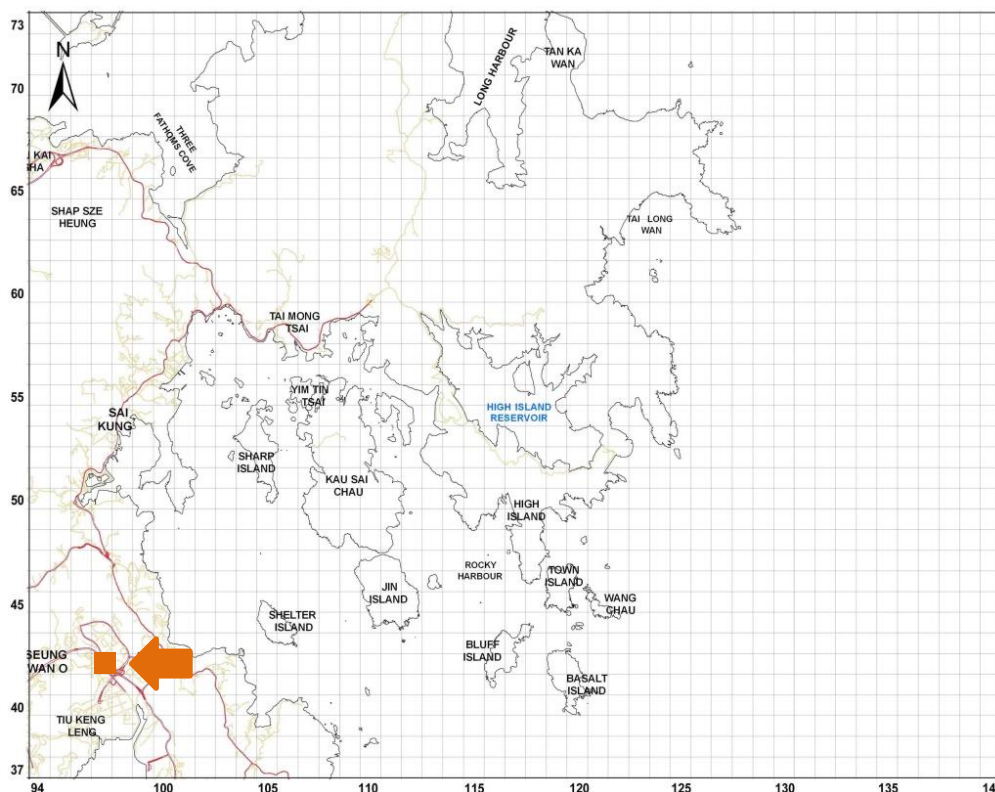
RAMS – by PlanD

2.1.2 PlanD have recently moved to the Regional Atmospheric Model System (RAMS), a highly versatile numerical code developed by scientists at Colorado State University for simulating and forecasting meteorological phenomena. It is capable of representing atmospheric dynamics, thermodynamics as well as resolving detailed topographic effects.

2.1.3 RAMS runs in three nested domains (in horizontal resolutions of 12.5km x 12.5km, 2.5km x 2.5km and 0.5km x 0.5km, for the outermost, middle and innermost domain, respectively), with the innermost modelled region covering the whole of Hong Kong SAR.

2.1.4 The Site is located in RAMS Grid (097, 042), as shown on **Figure 2-1**:

Figure 2-1 RAMS Map Identifying the Site in Grid (097, 042)

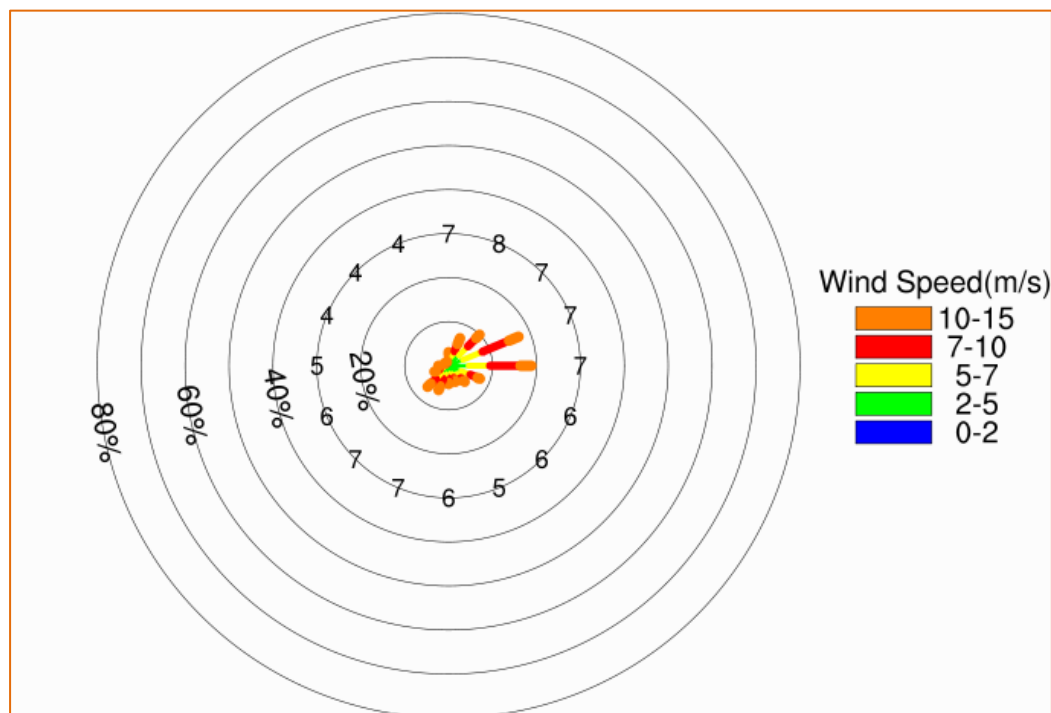


Source: RAMS Data http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/domain_f.html.

Annual Wind Analysis

2.1.5 The RAMS Wind Rose for Grid (097, 042) is shown on **Figure 2-2** and presents the frequency of annual wind speed and directions at the Site.

Figure 2-2 RAMS Annual Wind Rose at 500m for Grid (097, 042)



Source: RAMS Data http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/097042.html

2.1.6 The RAMS probability of speed and frequency of occurrence of annual wind from 16 directions is shown in **Table 2-1**, below. Eight wind directions (E, ENE, NE, ESE, NNE, SW, SSW and SE) cumulatively exceed the 75% frequency (actually, 79.4%) specified in the *Technical Guide* and thereby represent the annual prevailing winds at the Site.

Table 2-1 Annual Wind Availability Data from RAMS Grid (097, 042)

Wind Direction	Wind Speed at Elevation of 500m (m/s)	Frequency of Occurrence
E	6.92	19.0%
ENE	7.14	17.4%
NE	6.36	10.2%
ESE	5.91	7.8%
NNE	7.26	7.0%
SW	6.32	6.8%
SSW	6.53	6.0%
SE	5.35	5.2%
S	5.42	4.2%
SSE	4.85	4.0%
WSW	6.22	3.6%

} 79.4%

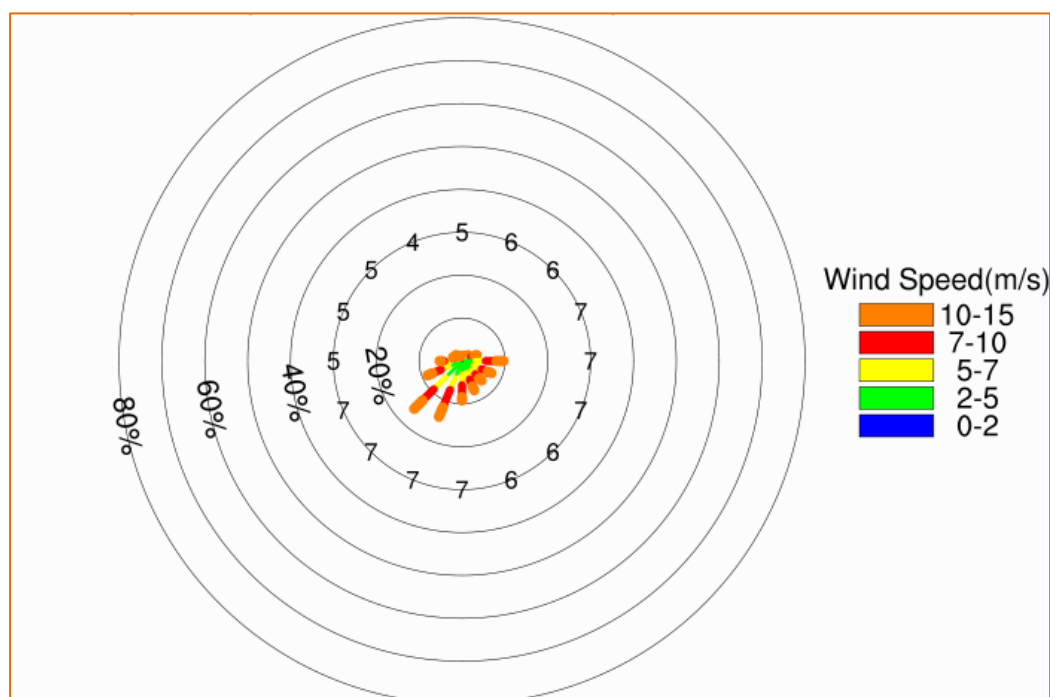
Wind Direction	Wind Speed at Elevation of 500m (m/s)	Frequency of Occurrence
N	6.53	3.2%
W	4.00	2.3%
NNW	3.20	1.0%
NW	2.80	1.0%
WNW	3.95	1.0%

2.1.7 The occurrences of wind from north eastern quadrant (E, ENE and NE) directions comprise 46.6% of the annual wind direction and are therefore considered to be the most predominant winds in the Site area.

Summer Wind Analysis

2.1.8 The RAMS Wind Rose for Grid (097, 042) is shown on **Figure 2-3** and presents the frequency of summer wind speed and directions at the Site.

Figure 2-3 RAMS Summer Wind Rose at 500m for Grid (097, 042)



Source: RAMS Data http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/097042.html

2.1.9 The RAMS probability of speed and frequency of occurrence of summer wind from 16 directions is shown in **Table 2-2**, below. Eight wind directions (SW, SSW, E, S, WSW, ESE, SSE and SE) cumulatively exceed the 75% frequency (actually, 80.4%) specified in the *Technical Guide* and thereby represent the summer prevailing winds at the Site.

Table 2-2 Summer Wind Availability Data from RAMS Grid (097, 042)

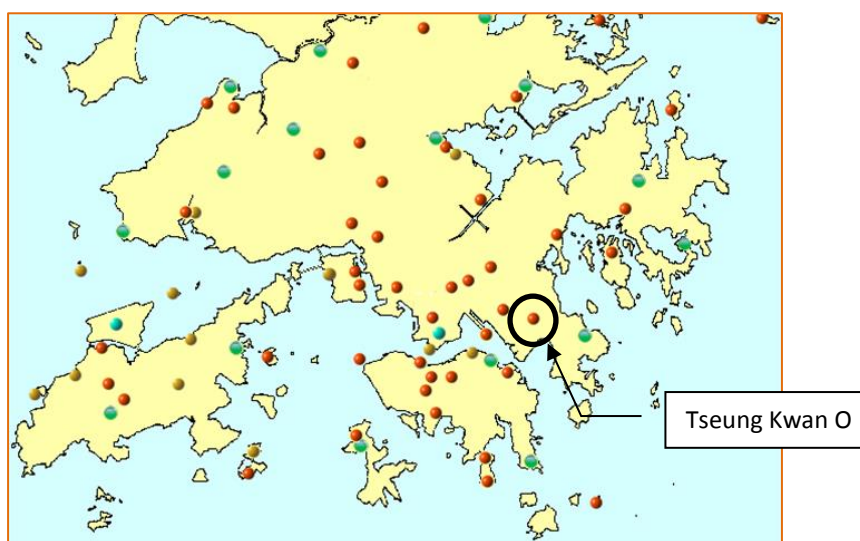
Wind Direction	Wind Speed at Elevation of 500m (m/s)	Frequency of Occurrence
SW	6.65	16.1%
SSW	7.05	14.3%
E	6.74	9.9%
S	6.45	9.5%
WSW	6.45	8.9%
ESE	5.99	7.6%
SSE	5.72	7.5%
SE	6.02	6.6%
W	4.99	5.3%
ENE	6.13	4.0%
WNW	5.07	2.3%
NE	5.76	2.1%
NW	5.10	2.0%
NNE	3.86	1.4%
NNW	4.38	1.2%
N	3.86	1.1%

} 80.4%

Climatological Information Services – HKO

2.1.10 Other than RAMS data, reference has been made to the nearest weather station at Tseung Kwan O, the location of which is shown in **Figure 2-4**.

Figure 2-4 Location of the Nearest Weather Station to the Site



2.1.11 Wind data from local HKO weather stations are used in parallel to assess wind variation across seasons. The data recorded by the weather stations are available in monthly format and are used to supplement RAMS data.

2.1.12 The annual wind rose measured at the Tseung Kwan O Weather Station from 1992 to 2015 is shown in **Figure 2-5**. Monthly wind roses at the Tseung Kwan O Weather Station from 1992 to 2015 are shown in **Figure 2-6**. Summer wind is represented by the wind roses from June to August.

Figure 2-5 Annual Wind Rose Measured at Tseung Kwan O Weather Station (1992-2015)

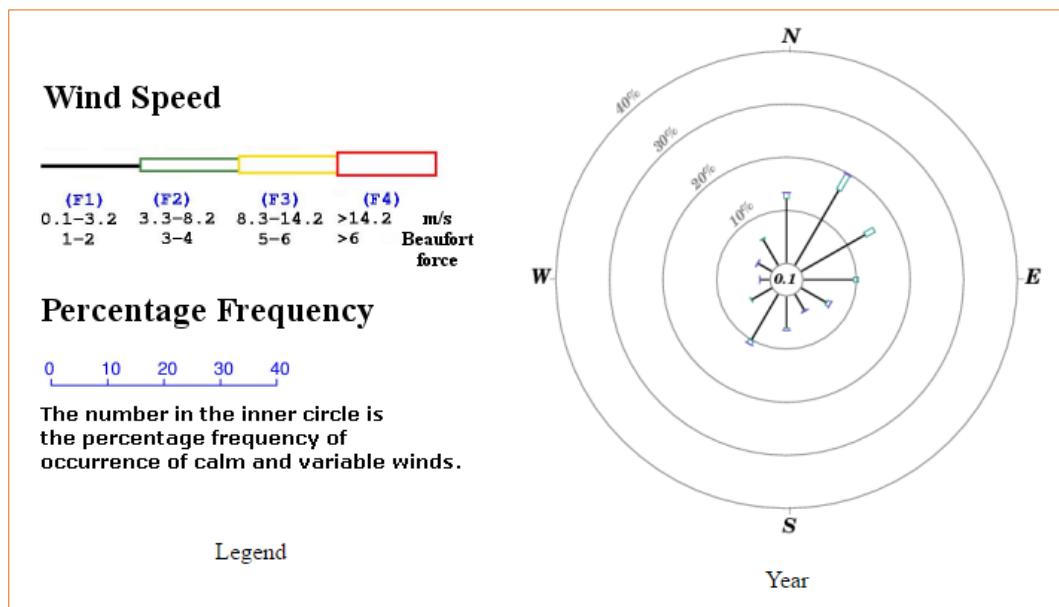
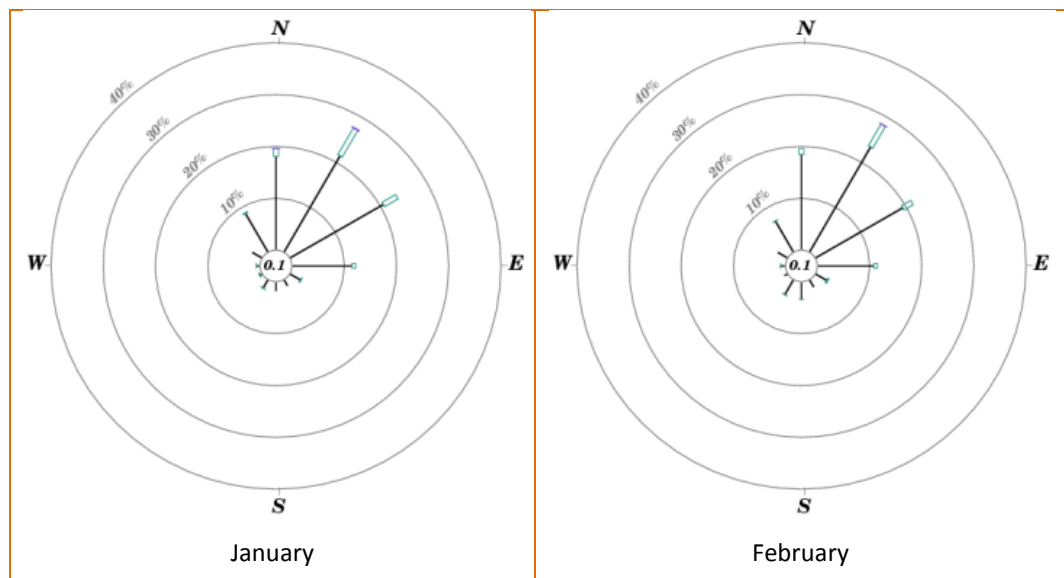
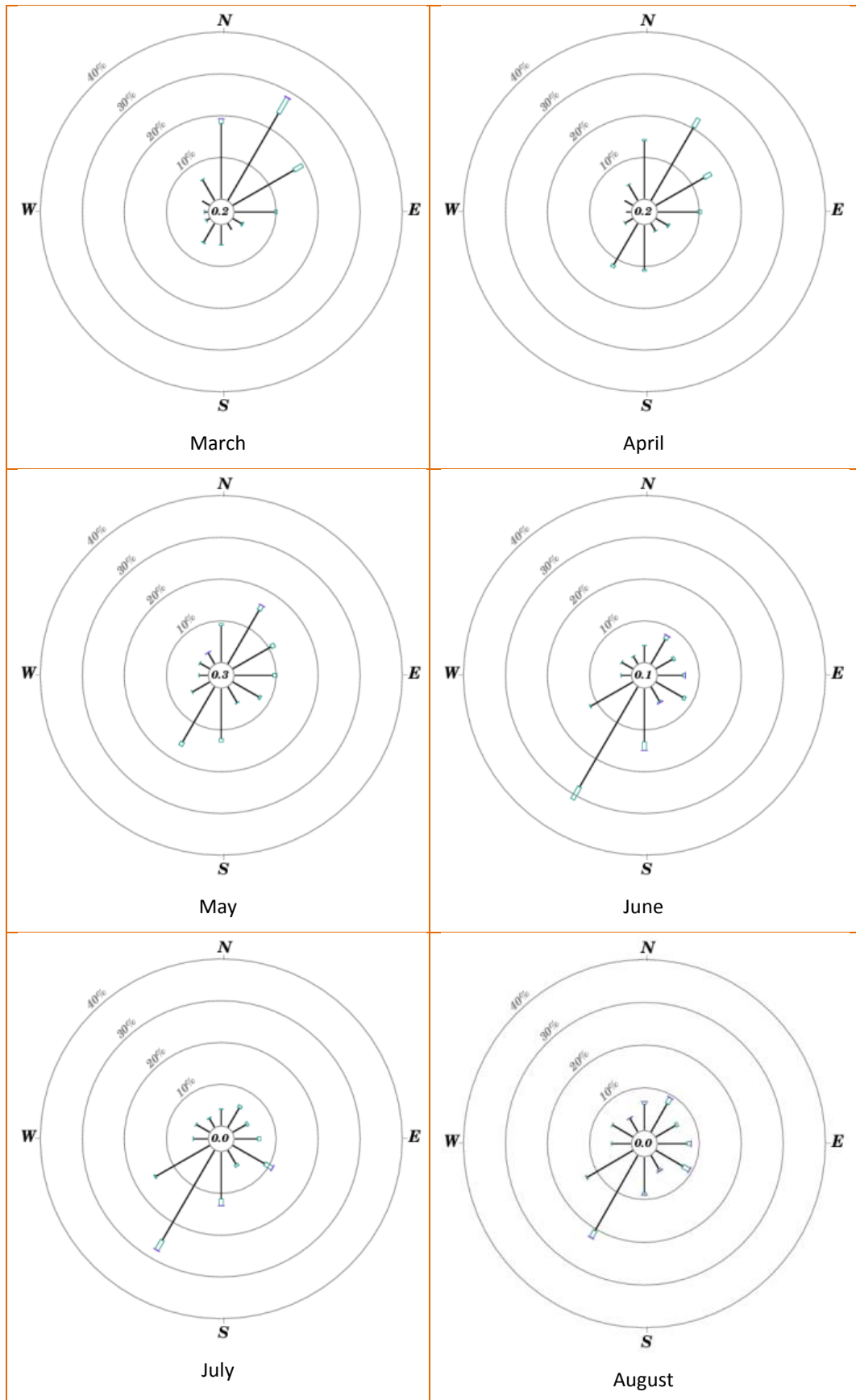
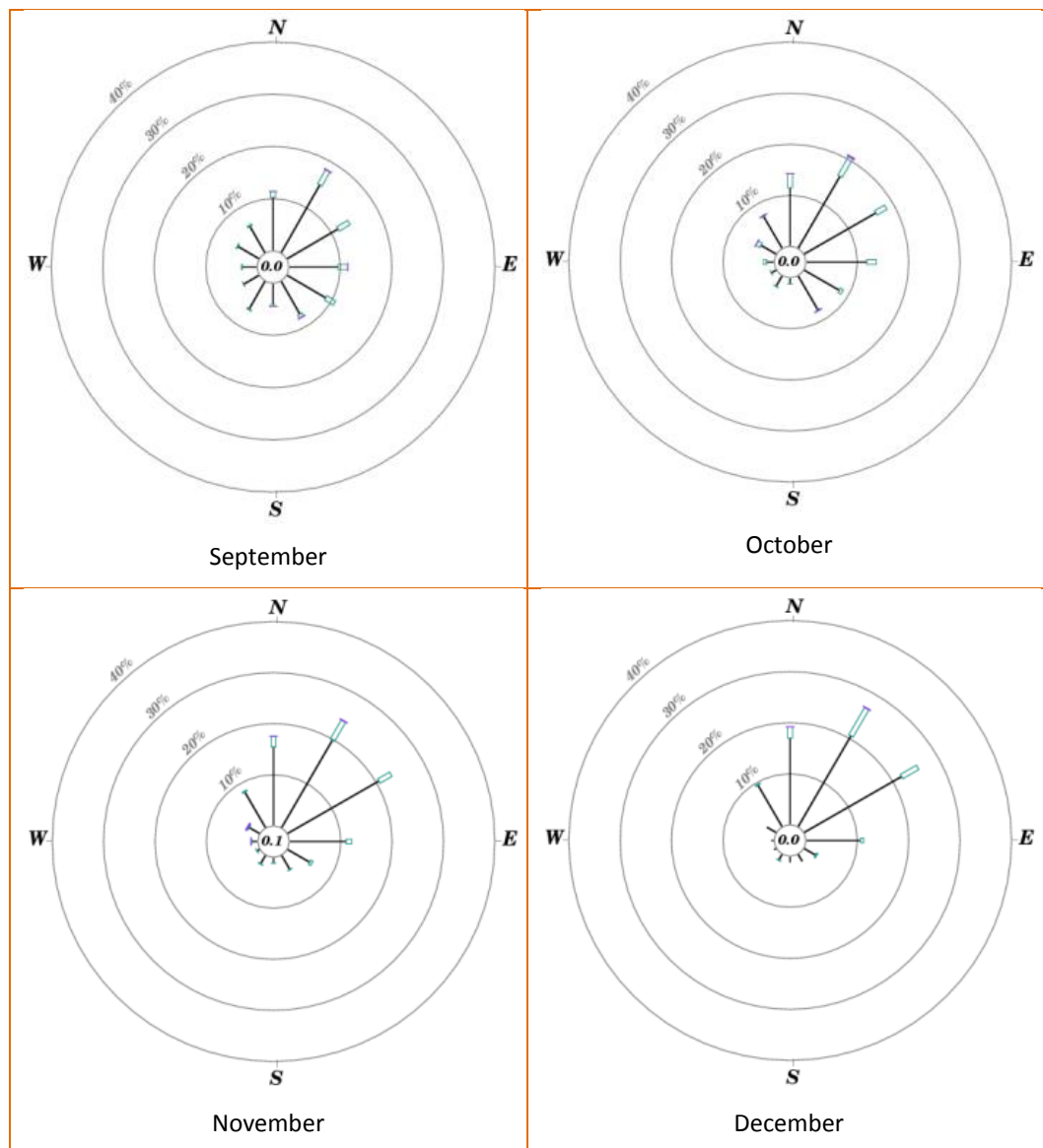


Figure 2-6 Monthly Wind Roses Measured at Tseung Kwan O Weather Station (1992-2015)







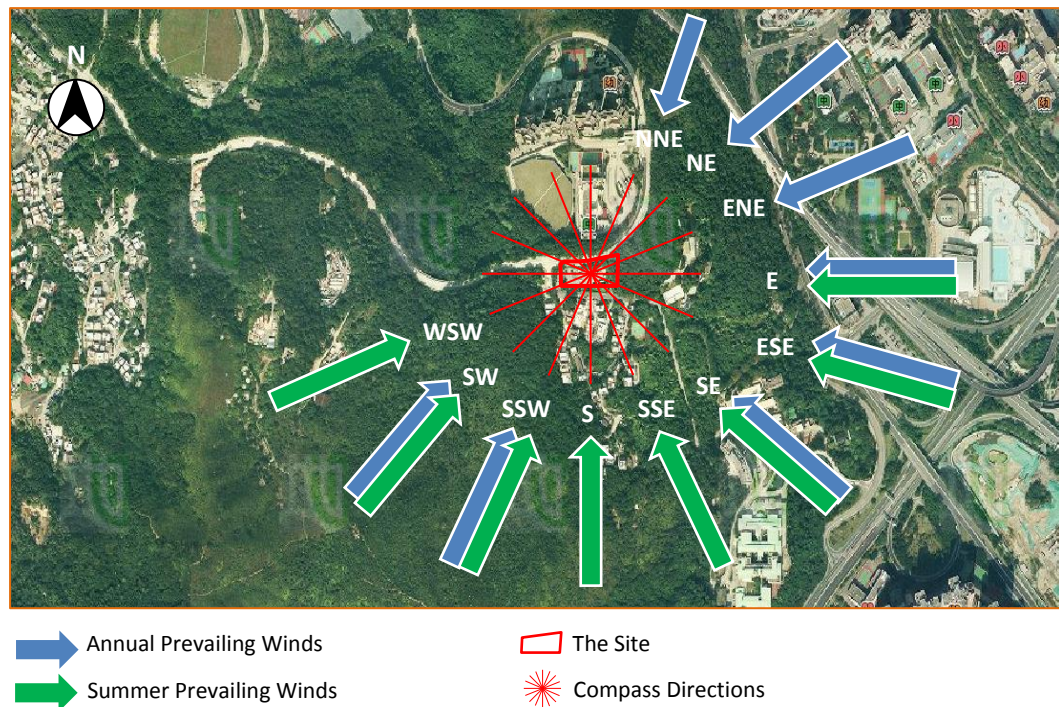
Conclusion

2.1.13 The following wind directions and wind speed at V infinity are identified and will be used for the Expert Evaluation:

- Annual Prevailing Winds: E, ENE, NE, ESE, NNE, SW, SSW and SE
- Summer Prevailing Winds: SW, SSW, E, S, WSW, ESE, SSE and SE

2.1.14 The suggested prevailing wind directions are shown in **Figure 2-7**.

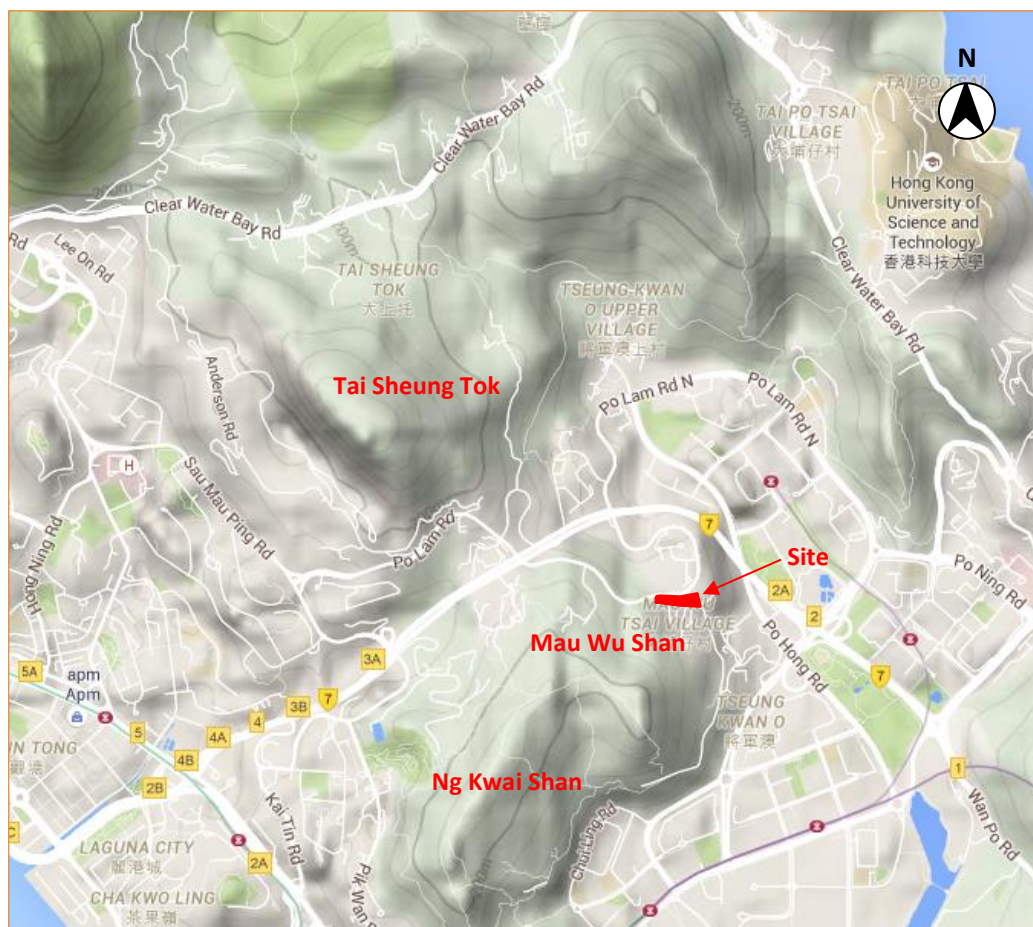
Figure 2-7 Annual and Summer Prevailing Wind Directions



2.2 Wind Environment Due to Topography

- 2.2.1 **Figure 2-8** shows the topography in the vicinity of the Proposed Development, which is located on the east side of Mau Wu Shan at an elevation of around 100m.
- 2.2.2 To the north of the Site, across Po Lam Road North, at a similar elevation is the Hong Sing Garden estate and further north, the terrain drops down towards Tseung Kwan O Tunnel Road, which is around 50m in elevation as it exits the tunnel. On the north side of this road, the land then rises up to Tai Sheung Tok, a hill with a peak at around 390m (the location of the Anderson Road Quarry on the western side). To the east of the Site, the terrain drops down towards Po Hong Road at an elevation of around 20m. To the south of the Site, the terrain drops down to Po Shun Road, at an elevation of around 10m, and further south the land gives way to Junk Bay. To the west of the Site, Mau Wu Shan rises to become Ng Kwai Shan (Black Hill), a hill with a peak ridge line at around 250m in elevation.
- 2.2.3 The high hilly terrain located at the immediate west of the Site (Ng Kwai Shan) and the hilly terrain further north (Tai Sheung Tok) might shelter the Site to some extent and weaken the general northerly winds towards the Site. However, given the fact that nearby residential developments are low to mid-rise, and the Site is located on the side of a hill, the surrounding topography is unlikely cause significant air ventilation problems for the Proposed Development.

Figure 2-8 Existing Topography in the Vicinity of the Site



2.3 Land Use and Urban Morphology

Land Use

2.3.1 An excerpt from Outline Zoning Plan (OZP) No. S/TKO/22 – Tseung Kwan O is shown in **Figure 2-9**. The portion near the Site is presented and the types of land use are listed in **Table 2-3** below.

Table 2-3 Type of Land Use







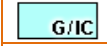


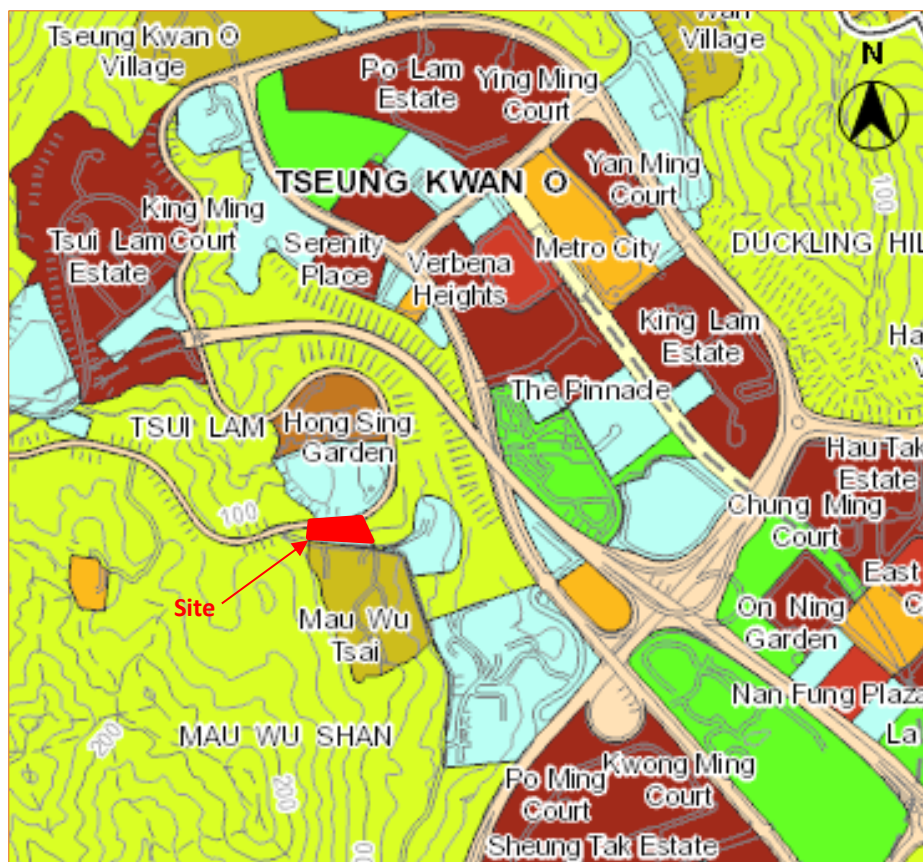
Colour	Type of Land Use	Abbreviation
	Open Space	O
	Recreation	REC
	Village Type Development	V
	Green Belt	GB
	Residential (Group A)	R(A)
	Commercial/Residential	C/R
	Government Institution or Community	G/IC
	Other Specified Uses	OU
	Residential (Group B)	R(B)

Figure 2-9 Types of Land Use near the Site



Source: Excerpt from OZP No. S/TKO/22 – Tseung Kwan O from Statutory Planning Portal 2, PlanD.

Government Institution or Community

- 2.3.2 The areas in light blue are zoned as “Government, Institution or Community”. There are altogether 13 areas zoned as G/ICs in the vicinity of the Site.
- 2.3.3 In the northern side of the Site, there is a school (King Ling College). Further towards the north over the Tseung Kwan O Tunnel Road, there are four institutions, namely SKH Tseung Kwan O Kei Tak Primary School, VTC Yeo Chei Man Senior Secondary School, PLK Laws Foundation College, Tseung Kwan O Pui Chi School.
- 2.3.4 Towards north-north-east direction cross Po Hong Road, there are two schools, namely YCH Lan Chi Pat Memorial Secondary School and TWGHs Hospitals Lui Yun Choy Memorial College. There is an institution called STFA Leung Kit Wah Primary School, sandwiched between Po Fung Road and Mau Tai Road.
- 2.3.5 Towards the northeast direction, there are many institutions, namely Tseung Kwan O Study Centre The HK Institution of Education, Tseung Kwan O Government Secondary School, Tseung Kwan O Jockey Club Clinic, St John The Baptist Church and Care and Attention Home. The Tseung Kwan O Police Station is located in between Yan King Road and Po Lam Road North.
- 2.3.6 Towards the eastern side of the Site, there is a community facility (Lions – YMCA Junk Bay Youth Camp). Across Tseung Kwan O Tunnel Road, there are altogether five institutions nearby, namely TWGHs Wong Yee Jar Jat Memorial Primary School, Chang

Pui Chung Memorial Secondary School, MKMCF Ma Chan Duen Hey Memorial College, STFA Cheng Yu Tung Secondary School and King Lam Catholic Primary School. The Tseung Kwan O Sports Centre is also located nearby.

2.3.7 Towards the southeast direction, there are two institutions, namely St Andrew’s Catholic Kindergarten and AOG Leung Sing Tak Primary School are located right opposite to Tseung Kwan O Sports Ground.

2.3.8 Towards the northwest direction, Tsui Lam Sports Centre is located right next to Tsui Lam Estate. Further to the west, there is one institution called Hong Chi Morningside School Tsui Lam. In addition, there are Tseung Kwan O Primary Fresh Water Service Reservoir and Tseung Kwan O West Low Level Service Reservoir respectively.

Residential (Group A)

2.3.9 The areas in reddish brown are zoned as “Residential (Group A)”. There are altogether 11 areas zoned as G/ICs in the vicinity of the Site.

2.3.10 There is one R(A) area located towards north, there are a few residential blocks sandwiched between Po Hong Road and To Lok Road at Serenity Place. In between Po Hong Road and Yuk Nga Lane, there are three other residential areas, namely Well On Garden, Finery Park and Radiant Towers. Further towards the north behind Po Tsui Park, it is occupied by residential developments of Po Lam Estate and Ying Ming Court.

2.3.11 Towards the northeast direction, there are two residential developments of Verbena Heights and Metro City Phase 1, sandwiched between Po Fung Road and Wan Hang Road.

2.3.12 Towards the east direction, there are residential developments of Yan Ming Court and King Lam Estate. Slightly forwards the southeast direction, there are residential developments of Yu Ming Court and On Ning Garden.

2.3.13 Towards the south direction, the area is occupied by residential developments of Kwong Ming Court, located right next to Tseung Kwan O Sports Ground.

2.3.14 Towards the northwest direction, it is mainly occupied by Tsui Lam Estate.

Residential (Group B)

2.3.15 The areas in brown are zoned as “Residential (Group B)”. There is only 1 area zoned as R(B) in the vicinity of the Site.

2.3.16 There is only one R(B) area in the vicinity of the Site, located to the north of the Site, it is occupied by residential developments of Hong Sing Garden.

Open Space

2.3.17 The areas in green are zoned as “Opened Space”. There are altogether 3 areas zoned as O in the vicinity of the Site.

2.3.18 Towards the north direction, there is a large open area occupied by Po Tsui Park across Po Hong Road.

- 2.3.19 Towards the east direction, there is an open area, the Po Hong Park, sandwiched between Po Hong Road and Wan Lung Road.
- 2.3.20 Towards the southeast direction, Tseung Kwan O Sports Ground and HK Velodrome are the open areas in in between Po Hong Road and Wan Po Road. In the same direction, across Wan Po Road, there are other open spaces of Sheung Ning Playground and Hang Hau Man Kuk Lane Park.

Green Belt

- 2.3.21 The areas in yellowish green are zoned as “Green Belt”. There are altogether 5 areas zoned as GB in the vicinity of the Site.
- 2.3.22 The areas in yellowish green are “Green Belt”. These areas are mainly the hilly slopes of Mau Wu Shan (located towards the southern part of the Site), Tsui Lam (located towards the northern part of the Site), Duckling Hills (located towards the north-eastern part of the Site).

Other Specified Uses

- 2.3.23 The areas in orange are zoned as “Other Specified Uses”. There is only 1 area zoned as OU in the vicinity of the Site.
- 2.3.24 Towards the northeast direction, there is an area of other specified uses (Metro City Phase 2), sandwiched between Mau Yip Road and Yan King Road, namely the Po Lam MTR Station and Metro City Phase 2.

Village Type Development

- 2.3.25 The areas in yellowish brown are zoned as “Village Type Development”. There is only 1 area zoned as V in the vicinity of the Site.
- 2.3.26 There is one village type development towards the south of the Site, namely Mau Wu Tsai Village. Towards the northern side of the Site, there is an area of village development of Tseung Kwan O Village.

Commercial/Residential

- 2.3.27 The areas in red are zoned as “Commercial/Residential”. There are 3 areas zoned as C/R in the vicinity of the Site.
- 2.3.28 Towards the northeast direction, The Metropolis is a C/R area. In addition, other C/R like Nan Fung Plaza and East Point City are located at the southeast direction of the Site.

Urban Morphology

2.3.29 The urban morphology surrounding the Site is illustrated on **Figure 2-10** and the heights of surrounding developments are provided in **Table 2-4**.

Figure 2-10 Site Location and its Environs

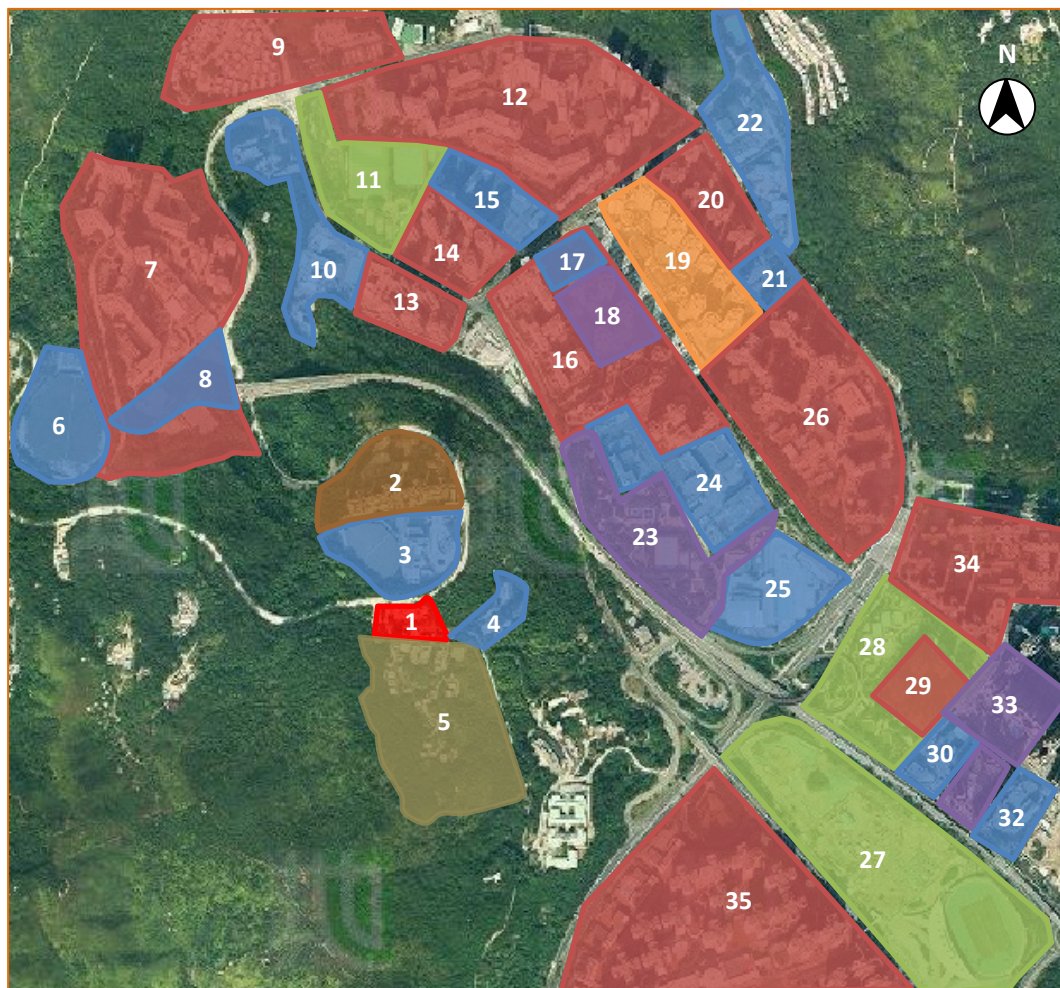


Table 2-4 Height of Developments in the Vicinity of the Site

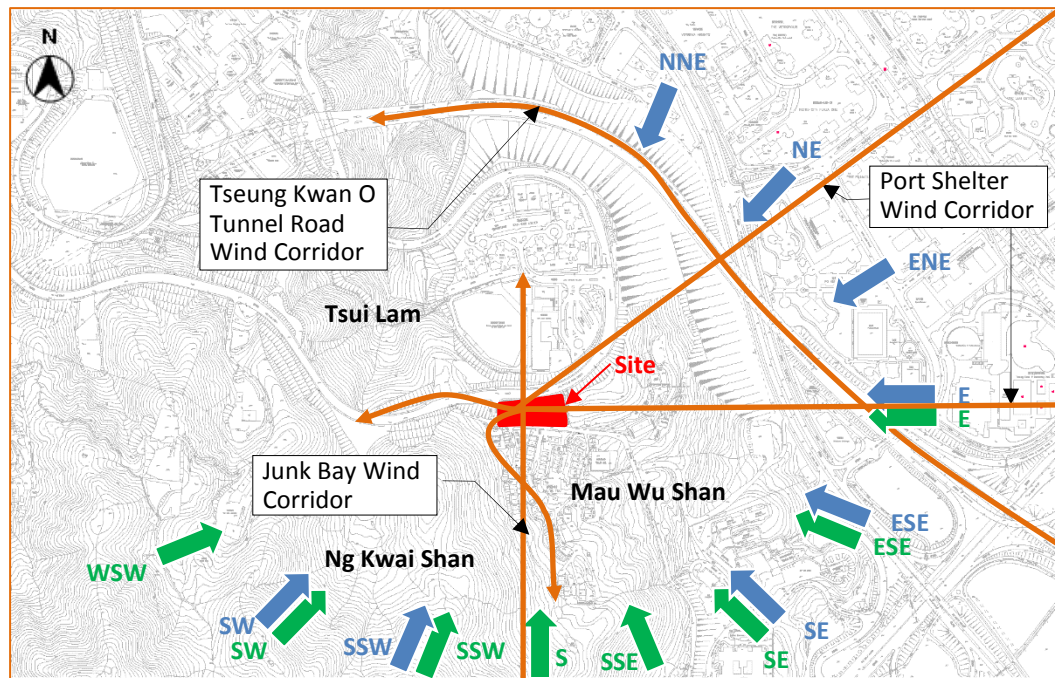
No.	Description	Building Height at Ground Level
1	Site	77.8m
2	Hong Sing Garden	96m (32 storeys)
3	King Ling College	~20m
4	Lions – YMCA Junk Bay Youth Camp	~10m
5	Mau Wu Tsai Village	~12m
6	Tseung Kwan O Primary Fresh Water Service Reservoir	-
7	Tsui Lam Estate	102m (34 storeys)
8	Hong Chi Morninghill School Tsui Lam	24m
9	Tseung Kwan O Village	12m
10	VTC Yeo Chei Man Senior Secondary School	24m
11	Po Tsui Park	-




No.	Description	Building Height at Ground Level
12	Po Lam Estate	102m (34 storeys)
13	Serenity Place	123m (41 storeys)
14	Well On Garden	120m (40 storeys)
15	YCH Lan Chi Pat Memorial Secondary School	24m
16	Verbena Heights	144m (48 storeys)
17	STFA Leung Kit Wah Primary School	24m
18	The Metropolis	129m (43 storeys)
19	Metro City Phase 2	114m (38 storeys)
20	Yan Ming Court	105m (35 storeys)
21	Tseung Kwan O Police Station	48m
22	Tseung Kwan O Govt Secondary School	24m
23	Po Hong Park	-
24	STFA Cheng Yu Tung Secondary School	24m
25	Tseung Kwan O Sports Centre	9m
26	King Lam Estate	102m (34 storeys)
27	Tseung Kwan O Sports Ground	-
28	Sheung Ning Playground	-
29	On Ning Garden	117m (39 storeys)
30	St. Andrew's Catholic Kindergarten	24m
31	Nan Fung Plaza	129m (43 storeys)
32	AOG Leung Sing Tak Primary School	24m
33	East Point City	120m (40 storeys)
34	Yu Ming Court	114m (38 storeys)
35	Kwong Ming Court	114m (38 storeys)

2.4 Wind Corridors Near the Site

- 2.4.1 Wind corridors near to the Site are shown in **Figure 2-11** below, although given the relatively exposed nature of the Site on the hillside, these wind corridors are not as significant in ventilating the Site as they would be for a dense urban high rise area.
- 2.4.2 Under ESE and SE annual winds, the wind corridor along Tseung Kwan O Tunnel Road passes through R(A), G/IC, O and C/R along Tseung Kwan O area, allows the prevailing wind to ventilate the southeast part of the Site.
- 2.4.3 Po Lam Road South facilitates the annual SSE wind to flow across the Mau Wu Shan area. As for Po Lam Road and Po Lam Road North, these two wind corridors facilitate the annual NNE wind to flow towards and across Tsui Lam.
- 2.4.4 Apart from the roads mentioned above, there is another wind corridor, Po Fung Road, located at the northeast direction of the Site. These serve as pathways for the wind to pass through and eventually reach the Site, as shown in **Figure 2-11**. Not only does it benefit the penetration of wind along annual NE direction, but also annual and summer SW direction.

Figure 2-11 Wind Corridors Near the Site



-  Annual Prevailing Winds
-  Summer Prevailing Winds
-  Wind Corridor

2.5 Evaluation of the Base Case

2.5.1 The air ventilation performance of the Base Case, i.e. the existing car park, has been evaluated. There are no buildings within the car park and no impediment to air flow. The penetration of wind within the Proposed Development is shown in **Figure 2-13**, below.

Annual Prevailing Wind

2.5.2 The majority of the annual prevailing wind is from the east and northeast and will reach the Site through the Port Shelter Wind Corridor. Annual prevailing winds from the southwest will be blocked by Ng Kwai Shan.

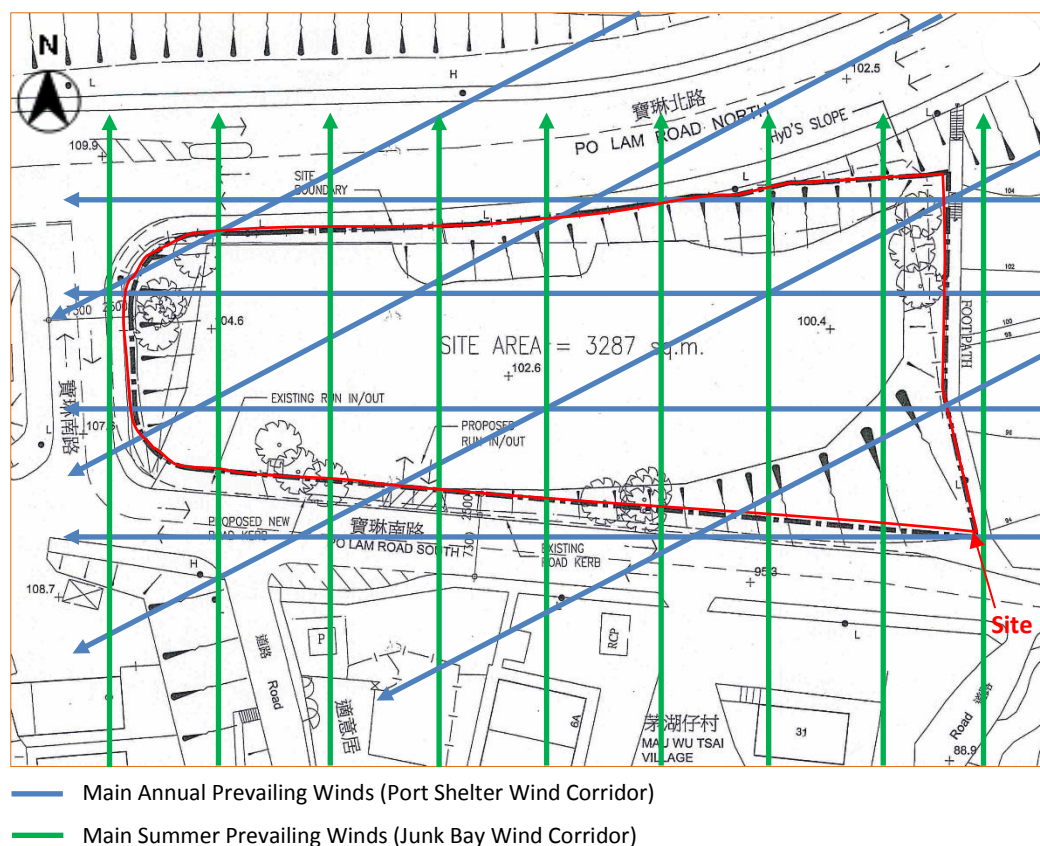
2.5.3 Winds from the east and northeast penetrate all of the Site, as shown in **Figure 2-13**.

Summer Prevailing Wind

2.5.4 The majority of the summer prevailing wind is from the south and east and will reach the Site through the Junk Bay Wind Corridor. Summer prevailing winds from the southwest will be blocked by Ng Kwai Shan.

2.5.5 All of the wind from the south will penetrate all the way through the Site.

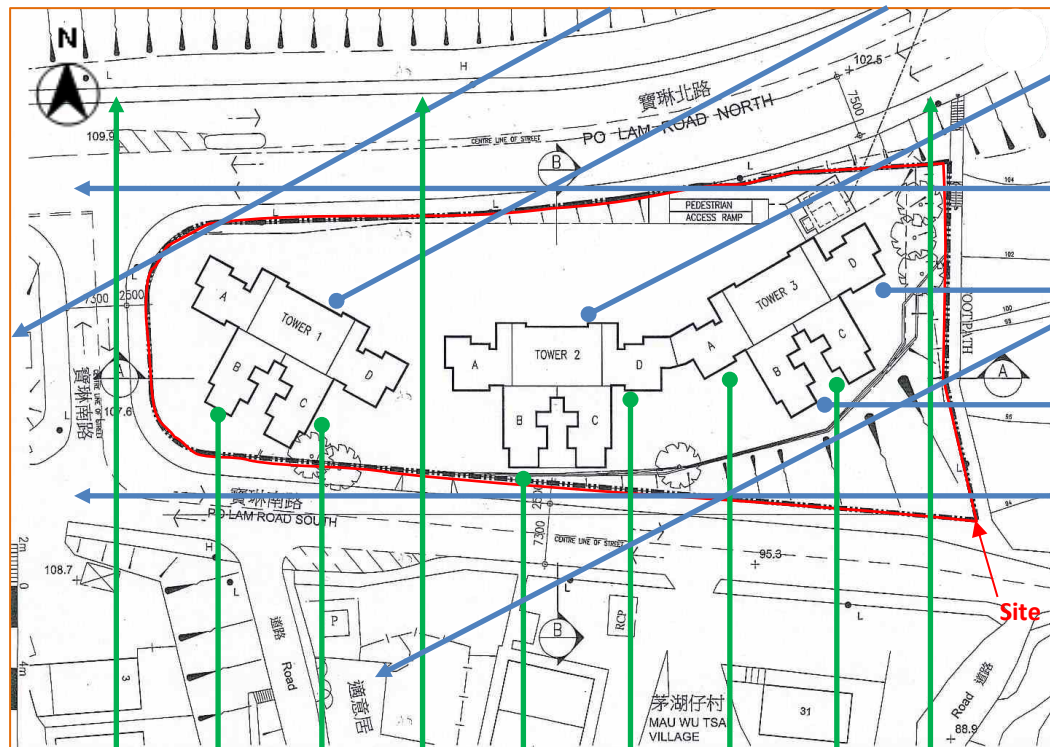
Figure 2-13 Penetration of Wind Within the Site – Base Case



2.6 Evaluation of the Proposed Case – Proposed Development (Original)

- 2.6.1 The air ventilation performance of the Proposed Case – Proposed Development (Original) has been evaluated. The proposed building section and typical building floor plan, respectively, used for the wind condition assessment are shown in **Appendix A**.
- 2.6.2 The height of buildings within the Proposed Development are approximately 77.8m above ground level (subject to detailed design). As the Site is located at the mountain side of Mau Wu Shan at a relatively high elevation, wind availability is not likely be affected by surrounding buildings in Tseung Kwan O at lower elevations, nor by the low-rise buildings in Mau Wu Tsai Village to the south.
- 2.6.3 The penetration of wind within the Proposed Development is shown in **Figure 2-14**, below.
- 2.6.4 It can be seen that the Port Shelter Wind Corridor will bring in mainly the annual prevailing winds, with generally good penetration within the Proposed Development. The Junk Bay Wind Corridor will bring in mainly the summer prevailing winds, although these will only penetrate the Proposed Development in one location, between Tower 1 and Tower 2, where there is a gap of around 4.4m. There is no gap between Tower 2 and Tower 3 that would allow wind penetration.

Figure 2-14 Penetration of Wind Within the Site – Proposed Development (Original)



- Main Annual Prevailing Winds (Port Shelter Wind Corridor)
- Main Summer Prevailing Winds (Junk Bay Wind Corridor)

Annual Prevailing Wind

2.6.5 The majority of the annual prevailing wind is from the east and northeast and will reach the Site through the Port Shelter Wind Corridor. Annual prevailing winds from the southwest will be blocked by Ng Kwai Shan.

2.6.6 The layout of the towers allows the winds from the east and northeast to penetrate much of the Site, as shown in **Figure 2-14**.

Summer Prevailing Wind

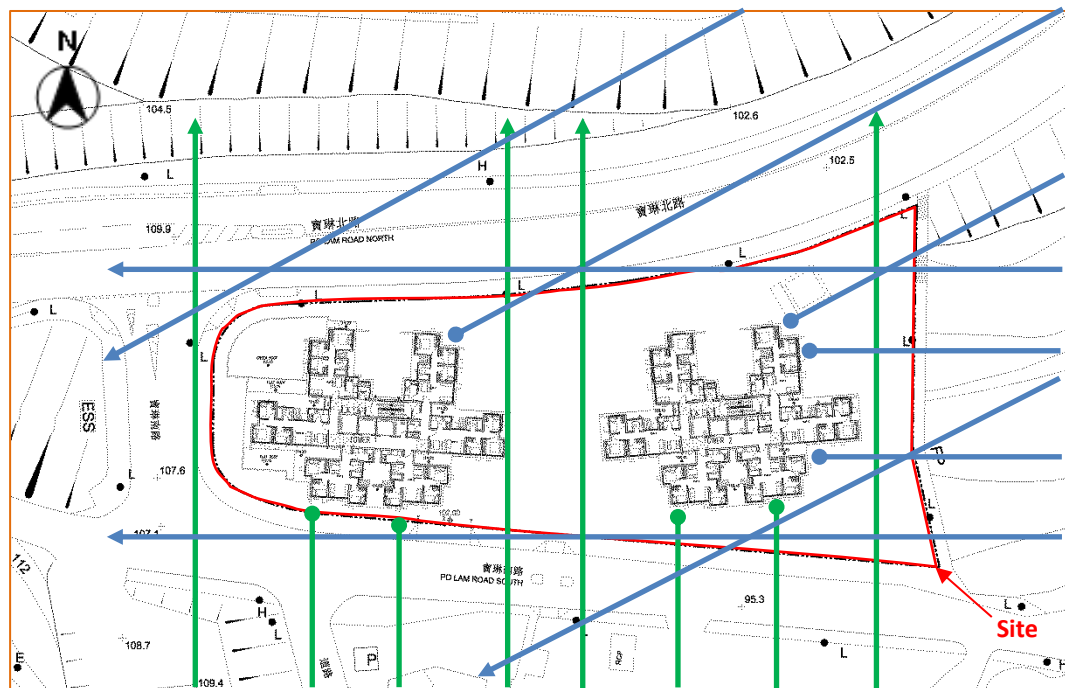
2.6.7 The majority of the summer prevailing wind is from the south and east and will reach the Site through the Junk Bay Wind Corridor. Summer prevailing winds from the southwest will be blocked by Ng Kwai Shan.

2.6.8 The layout of the towers will block the majority of the wind from the south from reaching the northern part of the Site, although the small 4.4m gap between Tower 1 and Tower 2 will allow some wind in the summer time from the south to penetrate all the way through the Site, but only at this location, as shown in **Figure 2-14**. As there is no gap between Tower 2 and Tower 3, summer winds from the south will not penetrate the Site at this location.

2.7 Evaluation of the Proposed Case – Proposed Development (Current)

- 2.7.1 The air ventilation performance of the Proposed Case – Proposed Development (Current) has been evaluated. The proposed building section and typical building floor plan, respectively, used for the wind condition assessment are shown in **Figures 1.7 to 1.16 of the Planning Statement**.
- 2.7.2 The height of buildings within the Proposed Development is approximately 77.8m above ground level (subject to detailed design). As the Site is located at the mountain side of Mau Wu Shan at a relatively high elevation, wind availability is not likely to be affected by surrounding buildings in Tseung Kwan O at lower elevations, nor by the low-rise buildings in Mau Wu Tsai Village to the south.
- 2.7.3 The penetration of wind within the Proposed Development is shown in **Figure 2-15**.

Figure 2-15 Penetration of Wind Within the Site – Proposed Development (Current)



- Main Annual Prevailing Winds (Port Shelter Wind Corridor)
- Main Summer Prevailing Winds (Junk Bay Wind Corridor)

- 2.7.4 It can be seen that the Port Shelter Wind Corridor will bring in mainly the annual prevailing winds, with generally good penetration within the Proposed Development. The Junk Bay Wind Corridor will bring in mainly the summer prevailing winds, although these will only penetrate the Proposed Development in one location, between Tower 1 and Tower 2, where there is a gap of around 10m.

Annual Prevailing Wind

- 2.7.5 The majority of the annual prevailing wind is from the east and northeast. Since the east side of the site is exposed to an area with lower elevation, the easterlies brought by the Port Shelter wind corridor will be able to reach the site, mainly experienced by Tower 2. As for wind blowing from NNE, NE and ENE, both Tower 1 and 2 will be able to

experience the wind. While the winds from north eastern quadrant dominate the Site area, the flats facing the north can enjoy most of the winds throughout the year. Yet the annual prevailing wind from the southwest is likely to be blocked by Ng Kwai Shan.

- 2.7.6 The layout of the towers allows the winds from the east and northeast to penetrate much of the Site, as shown in **Figure 2-15**.

Summer Prevailing Wind

- 2.7.7 Summer prevailing winds range from the direction of E to WSW. The Junk Bay wind corridor can carry the wind and reach the site, which will mainly be experienced by the south-facing flats of both Tower 1 and 2. Even though Ng Kwai Shan may block off the wind from the southwest, the wind from the south will still be able to reach the Site along hillside.

- 2.7.8 The layout of the towers will block the some of the wind from the south from reaching the northern part of the Site, but the large 10m gap between Tower 1 and Tower 2 will allow a significant amount of wind in the summer time from the south to penetrate all the way through the Site, as shown in **Figure 2-15**.

2.8 Conclusion

- 2.8.1 The majority of the annual prevailing wind is from the east and northeast and will reach the Site through the Port Shelter Wind Corridor. Annual prevailing winds from the southwest will be blocked by Ng Kwai Shan. The majority of the summer prevailing wind is from the south and east and will reach the Site through the Junk Bay Wind Corridor. Summer prevailing winds from the southwest will also be blocked by Ng Kwai Shan.
- 2.8.2 For the Base Case, i.e. the existing car park, there are no buildings within the car park and no impediment to air flow. With the exception of winds blocked by Ng Kwai Shan, there is full penetration of annual prevailing winds and of the summer prevailing winds and thereby full wind availability within the Site.
- 2.8.3 For the Proposed Case – Proposed Development (Original), the three-tower layout allows the annual prevailing winds from the east and northeast to penetrate much of the Site. The layout of the towers will block the majority of the wind from the south from reaching the northern part of the Site, although the smaller 4.4m gap between Tower 1 and Tower 2 will allow some wind in the summer time from the south to penetrate all the way through the Site, but only at this location. As there is no gap between Tower 2 and Tower 3, summer winds from the south will not penetrate the Site at this location.
- 2.8.4 For the Proposed Case – Proposed Development (Current), the two-tower layout also allows the annual prevailing winds from the east and northeast to penetrate much of the Site. However, with only two towers and a larger 10m gap between the two towers, a significant amount of wind in the summer time from the south will be able to penetrate all the way through the Site.
- 2.8.5 Compared to Proposed Development (Original) with a three-tower layout, the Proposed Development (Current) with a two-tower layout provides greater wind availability within the Site and therefore better air flow and ventilation can be achieved.

3 CONCLUSIONS AND RECOMMENDATIONS

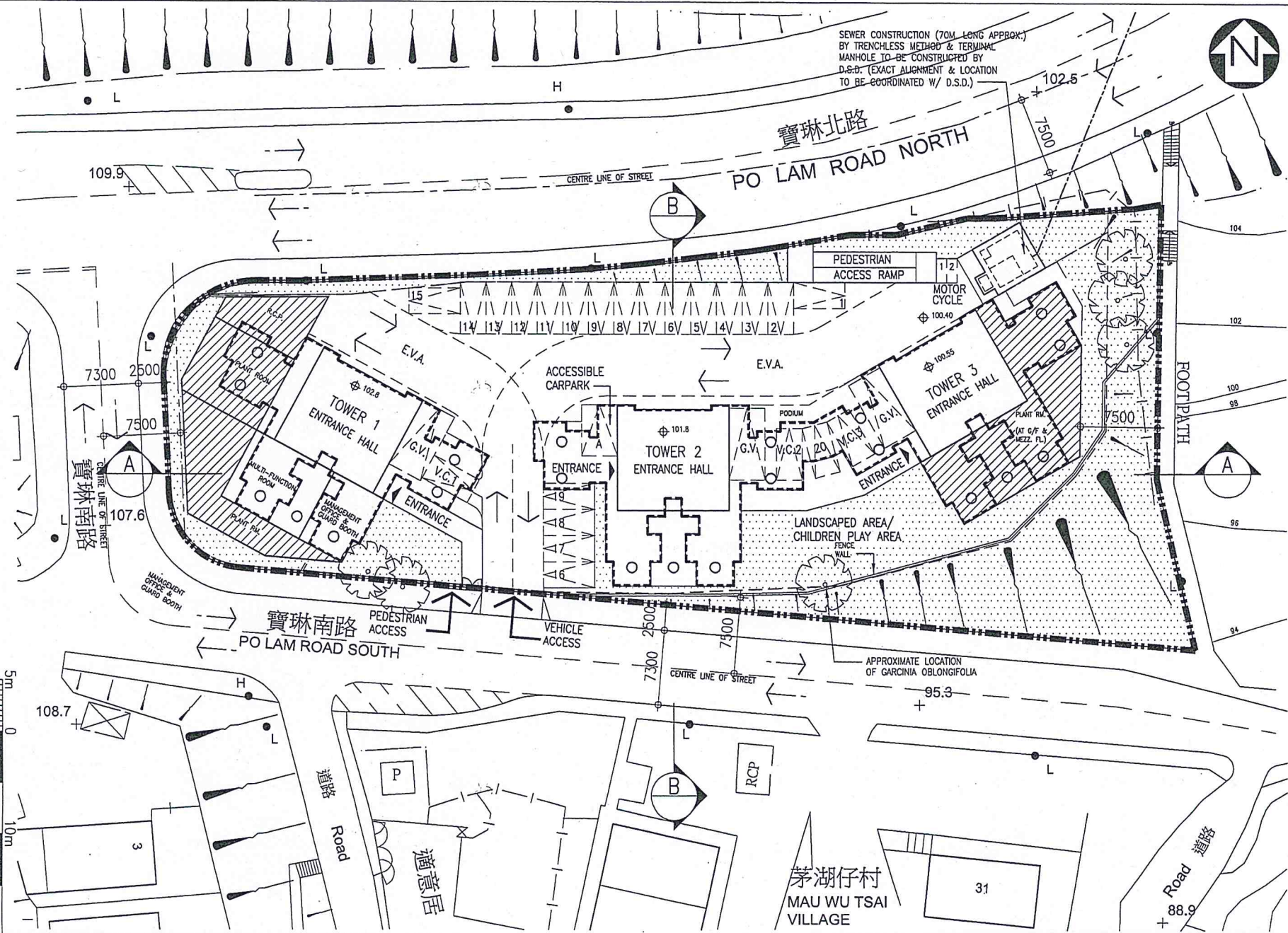
- 3.1.1 In this Expert Evaluation Study, the Site located at Po Lam Road in Tseung Kwan O has been evaluated. Three scenarios have been compared; a Base Case, which is the existing car park without any buildings; the Proposed Case – Proposed Development (Original), which comprises a three-tower layout; and the Proposed Case – Proposed Development (Current), which comprises a two-tower layout.
- 3.1.2 Based on the analysis from RAMS data from PlanD and wind data from HKO, the annual and summer prevailing wind directions can be deduced. There are altogether 8 annual prevailing winds, namely E, ENE, NE, ESE, NNE, SW, SSW and SE. There are also 8 summer prevailing winds, namely SW, SSW, E, S, WSE, ESE, SSE and SE.
- 3.1.3 The Site is located on the east side of Mau Wu Shan at an elevation of around 100m. The surrounding topography and urban morphology has been reviewed. The high hilly terrain located at the immediate west of the Site (Ng Kwai Shan) and the hilly terrain further north (Tai Sheung Tok) might shelter the Site to some extent and weaken the general northerly winds towards the Site. However, given the fact that nearby residential developments are low to mid-rise, and the Site is located on the side of a hill, the surrounding topography and urban morphology is unlikely cause significant air ventilation problems for the Site.
- 3.1.4 According to the wind availability under annual and summer prevailing winds, wind corridors have been identified. Given the relatively high elevation of the Site on a hillside above surrounding low to mid-rise developments, these wind corridors are not as significant in ventilating the Site as they would be for a dense urban high-rise area. There are altogether three main wind corridors, designated the Tseung Kwan O Tunnel Road Wind Corridor, Port Shelter Wind Corridor and Junk Bay Wind Corridor.
- 3.1.5 The majority of the annual prevailing wind is from the east and northeast and will reach the Site through the Port Shelter Wind Corridor. Annual prevailing winds from the southwest will be blocked by Ng Kwai Shan. The majority of the summer prevailing wind is from the south and east and will reach the Site through the Junk Bay Wind Corridor. Summer prevailing winds from the southwest will also be blocked by Ng Kwai Shan.
- 3.1.6 For the Base Case, i.e. the existing car park, there are no buildings within the car park and no impediment to air flow. With the exception of winds blocked by blocked by Ng Kwai Shan, there is full penetration of annual prevailing winds and of the summer prevailing winds and thereby full wind availability within the Site
- 3.1.7 For the Proposed Case – Proposed Development (Original), the three-tower layout allows the annual prevailing winds from the east and northeast to penetrate much of the Site. The layout of the towers will block the majority of the wind from the south from reaching the northern part of the Site, although the smaller 4.4m gap between Tower 1 and Tower 2 will allow some wind in the summer time from the south to penetrate all the way through the Site, but only at this location. As there is no gap between Tower 2 and Tower 3, summer winds from the south will not penetrate the Site at this location.
- 3.1.8 For the Proposed Case – Proposed Development (Current), the two-tower layout also allows the annual prevailing winds from the east and northeast to penetrate much of the Site. However, with only two towers and a larger 10m gap between the two towers,

a significant amount of wind in the summer time from the south will be able to penetrate all the way through the Site.

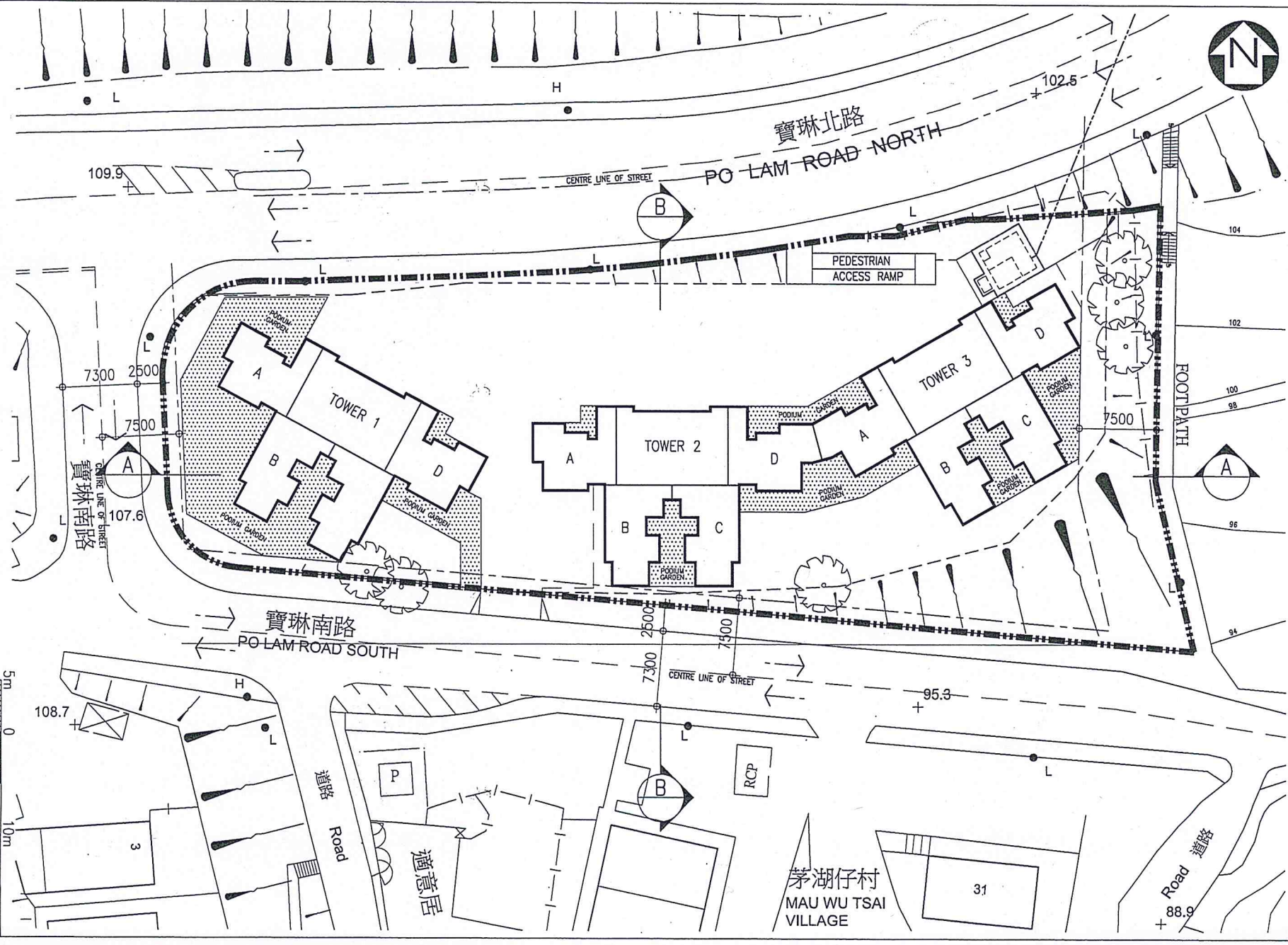
- 3.1.9 Unlike a dense urban high rise area, given the location of the Site is on a hillside, the surrounding low- to mid-rise development, the generally open nature of the surrounding environment, and the numerous wind corridors, it is unlikely that the Proposed Development (either Original or Current) will result in any adverse wind environment or lack of ventilation – the Site is considered to be well ventilated.
- 3.1.10 Having said that, compared to the Proposed Development (Original) with a three-tower layout, the Proposed Development (Current) with a two-tower layout provides even greater wind availability within the Site and therefore even better air flow and ventilation can be achieved. On this basis, the Proposed Development (Current) is recommended in terms of air ventilation.
- 3.1.11 This Expert Evaluation has concluded that there are no problem areas within the Proposed Development (Current) that require further study. The wind penetration through the Site is generally good and no areas or locations of excessive wind or insufficient ventilation have been identified. No modifications to the design of the Proposed Development (Current) are needed as the two-tower design appears to perform acceptably in terms of air ventilation.
- 3.1.12 Had the Site been in a dense urban high rise area, Computational Fluid Dynamics (CFD) modelling would have been recommended to confirm the findings of the Expert Evaluation. However, given the location of the Site on a hillside, surrounded by low- to mid-rise developments and the generally open nature of the surrounding environment, it is considered necessary to carry out CFD modelling – the conclusions of this Expert Evaluation are considered to be robust and the results of CFD modelling are unlikely to affect the conclusions of this Expert Evaluation.
- 3.1.13 However, should there be any further significant design changes to the Proposed Development (Current) that could affect wind availability, then the Expert Evaluation should be carried out again, and supplemented with CFD modelling if required.

APPENDIX A

Layout and Sectional Plans of the Proposed Development (Original)



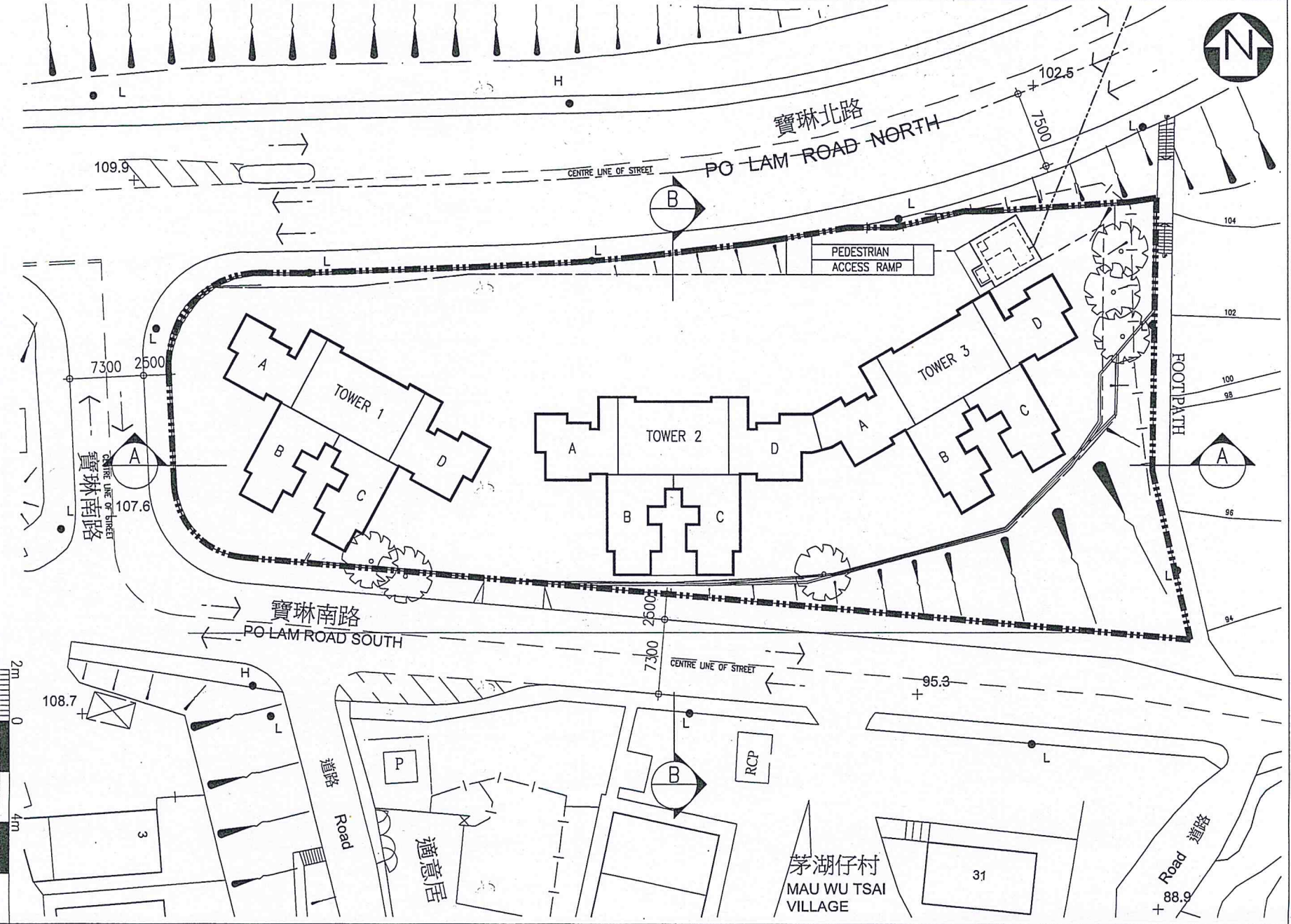
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ARCHITECTURAL SERVICES DEPARTMENT 建築署		



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drawing title
FIRST FLOOR PLAN

ARCHITECTURAL
SERVICES
DEPARTMENT 建築署

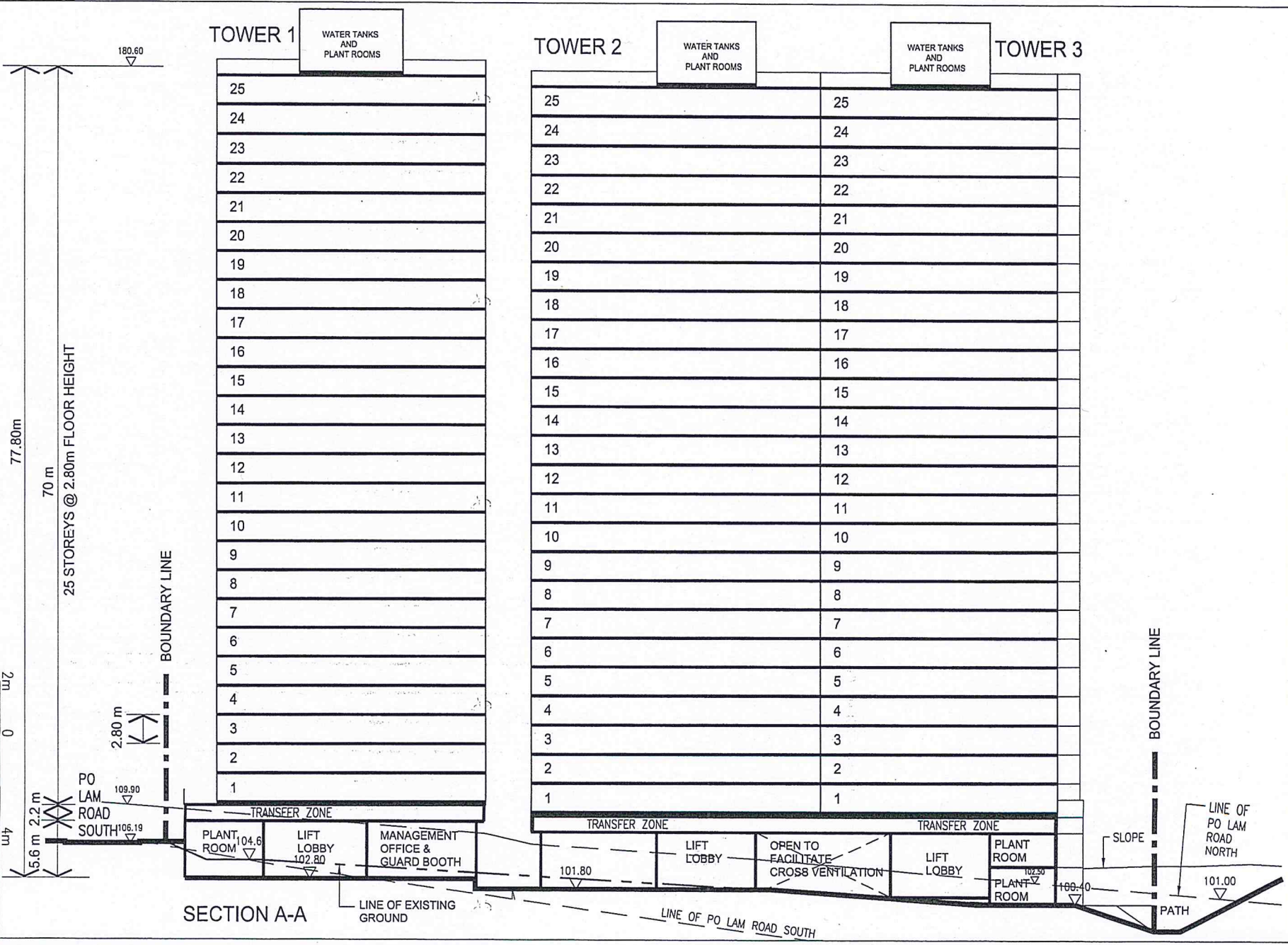


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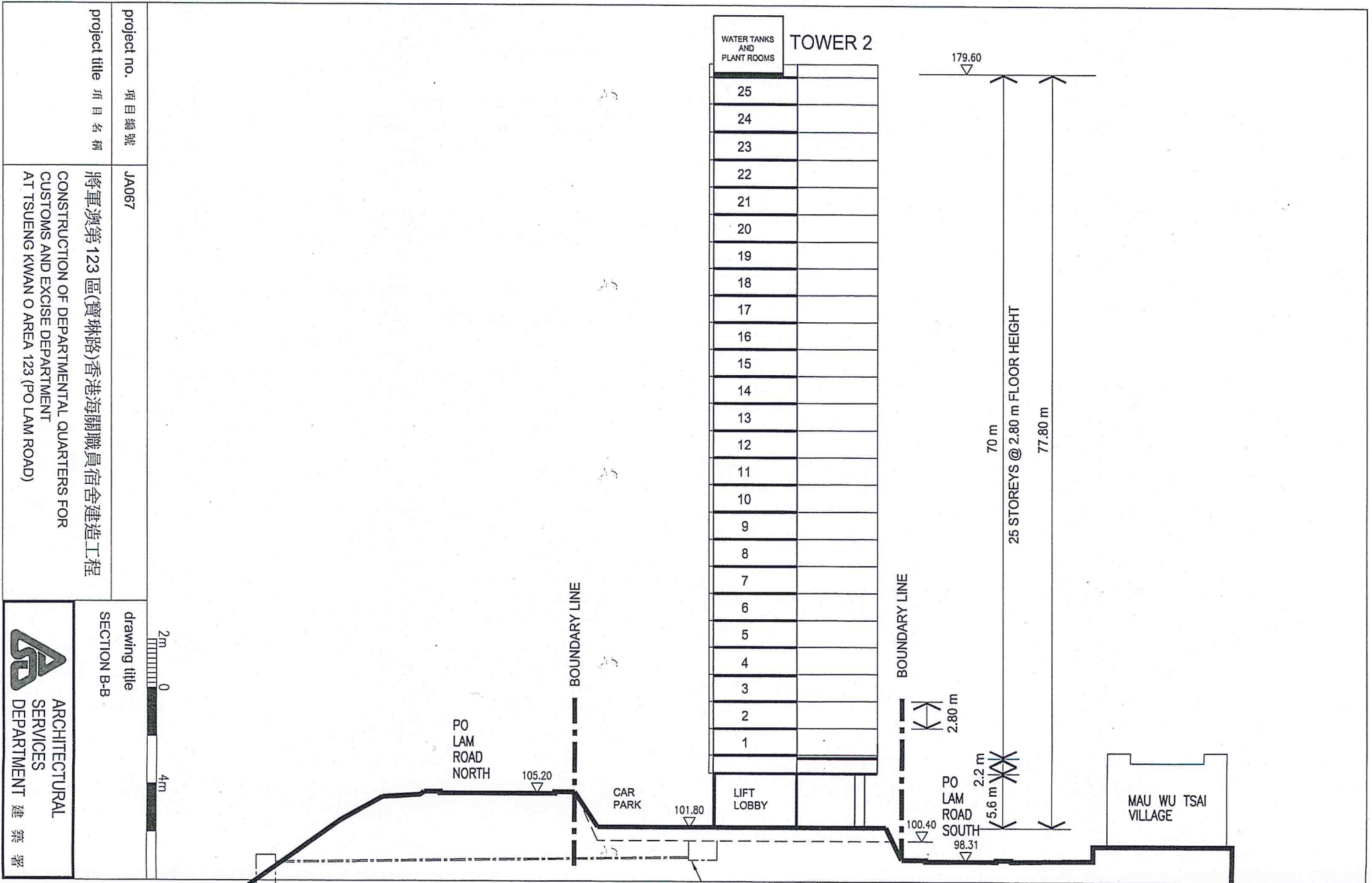
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CONSTRUCTION OF DEPARTMENTAL QUARTERS FOR
CUSTOMS AND EXCISE DEPARTMENT
AT TSUENG KWAN O AREA 123 (PO LAM ROAD)

drawing title
TYPICAL FLOOR PLAN (2/F - 25/F)

ARCHITECTURAL
SERVICES
DEPARTMENT 建築署



project title 項目名稱	project no. 項目編號
將軍澳第123區(寶琳路)香港海關職員宿舍建造工程 CONSTRUCTION OF DEPARTMENTAL QUARTERS FOR CUSTOMS AND EXCISE DEPARTMENT AT TSUENG KWAN O AREA 123 (PO LAM ROAD)	JA067
drawing title	SECTION A-A
ARCHITECTURAL SERVICES DEPARTMENT 建築署	



TO EXISTING PUBLIC MANHOLE

SECTION B-B

SEWER CONSTRUCTION (70M. LONG APPROX.) BY TRENCHLESS METHOD & TERMINAL MANHOLE TO BE CONSTRUCTED BY D.S.D. (EXACT ALIGNMENT)