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3. Air Quality Impact

3.1 Legislation, Standards, and Guidelines

3.1.1 General

3.1.1.1 The legislation and guidelines that are relevant to air quality impact assessment include, but not limited to, the following:

- Criteria and guidelines for evaluating and assessing air quality impact as specified in Section 1 of Annexes 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM);
- Air Pollution Control Ordinance (APCO) (Cap. 311);
- Air Pollution Control (Construction Dust) Regulation (Cap. 311R);
- Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation (Cap 311Z);
- Air Pollution Control (Fuel Restriction) Regulation (Cap 311I);
- Air Pollution Control (Specified Processes) Regulations (Cap 311F);
- Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2 (16);
- Development Bureau Technical Circular (Works) No. 13/2020 Timely Application of Temporary Electricity and Water Supply for Public Works Contracts and Wider Use of Electric Vehicles in Public Works Contracts; and
- Practice Note on Control of Air Pollution in Vehicle Tunnels

3.1.2 Environmental Impact Assessment Ordinance (EIAO) and Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)

3.1.2.1 The EIAO-TM is issued under section 16 of the EIAO. Annex 4 of the EIAO-TM sets out the criteria for evaluating air quality impact, and Annex 12 of the EIAO-TM sets out the general approaches and methodologies for assessment of air quality impact arising from designated projects.

3.1.3 Air Pollution Control Ordinance (APCO) (Cap. 311)

Air Quality Objective

3.1.3.1 The principal legislation for controlling air pollutants is the Air Pollution Control Ordinance (APCO) (Cap. 311) which provides a statutory framework for establishing the Air Quality Objectives (AQOs) and stipulating the anti-pollution requirements for air pollution sources. The AQOs stipulate limits on concentrations for 7 pollutants including Sulphur Dioxide (SO_2), Respirable Suspended Particulates (RSP), Fine Suspended Particulates (FSP), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Photochemical Oxidants (as Ozone (O_3)), and Lead (Pb). The current AQOs which took effect in January 2022 are listed in Table 3.1:

Table 3.1 Current Hong Kong Air Quality Objectives (HKAQO)

Pollutants	Limits on Concentration, μg/m^3 [1] (The Number of Exceedance per calendar year allowed is shown in brackets)				
	10-min	1-hr	8-hr	24-hr	Annual
SO_2	500 (3)			50 (3)	
RSP (PM_{10}) [2]				100 (9)	50
FSP ($PM_{2.5}$) [3]				50 (35/18) [4]	25
CO		30,000 (0)	10,000 (0)		
NO_2		200 (18)			40
O_3			160 (9)		
Pb					0.5

Notes:

[1] All measurements of the concentration of gaseous air pollutants, i.e., sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293 Kelvin and a reference pressure of 101.325 kilopascal.

[2] Respirable suspended particulates (RSP) means suspended particles in air with a nominal aerodynamic diameter of 10 μm or less (i.e. PM_{10}).

[3] Fine suspended particulates (FSP) means suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less (i.e. $PM_{2.5}$).

[4] On a best endeavour basis, a more stringent standard of 24-hour AQO for FSP at concentration level of 50 μg/m^3 is adopted by setting the number of allowable exceedances to be 18 days per calendar year as the benchmark for conducting air quality impact assessments.

3.1.4 Air Pollution Control (Construction Dust) Regulation (Cap. 311R)

3.1.4.1 The Air Pollution Control (Construction Dust) Regulation specifies processes that require special dust control. The Contractors are required to inform the Environmental Protection Department (EPD) and adopt proper dust suppression measures while carrying out "Notifiable Works" (which requires prior notification by the regulation) and "Regulatory Works" to meet the requirements as defined under the regulation.

3.1.5 Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation (Cap. 311Z)

3.1.5.1 Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation specifies that all non-road mobile machinery (NRMMs), except for those exempted, used in specified activities and locations including construction sites, container terminals and back up facilities, restricted areas of the airport, designated waste disposal facilities and specified processes are required to comply with the prescribed emission standards.

3.1.6 Air Pollution Control (Fuel Restriction) Regulation (Cap. 311I)

3.1.6.1 Air pollution Control (Fuel Restriction) Regulation controls the types of fuel allowed for use and their sulphur contents in commercial and industrial processes to reduce sulphur dioxide (SO_2) emissions.

3.1.7 Air Pollution Control (Specified Processes) Regulations (Cap. 311F)

3.1.7.1 According to Part IV and Schedule 1 of the APCO, a number of polluting industrial processes are classified as Specified Processes (SPs), which are subject to more stringent emission control. A licence is required for the operation of SP. Cement Work (Concrete Batching Plant) which is SP would be involved during construction phase of the Project. The relevant requirements for this SP are discussed in **Section 3.1.8**.

3.1.8 Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2 (16)

3.1.8.1 Apart from obtaining a SP licence under APCO, the SP shall be operated in accordance with the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2 (16) to prevent the emission of noxious or offensive emissions from their plants, prevent the discharge of such emissions into the atmosphere and render such emissions where discharged harmless and inoffensive. This Note sets out the minimum requirements for Cement Work (Concrete Batching Plant) in which the total silo capacity exceeds 50 tonnes and in which cement is handled or in which argillaceous and calcareous materials are used in the production of cement clinker, and works in which cement clinker is ground, including the allowable emission limit, fugitive emission control and monitoring requirements associated with the operation of SP.

3.1.8.2 The emission limit stipulated in the BPM is shown in **Table 3.2**.

Table 3.2 Concentration Limit for Emission from Cement Work

Pollutant	Concentration Limit (mg/m^3) [1]
Particulate matter	10

Note:
[1] The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, and without correction for water vapour content. Introduction of diluted air to achieve the emission concentration limit shall not be permitted.

3.1.9 Development Bureau Technical Circular (Works) No. 13/2020

3.1.9.1 Development Bureau Technical Circular (Works) No. 13/2020 promulgates the policy on timely application of temporary electricity and water supply for public works contracts as well as wider use of electric vehicles (EVs) in public works contracts. All public works contracts, including design and build contracts and term contracts, the tender invitations of which are issued on or after 1 February 2021, shall observe the requirements as set out in this Circular.

3.1.10 Practice Note on Control of Air Pollution in Vehicle Tunnels

3.1.10.1 The Practice Note on Control of Air Pollution in Vehicle Tunnels provides guidelines on control of air pollution in vehicle tunnels. Air pollutant concentration limits are shown in **Table 3.3**.

Table 3.3 Tunnel Air Quality Guidelines

Pollutant	Average Time	Maximum Concentration	
		$\mu g/m^3$ [1]	ppm
CO	5 minutes	115,000	100
NO_2	5 minutes	1,800	1

Pollutant	Average Time	Maximum Concentration	
		µg/m³ [1]	ppm
SO_2	5 minutes	1,000	0.4

Note:
[1] Expressed at the reference condition of 298K and 101.325 kPa.

3.2 Description of the Environment

3.2.1 Existing Ambient Air Quality

3.2.1.1 The existing ambient air quality could be referred to the nearest EPD's Tuen Mun Air Quality Monitoring Station (AQMS). The latest air quality monitoring data (available up to 2022) of various air pollutants monitored at Tuen Mun AQMS is presented in **Table 3.4** and compared with the Air Quality Objectives (AQOs).

Table 3.4 Air quality monitoring data (Tuen Mun AQMS, 2018-2022)

Pollutant	Parameter	Concentrations (µg/m³) [1]						AQO (µg/m³) [2]
		2018	2019	2020	2021	2022	5-year Mean [2]	
SO_2	4th highest 10-minute	94	45	98	22	29	58 [12%]	500 (3)
	4th highest 24-hour	20	12	10	9	11	12 [25%]	50 (3)
NO_2	19th highest 1-hour	177	166	166	172	128	162 [81%]	200 (18)
	Annual	**47**	**47**	40	**44**	39	**43 [109%]**	40
CO	Max. 1-hour	1,900	2,050	1,650	1,720	1,480	1,760 [6%]	30,000
	Max. 8- hour	1,666	1,758	1,513	1,450	1,345	1,546 [15%]	10,000
O_3	10th highest 8-hour	**173**	**203**	**166**	**161**	**195**	**180 [112%]**	160 (9)
RSP	10th highest 24-hour	87	89	84	87	65	82 [82%]	100 (9)
	Annual	42	41	34	36	32	37 [74%]	50
FSP	19th highest 24-hour	47	46	41	42	39	43 [86%]	50 (18)
	Annual	**26**	24	20	19	18	21 [86%]	25

Notes:
[1] Monitoring results exceeding the AQO are in **bold**.
[2] The 5-year mean is the average of the five yearly concentrations. Percentage of the 5-year mean concentration to AQO is shown in [ ]. Number of exceedance allowed under the AQO is shown in ( ).

3.2.1.2 It can be seen from **Table 3.4** that there was a general decreasing trend for the 19th highest 1-hour NO_2 concentration since 2018, except for 2021, and the range was between 128μg/m^3 and 177μg/m^3 in the past 5 years, all complying with the AQO of 200μg/m^3. The annual NO_2 concentrations exceeded the AQO of 40μg/m^3, except 2020 and 2022. The Tuen Mun AQMS is located at Tuen Mun Public Library surrounded by several major roads including Tuen Mun Road, Castle Peak Road – Castle Peak Bay, Tuen Mun Heung Sze Wui Road, Tuen Hing Road, etc. It is likely that the vehicular emissions from these roads contribute to the high level of annual NO_2 concentrations.

3.2.1.3 The annual RSP concentrations were generally decreasing from 42μg/m^3 to 32μg/m^3 from 2018 to 2022, except for Year 2021. The 10th highest daily RSP concentrations were ranged from 65μg/m^3 to 89μg/m^3. An overall decreasing trend is observed from 2018 to 2022. Both annual and 10th highest daily RSP comply with the AQO of 50μg/m^3 and 100 μg/m^3 in the past 5 years.

3.2.1.4 The annual FSP concentrations decreased from 26μg/m^3 to 18μg/m^3 over the past 5 years, whilst the 19th highest daily FSP concentrations dropped from 47μg/m^3 to 39μg/m^3 from 2018 to 2022, except for 2021. Exceedance was found in 2018 annual FSP concentration. However, improvement was observed and the annual FSP comply with the respective AQOs in recent 4 years.

3.2.1.5 The 10th highest 8-hour averaged O_3 concentrations ranged from 161μg/m^3 in 2021 to 203μg/m^3 in 2019 and all exceeded the AQO of 160μg/m^3 in the past 5 years. According to EPD's Air Quality in Hong Kong 2021 report, O_3 is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of primary pollutants such as NO_x and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, O_3 recorded in one place could be attributed to VOC and NO_x emissions from places afar. Hence, O_3 is more a regional air pollution problem.

3.2.1.6 Monitoring records of SO_2 and CO indicated that these two pollutants were in relatively low levels. Both pollutants were well within the AQOs.

3.2.2 Future Background Air Quality

3.2.2.1 It should be noted that the ambient air quality conditions described in the above sections are based on the historical monitoring data. The future background air quality is predicted by a regional air quality model named "Pollutants in the Atmosphere and their Transport over Hong Kong" (i.e. PATH).

3.2.2.2 The assessment area of the Project involves 13 grids in the latest PATH model (i.e. PATH v2.1). The Project is tentatively commissioned in Year 2033. According to the PATH v2.1 model results available from EPD's website (https://path.epd.gov.hk/index_en_2030.html), the background concentrations for Year 2030 are comparatively higher than that of Year 2035. The future background concentrations of the key pollutants predicted by the PATH v2.1 for Year 2030 are summarised in **Table 3.5** to **Table 3.7**. **Figures 3.1a** to **c** illustrate the locations of concerned PATH grids.

Table 3.5 Future background air quality for concerned PATH grids in Lam Tei Area

Pollutant	Parameter	Concentrations (μg/m^3)						
		21_43	21_44	21_45	22_43	22_44	22_45	AQO [1]
NO_2	19th highest 1-hour	91	91	93	87	90	89	200 (18)
	Annual	18	19	18	15	17	17	40
RSP	10th highest 24-hour	69	71	73	68	69	71	100 (9)
	Annual	27	27	27	27	27	27	50
FSP	19th highest 24-hour	36	37	38	37	37	37	50 (18)
	Annual	15	15	16	15	15	15	25

Note:
[1] Number of exceedance allowed under the AQO is shown in ( ).

Table 3.6 Future background air quality for concerned PATH grids in Pillar Point Area

Pollutant	Parameter	Concentrations (μg/m^3)				
		16_39	17_38	17_39	18_39	AQO [1]
NO_2	19th highest 1-hour	104	116	102	105	200 (18)
	Annual	30	37	29	29	40
RSP	10th highest 24-hour	69	71	69	69	100 (9)
	Annual	28	29	28	28	50
FSP	19th highest 24-hour	38	39	39	39	50 (18)
	Annual	15	16	16	16	25

Note:
[1] Number of exceedance allowed under the AQO is shown in ( ).

Table 3.7 Future background air quality for concerned PATH grids in Sam Shing Area

Pollutant	Parameter	Concentrations (μg/m^3)				
		20_40	20_41	21_40	21_41	AQO [1]
NO_2	19th highest 1-hour	99	94	89	88	200 (18)
	Annual	24	22	21	17	40
RSP	10th highest 24-hour	69	71	69	68	100 (9)
	Annual	27	28	27	27	50
FSP	19th highest 24-hour	39	39	38	37	50 (18)
	Annual	15	16	15	15	25

Note:
[1] Number of exceedance allowed under the AQO is shown in ( )

3.3 Representative Air Sensitive Receivers

3.3.1.1 In accordance with Annex 12 of the EIAO-TM, Air Sensitive Receivers (ASRs) include domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre. Any other premises or places with which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants as the aforelisted premises and places would also be considered as a sensitive receiver.

3.3.1.2 The alignment of Project can be generally divided into three sections, including areas of Lam Tei, Sam Shing and Pillar Point. Detailed description of the alignment shall be referred to **Section 2** and **Figure 1.1**.

3.3.1.3 Representative ASRs within the boundary of the Assessment Area (i.e. 500m from the boundary of the Project Site and associated works and temporary work site / works area during construction phase, and 500m from the Project Road and highway / tunnel operation and maintenance facilities during operational phase) have been identified. These ASRs include existing, committed and planned ASRs.

3.3.1.4 Existing ASRs are identified by means of topographic maps, aerial photos, building plans, and are verified by site inspections. Representative ASRs are described in clusters as follows:

ASRs in Lam Tei	• Residential developments (e.g. The Sherwood, Botania Villa, GreenView and Fu Tai Estate), village houses (e.g. Nai Wai, Tsoi Yuen Tsuen, Fuk Hang Tsuen, Wo Ping San Tsuen and Fu Tei Ha Tsuen), recreational facilities (e.g. Fuk Hang Playground and Lam Tei Basketball Court), school (e.g. Madam Lau Kam Lung Secondary School Of Miu Fat Buddhist Monastery), as well as temples (e.g. Miu Fat Buddhist Monastery and Tin Hau Temple)
ASRs in Pillar Point	• Government, institution and community facilities (e.g. Pillar Point Fire Station, Customs and Excise Department Harbour and River Trade Division, EMSD Vehicle Servicing Station, Administration Building of Pillar Point Sewage Treatment Works, Administration Building, Maintenance Depot Office and Kiosk of Tuen Mun - Chek Lap Kok Link, etc.), and various industrial premises and warehouses (e.g. sawmills, metal recycle or vehicle repairing workshops, Chu Kong warehouses, Sun Hing Logistics Centre, and Butterfly Beach Park etc. along Ho Yeung Street)
ASRs in Sam Shing	• Residential developments (e.g. Kam Fai Garden, Harvest Garden, Hoi Tak Garden, Alpine Garden and Dragon Inn Court), schools (e.g. CSBS Mrs. Aw Boon Haw Secondary School and Semple Memorial Secondary School), government, institution and community facilities (e.g. Caritas Li Ka Shing Care And Attention Home and Tuen Mun Siu Lun Government Complex), as well as recreational facilities (e.g. Tsing Sin Playground and Wah Fat Playground)

3.3.1.5 Planned/committed ASRs are identified by referring to the following relevant documents:

- Lam Tei and Yick Yuen Outline Zoning Plan (OZP) (No. S/TM – LTYY/12);
- Hung Shui Kiu and Ha Tsuen OZP (No. S/HSK/2);
- Tuen Mun OZP (No. S/TM/37);
- Tong Yan San Tsuen OZP (No. S/YL – TYST/14);

- Planning Applications under of S.16 / S.12a Town Planning Ordinance; and
- Land Sale Programme published by the Lands Department.

3.3.1.6 In addition to the developments planned / zoned according to the above plans, other planned / committed development projects within the assessment area have also been reviewed and identified. These include the Planned Public Housing in Hung Shui Kiu/Ha Tsuen New Development Area, Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun, as well as Planned Lam Tei North East Development. The planning information, tentative layout drawings and implementation programme of these concurrent development projects are provided by corresponding project proponents if available.

3.3.1.7 The planned population intake year for the Planned Public Housing in Hung Shui Kiu/Ha Tsuen New Development Area within the assessment area is 2030. For the Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun, the planned population intake year is under review at the time of preparation of this EIA report. Nonetheless, as checked with Civil Engineering and Development Department (CEDD), by the time when Tuen Mun Bypass (TMB) is commissioned (i.e. 2033), the existing premises or land within the areas shall have been resumed for these planned developments. Hence, only planned ASRs within these development areas are considered for operational air quality assessment.

3.3.1.8 The Planned Lam Tei North East Development is also identified as one of the concurrent development project within the Assessment Area. There is also no available information on the planned population intake year at the time of preparation of this EIA report. As confirmed by CEDD, since the Planned Lam Tei North East Development is still being under early feasibility study stage and the planning details of the development are not yet available during the course of this EIA Study, assessments on the Planned Lam Tei North East Development will be covered in its separate EIA. Hence, they are not included as ASRs in this EIA Study. Nonetheless, it is anticipated that the existing ASRs would still exist in the area after commissioning of TMB and before land resumption for the Planned Lam Tei North East Development, hence, the existing ASRs are considered in the assessment.

3.3.1.9 The locations of representative ASRs for air quality impact assessment are summarized in **Table 3.8** to **Table 3.10** and are shown in **Figures 3.2a** to **c** and **Figures 3.3a** to **c**. In addition to discrete ASRs, contour plots covering the whole 500m assessment area are also prepared at the worst affected level and worst scenario years to ensure no exceedance at all air sensitive areas, as shown in **Figure 3.6a** to **3.11c**. The selected ASRs and coverage of the assessment area in Lam Tei area are the same as those in Route 11(R11) EIA.

Table 3.8 Representative ASRs for Air Quality Impact Assessment in Lam Tei Area

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
Existing ASRs										
A001	Wo Ping San Tsuen House 198	Res	13.7	10	1.5	10	-	1250	1250	Both
A002	Wo Ping San Tsuen Village House	Res	18.2	10	1.5	10	-	1210	1210	Both
A003	Wo Ping San Tsuen Village House	Res	18.2	10	1.5	10	-	1200	1200	Both
A004	Wo Ping San Tsuen House 145	Res	16.4	10	1.5	10	-	1130	1130	Both
A008	Tsoi Yuen Tsuen House 283	Res	18.8	10	1.5	10	-	850	850	Both
A009	Tsoi Yuen Tsuen House 282	Res	18.1	10	1.5	10	-	800	820	Both
A010	Tsoi Yuen Tsuen House 74	Res	17.9	10	1.5	10	-	770	790	Both
A011	Fuk Hang Tsuen House 152	Res	17.8	10	1.5	10	-	720	740	Both
A012	Tsoi Yuen Tsuen Village House	Res	17.3	10	1.5	10	-	700	720	Both
A013	Tsoi Yuen Tsuen House 159	Res	15.2	10	1.5	10	-	690	710	Both
A014	Tsoi Yuen Tsuen Village House	Res	15.7	10	1.5	10	-	690	710	Both
A015	Tsoi Yuen Tsuen House 166	Res	13.8	10	1.5	10	-	680	710	Both
A016	Tsoi Yuen Tsuen House 189	Res	13.3	10	1.5	10	-	700	720	Both
A017	Tsoi Yuen Tsuen Village House	Res	12.2	10	1.5	10	-	700	730	Both
A020	Nai Wai House 332	Res	11.9	10	1.5	10	-	930	960	Both
A021	Nai Wai Village House	Res	10.4	10	1.5	10	-	1030	1060	Both
A022	Nai Wai House 248	Res	11.3	10	1.5	10	-	1080	1110	Both
A023	Nai Wai Village House	Res	10.5	10	1.5	10	-	1110	1140	Both
A024	Yorks Field Garden	Res	14.8	10	1.5	10	-	1210	1230	Both
A025	Tsoi Yuen Tsuen House 211A	Res	12.8	10	1.5	10	-	970	990	Both
A026	Nai Wai Temple	Wor	12.3	10	1.5	10	-	1100	1120	Both
A027	Nai Wai House 158	Res	12.3	10	1.5	10	-	1070	1090	Both
A028	Belrose Place Block A	Res	10.7	10	1.5	10	-	1160	1190	Both
A029	Tsing Yick Road Village House	Res	8.9	10	1.5	10	-	1250	1280	Both
A030	Tsing Yick Road Village House	Res	8.7	10	1.5	10	-	1260	1290	Both
A031	Lam Tei Pet Garden	Rec	9.7	N/A	1.5	1.5	-	1070	1100	Both
A032	Fuk Hang Playground Basketball Court	Rec	9.1	N/A	1.5	1.5	-	1060	1090	Both
A033	Fuk Hang Tsuen Road House 2	Res	10	10	1.5	10	-	1020	1050	Both
A034	Fuk Hang Tsuen Road House 11	Res	10.5	10	1.5	10	-	970	1000	Both
A035	Fuk Hang Tsuen Road Garden	Rec	10.4	N/A	1.5	1.5	-	950	980	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
A036	Fuk Hang Tsuen Road House 18	Res	10.9	10	1.5	10	-	900	930	Both
A037	Fortress Garden Block 8	Res	9	10	1.5	10	-	1210	1240	Both
A038	Tuen Tsz Wai Village House	Res	8	10	1.5	10	-	1120	1150	Both
A039	Tuen Tsz Wai House 565	Res	8.7	10	1.5	10	-	1100	1130	Both
A040	Farmer Restaurant	Com	8.7	15	1.5	15	-	1050	1080	Both
A041	Miu Fat Buddhist Monastery Ksitigarbha Hall	Wor	10.5	5	1.5	5	-	980	1010	Both
A042	Miu Fat Buddhist Monastery	Wor	8.5	35	1.5	50	-	1000	1030	Both
A043	Madam Lau Kam Lung Secondary School of Miu Fat Buddhist Monastery	Edu	9.1	25	1.5	30	-	970	1000	Both
A044	Miu Fat Buddhist Monastery Elderly Home	Res	10.9	25	1.5	30	-	950	980	Both
A045	Temple at Lam Tei	Wor	10.4	5	1.5	1.5	-	940	970	Both
A046	Lam Tei House 20	Res	10.1	10	1.5	10	-	900	930	Both
A047	The Sherwood Block 1	Res	11.1	50	1.5	50	-	940	970	Both
A048	The Sherwood Block 2	Res	11.1	50	1.5	50	-	920	950	Both
A049	The Sherwood Block 3	Res	11.1	50	1.5	50	-	900	930	Both
A050	The Sherwood Block 4	Res	11.1	50	1.5	50	-	890	920	Both
A051	The Sherwood Block 5	Res	11.1	50	1.5	50	-	870	900	Both
A052	The Sherwood Podium	Com	11.4	5	1.5	5	-	830	860	Both
A053	The Sherwood Block 13	Res	11.4	45	1.5	50	-	800	830	Both
A054	The Sherwood Block 12	Res	11.4	45	1.5	50	-	770	800	Both
A055	The Sherwood Block 11	Res	11.4	45	1.5	50	-	750	780	Both
A056	The Sherwood Block 10	Res	11.4	45	1.5	50	-	720	750	Both
A057	The Sherwood Block 9	Res	11.4	45	1.5	50	-	700	730	Both
A058	Lam Tei Main Street House 88	Res	13	10	1.5	10	-	790	820	Both
A059	Tuen Mun San Tsuen House 110	Res	11.9	10	1.5	10	-	710	740	Both
A060	Store at Lam Tei Main Street House 128	Com	14.5	10	1.5	10	-	650	680	Both
A061	Botania Villa Block 1	Res	11.5	45	1.5	50	-	670	700	Both
A062	Botania Villa Podium	Rec	11.5	5	1.5	5	-	640	670	Both
A063	Botania Villa Block 10	Res	11.5	45	1.5	50	-	610	640	Both
A064	GreenView Podium	Rec	15	5	1.5	5	-	600	630	Both
A065	GreenView	Res	15	45	1.5	50	-	580	610	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
A066	Botania Villa Block 9	Res	11.5	45	1.5	50	-	560	590	Both
A067	Fuk Hang Tsuen House 12	Res	13.3	10	1.5	10	-	620	650	Both
A068	The Church of Christian Faith Lam Tei Gospel Church	Wor	14.9	5	1.5	5	-	600	630	Both
A069	Property Agency at Fuk Hang Tsuen Road	Res	14.1	5	1.5	1.5	-	630	660	Both
A070	Fuk Hang Tsuen House 25	Res	14.4	10	1.5	10	-	540	570	Both
A071	Fuk Hang Tsuen House 458	Res	14.1	10	1.5	10	-	520	540	Both
A072	Fuk Hang Tsuen Village House	Res	19.3	10	1.5	10	-	510	530	Both
A073	Fuk Hang Tsuen Village House	Res	19.6	10	1.5	10	-	480	500	Both
A074	Fuk Hang Tsuen Village House	Res	15.7	10	1.5	10	-	470	490	Both
A075	Fuk Hang Tsuen Village House	Res	16	10	1.5	10	-	440	470	Both
A076	Fuk Hang Tsuen Houses 59-61	Res	17.1	10	1.5	10	-	430	460	Both
A077	Church of Christian Faith Lam Tei Gospel Church	Wor	17.8	10	1.5	10	-	440	470	Both
A078	Fuk Hang Tsuen Village House	Res	17.1	10	1.5	10	-	440	470	Both
A079	Tin Hau Temple at Fuk Hang Tsuen Road	Wor	17.3	5	1.5	1.5	-	410	440	Both
A080	Tuen Mun Heung Fuk Hang Tsuen Village Office	GIC	17.3	10	1.5	10	-	410	440	Both
A081	Lam Tei Fa Pao Association	GIC	12	5	1.5	1.5	-	470	500	Both
A082	Fuk Hang Tsuen House 130	Res	11.6	10	1.5	10	-	410	440	Both
A083	Fuk Hang Tsuen Village House	Res	10.9	10	1.5	10	-	450	480	Both
A084	Fuk Hang Tsuen Village House	Res	9	10	1.5	10	-	500	530	Both
A085	To Yuen Wai House 160	Res	8.5	10	1.5	10	-	570	600	Both
A086	To Yuen Wai House 85	Res	9.9	10	1.5	10	-	700	N/A	Construction [8]
A087	Tan Kwai Tsuen Village House	Res	21.4	10	1.5	10	-	1160	1160	Both
A088	Tung Fuk Road Village House	Res	25.7	10	1.5	10	-	1020	1020	Both
A089	Tung Fuk Road Village House	Res	30.8	10	1.5	10	-	990	990	Both
A090	Tung Fuk Road Village House	Res	26.8	10	1.5	10	-	930	930	Both
A091	Tung Fuk Road Village House	Res	26.2	10	1.5	10	-	860	860	Both
A092	Tung Fuk Road Village House	Res	28.1	10	1.5	10	-	790	790	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
A093	Tung Fuk Road Village House	Res	25.6	10	1.5	10	-	740	740	Both
A094	Fuk Hang Tsuen House 178	Res	29.3	10	1.5	10	-	630	630	Both
A095	Fuk Hang Tsuen Village House	Res	26.4	10	1.5	10	-	600	600	Both
A096	Fuk Hang Tsuen Village House	Res	32.1	10	1.5	10	-	670	670	Both
A097	Tin Hau Temple at Fuk Hang Tsuen Path	Wor	29.6	5	1.5	1.5	-	610	610	Both
A098	Fuk Hang Tsuen Village House	Res	32.9	10	1.5	10	-	550	550	Both
A099	Fuk Hang Tsuen Village House	Res	30	10	1.5	10	-	440	440	Both
A100	Chui Fuk Road Village House	Res	19.2	10	1.5	10	-	200	220	Both
A101	Chui Fuk Road Village House	Res	23.5	10	1.5	10	-	160	180	Both
A102	Chui Fuk Road Village House	Res	29	10	1.5	10	-	120	130	Both
A103	Fu Fuk Road Village House	Res	16.7	10	1.5	10	-	160	180	Both
A104	Fu Tei Ha Tsuen Village House	Res	17.3	10	1.5	10	-	240	270	Both
A105	Fu Tei Ha Tsuen Village House	Res	17.7	10	1.5	10	-	280	310	Both
A106	Fu Tei Ha Tsuen Village House	Res	9.1	10	1.5	10	-	330	360	Both
A107	Fu Tei Ha Tsuen Village House	Res	7.6	10	1.5	10	-	490	510	Both
A108	Fu Tei Ha Tsuen Village House	Res	7.1	10	1.5	10	-	550	580	Both
A109	Fu Tei Ha Tsuen House 52	Res	7.3	10	1.5	10	-	670	N/A	Construction [8]
A110	Fu Tei Ha Tsuen Village House	Res	18.3	10	1.5	10	-	100	120	Both
A111	Sin Fat Hang Yuen Temple	Wor	27.5	5	1.5	1.5	-	160	190	Both
A112	Nam On Buddhist Monastery	Wor	18.5	5	1.5	1.5	-	170	190	Both
A113	Fu Tei Ha Tsuen Village House	Res	20.5	10	1.5	10	-	250	270	Both
A114	Fu Tei Ha Tsuen Village House	Res	14.9	10	1.5	10	-	250	280	Both
A115	Fu Tei Ha Tsuen Village House	Res	12.4	10	1.5	10	-	350	380	Both
A116	Fu Tai Estate - Ning Tai House	Res	15	120	1.5	120	-	480	500	Both
A117	Fu Tai Estate - Yat Tai House	Res	12	120	1.5	120	-	530	550	Both
A118	Fu Tai Estate - Yan Tai House	Res	13	120	1.5	120	-	560	N/A	Construction [8]
A119	Fu Tai Estate - Oi Tai House	Res	11	115	1.5	120	-	610	N/A	Construction [8]

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
Planned/Committed ASRs										
P001	Proposed Public Housing at Ping Shan South and Podium with potential non-domestic facilities [7]	Res/ GIC/ Com	13	170	1.5	180	N/A	1380	1380	Both
P002a	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	19	160	1.5	180	N/A	1020	1020	Both
P002b	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	19	160	1.5	180	N/A	990	990	Both
P002c	Podium with potential non-domestic facilities for Proposed Public Housing at Lam Tei North	GIC/ Com	19	15	1.5	15	N/A	980	980	Both
P003a	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	18	160	1.5	180	N/A	920	940	Both
P003b	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	18	160	1.5	180	N/A	970	990	Both
P003c	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	18	160	1.5	180	N/A	1000	1010	Both
P004a	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	20	160	1.5	180	N/A	890	900	Both
P004b	Proposed Public Housing at Lam Tei North and Podium with potential non-domestic facilities	Res/ GIC/ Com	20	160	1.5	180	N/A	940	950	Both
P005a	Proposed Public Housing at Lam Tei North	Res	20	160	1.5	180	N/A	910	910	Both
P005b	Proposed Public Housing at Lam Tei North	Res	20	160	1.5	180	N/A	890	890	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
P006	Proposed Temporary Place of Recreation, Sports or Culture (Indoor Recreation Centre)	Rec	17	5	1.5	1.5	N/A	800	810	Both
P007a	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	13	180	1.5	180	N/A	790	820	Both
P007b	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	13	180	1.5	180	N/A	820	850	Both
P008a	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	12	180	1.5	180	N/A	740	770	Both
P008b	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	12	180	1.5	180	N/A	790	820	Both
P008c	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	12	180	1.5	180	N/A	810	830	Both
P008d	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	12	180	1.5	180	N/A	770	800	Both
P009a	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	10	180	1.5	180	N/A	810	830	Both
P009b	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	10	180	10	180	N/A	840	860	Both
P010	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	12	180	10	180	N/A	860	890	Both
P011	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	10	180	1.5	180	N/A	910	940	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
P012a	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	10	180	1.5	180	N/A	990	1020	Both
P012b	Proposed Public Housing at Nai Wai and Podium with potential non-domestic facilities [6]	Res/ GIC/ Com	10	180	1.5	180	N/A	1050	1070	Both
P013a	Planned Public Housing in Hung Shui Kiu/Ha Tsuen New Development Area and Podium with Retail Use	Res/ Com	11	160	1.5	180	2030	1280	1310	Both
P014	Proposed Development of Elderly Home by Pok Oi Hospital	Res	12.8	60	1.5	80	2026	810	840	Both
P015	Proposed Development of Elderly Home by Pok Oi Hospital	Res	13.4	60	1.5	80	2026	740	770	Both
P016	Proposed Development of Elderly Home by Pok Oi Hospital	Res	13	60	1.5	80	2026	670	700	Both
P017	Proposed Comprehensive Development Area in Lot 2883 in D.D. 130	Res	14.5	15	1.5	15	N/A	560	590	Both
P018	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	Res	16.5	40	1.5	50	N/A	500	530	Both
P019	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	Res	17.3	40	1.5	50	N/A	430	460	Both
P020	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	Res	18.5	40	1.5	50	N/A	380	410	Both
P021	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	Res	19.5	40	1.5	50	N/A	400	430	Both
P022	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	Res	20.6	40	1.5	50	N/A	370	390	Both

ASR ID [1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
P025	Temporary Place of Recreation, Sports or Culture (Sports Training Ground)	Rec	30.3	15	1.5	15	N/A	480	480	Both

Notes:

[1] ASR ID A005 to A007, A018, A019, P023 and P024 are not used.

[2] Com – Commercial; Edu – Education; GIC – Government, Institution and Community; Hos – Hospital/Clinic; Off – Office; Rec – Park/ Recreational; Res – Residential; and Wor – Worship.

[3] ASR location, height, the lowest and highest floor with air sensitive use (i.e. lowest and highest assessment heights) are determined based on site survey, building plan and latest layout plan, where available and applicable. For all planned ASRs, the lowest assessment height is assumed to be 1.5m, except those ASRs located above planned PTIs.

[4] Building heights are rounded up to the nearest 5m. Height of village houses are assumed to be 10m, which is the common height of a typical 3-storey village house.

[5] The assessment heights are set at 10 levels (1.5, 5, 10, 15, 20, 30, 50, 80, 120 and 180 mAG) (see details in **Table 3.21**). The highest assessment height of each ASR has covered the top level of the building, e.g. for P021, the building height is 40m, the highest assessment height is up to 50m.

[6] Population intake years are only presented for committed/planned ASRs. For those without confirmed population intake programme, it is indicated as N/A in the table. For committed/planned developments with development programme to be implemented before commissioning of TMB, only planned ASRs in the development area have been included in the assessment. There is no confirmed programme on population intake for Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun. As checked with CEDD, the existing premises and land within the areas shall have been resumed for these planned developments by the time when TMB is commissioned. Hence, only planned ASRs within these development areas are included for operational air quality assessment. For other committed/planned developments where there is no available information on the programme on both population intake and land resumption, both existing and planned ASRs in the development area have been included in the assessment. The locations of representative ASRs for Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai are based on conceptual plan provided by CEDD. For planned development where layout plan is not available, minimum setback distance from the respective roads according to the Hong Kong Planning Standards and Guidelines would be adopted.

[7] The Project during Construction Phase refers to the boundary of the Project Site and associated works and temporary work site / works area, and the Project during Operation Phase refers to road and highway / tunnel and their associated operation and maintenance facilities during operational phase. The selected ASRs and coverage of the assessment area in Lam Tei area are the same as those in R11 EIA. The distance of ASRs to the Project TMB might be over 500m.

[8] These ASRs are representative ASRs during construction phase only since they are beyond 500m assessment area of operational phase.

Table 3.9 Representative ASRs for Air Quality Impact Assessment in Pillar Point Area

ASR ID[1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
Existing ASRs										
A401	TMCLK Main Control Building FAI [8]	Off	19.6	N/A	2.7	2.7	-	30	40	Both
A402	TMCLK Main Control Building Windows [8]	Off	19.6	N/A	5	15	-	30	40	Both
A403	Butterfly Beach Laundry	Ind	5.8	20	1.5	20	-	40	50	Both
A404	Butterfly Beach Laundry	Ind	5.8	20	1.5	20	-	80	90	Both
A405	Metal Recycle or Vehicle Repairing Workshop	Ind	5.8	10	1.5	10	-	60	70	Both
A406	Metal Recycle or Vehicle Repairing Workshop	Ind	5.6	10	1.5	10	-	90	90	Both
A407	Metal Recycle or Vehicle Repairing Workshop	Ind	5.6	10	1.5	10	-	90	90	Both
A408	Metal Recycle or Vehicle Repairing Workshop	Ind	6	10	1.5	10	-	60	70	Both
A409	Metal Recycle or Vehicle Repairing Workshop	Ind	5.8	10	1.5	10	-	90	90	Both
A410	Sawmill at 25-33 Ho Yeung Street	Ind	6	10	1.5	10	-	110	120	Both
A411	Sawmill at 25-33 Ho Yeung Street	Ind	6	10	1.5	10	-	180	190	Both
A412	Sawmill at 25-33 Ho Yeung Street	Ind	6	10	1.5	10	-	100	120	Both
A413	Sawmill at 25-33 Ho Yeung Street	Ind	6	10	1.5	10	-	140	190	Both
A414	Sawmill at 25-33 Ho Yeung Street	Ind	6	15	1.5	15	-	100	180	Both
A415	Sawmill at 61-69 Ho Yeung Street	Ind	6	10	1.5	10	-	70	190	Both
A416	Sawmill at 61-69 Ho Yeung Street	Ind	5.8	10	1.5	10	-	90	110	Both
A417	Sawmill at 81-85 Ho Yeung Street	Ind	5.5	5	1.5	5	-	40	110	Both
A418	Sawmill at 81-85 Ho Yeung Street	Ind	6	10	1.5	10	-	20	130	Both
A419	Sawmill at 81-85 Ho Yeung Street	Ind	6	10	1.5	10	-	30	190	Both
A420	Sunhing Hungkai Tuen Mun	Ind	6	20	1.5	20	-	60	70	Both
A421	Pillar Point Fire Station [8]	GIC	5.9	15	6	15	-	40	60	Both
A422	Sunhing Hungkai Tuen Mun	Ind	5.5	20	1.5	20	-	50	70	Both

ASR ID[1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
A423	Pillar Point Fire Station [8]	GIC	5.9	15	6	15	-	30	90	Both
A424	Sunhing Hungkai Tuen Mun	Ind	5.8	20	1.5	20	-	80	100	Both
A425	Chu Kong Warehouse Block 2	Ind	6	20	1.5	20	-	10	40	Both
A426	Chu Kong Warehouse Block 1	Ind	6	20	1.5	20	-	<10	130	Both
A427	TMCLK Kiosk N2 FAI [8]	Off	5.5	N/A	2.5	2.5	-	<10	300	Both
A428	TMCLK Maintenance Depot Office Windows [8]	Off	6.1	N/A	2.5	2.5	-	50	300	Both
A429	TMCLK Administration Building [8]	Off	6.3	10	1.5	10	-	80	380	Both
A430	Customs and Excise Department Harbour and River Trade Division FAI [8]	Off	5.6	N/A	19.7	19.7	-	50	50	Both
A431	EMSD Tuen Mun Vehicle Servicing Station	Off/ Ind	12	10	1.5	10	-	Within Boundary	20	Both
A432	Administration Building of Pillar Point Sewage Treatment Works	Off	5.5	10	1.5	10	-	30	50	Both
A433	Goodman Westlink	Off/ Ind	9.5	20	1.5	20	-	100	260	Both
C401	Hong Kong Science Museum Exhibition Workshop	Off/ Ind	12.5	15	1.5	10	-	90	N/A	Construction [9]
C402	Tuen Mun Fireboat Station	GIC	4.9	5	1.5	1.5	-	110	N/A	Construction [10]
C403	Tuen Mun Customs Marine Base	Off	4.9	10	1.5	10	-	160	N/A	Construction [10]
C404	Immigration Department Harbour Division River Trade	Off	5	5	1.5	1.5	-	220	N/A	Construction [10]
C405	Chu Kong Shipping Company Limited	Off/ Ind	5.7	5	1.5	1.5	-	60	N/A	Construction [10]
C406	Chu Kong Shipping Company Limited	Off/ Ind	5.5	10	1.5	10	-	<10	N/A	Construction [10]
C407	Tuen Mun Customs Marine Base	Off	6.1	20	1.5	20	-	20	N/A	Construction [10]
C408	Tuen Mun Fireboat Station	GIC	6.2	10	1.5	10	-	20	N/A	Construction [10]

ASR ID[1]	Location	Land Use [2]	Base Elevation (mPD)	Building Height [3] [4] (mAG)	Lowest Assessment Height [3] (mAG)	Highest Assessment Height [3] [5] (mAG)	Intake Year [6]	Approx. distance from Project during Construction Phase [7] (m)	Approx. distance from Project during Operational Phase [7] (m)	Operation/ Construction Phase ASR
C410	WEEE · PARK	Ind/ Off	6.4	15	1.5	15	-	310	N/A	Construction [10]
C411	WEEE · PARK	Ind/ Off	6.5	5	1.5	5	-	300	N/A	Construction [10]

Notes:

[1] ASR ID C409 is not used.

[2] Com – Commercial; Edu – Education; GIC – Government, Institution and Community; Hos – Hospital/Clinic; Off – Office; Rec – Park/ Recreational; Res – Residential; and Wor – Worship.

[3] ASR location, height, the lowest and highest floor with air sensitive use (i.e. lowest and highest assessment heights) are determined based on site survey, building plan and latest layout plan, where available and applicable. For all planned ASRs, the lowest assessment height is assumed to be 1.5m.

[4] Building heights are rounded up to the nearest 5m. Height of village houses are assumed to be 10m, which is the common height of a typical 3-storey village house.

[5] The assessment heights are set at 10 levels (1.5, 5, 10, 15, 20, 30, 50, 80, 120 and 180 mAG) (see details in **Table 3.21**). The highest assessment height of each ASR has covered the top level of the building, e.g. for P021, the building height is 40m, the highest assessment height is up to 50m.

[6] Population intake years are only presented for committed/planned ASRs. There is no planned/committed ASRs in Pillar Point Area.

[7] The Project during Construction Phase refers to the boundary of the Project Site and associated works and temporary work site / works area, and the Project during Operation Phase refers to road and highway / tunnel and their associated operation and maintenance facilities during operational phase.

[8] Window/ FAI heights are based on information and layout drawings provided by the respective operators and government departments.

[9] These ASRs are not representative ASRs during operational phase since there are other ASRs which are located closer to the project alignment and their associated operation and maintenance facilities, and are more representative. Nonetheless, they are also covered in the contour plots.

[10] These ASRs are not representative ASRs during operational phase since they are beyond 500m assessment area of operational phase.

Table 3.10 Representative ASRs for Air Quality Impact Assessment in Sam Shing Area

ASR ID	Location	Land Use [1]	Base Elevation (mPD)	Building Height [2] [3] (mAG)	Lowest Assessment Height [2] (mAG)	Highest Assessment Height [2] [4] (mAG)	Intake Year [5]	Approx. distance from Project during Construction Phase [6] (m)	Approx. distance from Project during Operational Phase [6] (m)	Operation/ Construction Phase ASR
Existing ASRs										
A301	Handsome Court Block 4	Res	6.1	60	1.5	80	-	340	370	Both
A302	Handsome Court Block 7	Res	6.1	60	1.5	80	-	240	270	Both
A303	Alpine Garden Block 2	Res	7.2	55	1.5	80	-	180	210	Both
A304	Alpine Garden Block 5	Res	7.2	55	1.5	80	-	80	110	Both
A305	Hoi Tak Garden Block 3	Res	8.8	45	1.5	50	-	40	50	Both
A306	Harvest Garden Block 3	Res	5.9	60	1.5	80	-	50	50	Both
A307	Harvest Garden Block 2	Res	5.9	60	1.5	80	-	50	50	Both
A308	Harvest Garden Block 1	Res	5.9	60	1.5	80	-	50	50	Both
A309	Kam Fai Garden Block 1	Res	7.8	55	1.5	80	-	70	70	Both
A310	Podium for Kam Fai Garden	Rec	8.5	10	1.5	10	-	30	30	Both
A311	Kam Fai Garden Block 4	Res	8.5	55	1.5	80	-	20	20	Both
A312	Kam Fai Garden Block 3	Res	8.5	55	1.5	80	-	80	70	Both
A313	Caritas Li Ka Shing Care and Attention Home	Others	25.5	15	1.5	15	-	30	70	Both
A314	Chi Lok Fa Yuen Stores	Com	5	5	1.5	1.5	-	330	360	Both
A315	Chi Lok Fa Yuen Block 8	Res	5	50	1.5	50	-	290	320	Both
A316	Taoist Association Yuen Yuen Primary School	Edu	5	25	1.5	30	-	280	300	Both
A317	Rainbow Garden Block B	Res	4.1	60	1.5	80	-	220	240	Both
A318	JC Place Tower 3	Res	4	50	1.5	50	-	160	170	Both
A319	JC Place Tower 1	Res	4	50	1.5	50	-	160	160	Both
A320	Tsing Sin Playground	Rec	5.8	N/A	1.5	1.5	-	140	140	Both
A321	Tai Tung Pui Care & Attention Home	Others	4.8	40	1.5	50	-	210	200	Both
A322	Hong King Garden Block B	Res	5.4	55	1.5	80	-	240	250	Both
A323	Tuen Mun Siu Lun Government Complex	Off	5.6	40	1.5	50	-	130	210	Both
A324	Chung Sing Benevolent Society Mrs. Aw Boon Haw Secondary School	Edu	6.2	30	1.5	30	-	110	290	Both

ASR ID	Location	Land Use [1]	Base Elevation (mPD)	Building Height [2] [3] (mAG)	Lowest Assessment Height [2] (mAG)	Highest Assessment Height [2] [4] (mAG)	Intake Year [5]	Approx. distance from Project during Construction Phase [6] (m)	Approx. distance from Project during Operational Phase [6] (m)	Operation/ Construction Phase ASR
A325	Semple Memorial Secondary School	Edu	6	25	1.5	30	-	140	360	Both
A326	Sam Shing Temple	Wor	30.5	10	1.5	10	-	90	230	Both
A327	Ki Lun Kong Public Park	Rec	4.5	N/A	1.5	1.5	-	90	360	Both
A328	The Salvation Army Sam Shing Nursery School	Edu	4.5	5	1.5	1.5	-	170	410	Both
A329	Palm Cove Tower 5	Res	18.1	45	1.5	50	-	180	320	Both
A330	Palm Cove Tower 3	Res	6.5	55	1.5	80	-	230	340	Both
A331	Palm Cove Tower 1	Res	6.5	55	1.5	80	-	290	390	Both
A332	Tsing Ha Lane Village House	Res	19	10	1.5	10	-	320	340	Both
A333	Dragon Villa	Res	9.6	35	1.5	50	-	350	390	Both
A334	Dragon Inn Court Block 4	Res	14.3	55	1.5	80	-	310	310	Both
A335	Dragon Inn Seafood Restaurant	Com	22	20	1.5	20	-	300	310	Both
A336	Tsing Yung Terrace Tower 1	Res	47.5	90	1.5	120	-	350	360	Both
A337	Tsing Yung Terrace Club House	Rec	55.5	5	1.5	1.5	-	400	400	Both
A338	Podium for Faraday House	Rec	39.7	10	1.5	10	-	420	430	Both
A339	Faraday House Block 1	Res	39.7	45	1.5	50	-	440	450	Both
A340	Wah Fat Playground	Rec	18.4	N/A	1.5	1.5	-	N/A	Within Boundary	Operation [7]
C301	Tuen Mun Siu Lun Government Complex	Off	5.6	40	1.5	50	-	100	N/A	Construction [8]
C302	CSBS Mrs. Aw Boon Haw Secondary School Basketball Court	Rec	6.2	N/A	1.5	1.5	-	80	N/A	Construction [8]
C303	Siu Lun Court Sui Lun House	Res	5.2	100	1.5	120	-	130	N/A	Construction [9]
C304	Hanford Garden Podium	Com	4.6	15	1.5	15	-	70	N/A	Construction [8]
C305	Sam Shing Hui Village Office	GIC/ Off	17.7	5	1.5	1.5	-	30	N/A	Construction [8]
C306	Sam Shing Temple	Wor	30.5	10	1.5	10	-	60	N/A	Construction [8]

ASR ID	Location	Land Use [1]	Base Elevation (mPD)	Building Height [2] [3] (mAG)	Lowest Assessment Height [2] (mAG)	Highest Assessment Height [2] [4] (mAG)	Intake Year [5]	Approx. distance from Project during Construction Phase [6] (m)	Approx. distance from Project during Operational Phase [6] (m)	Operation/ Construction Phase ASR
C307	Hanford Garden Block 2 and Podium	Res/Com	4.6	95	1.5	120	-	40	N/A	Construction [8]
C308	Sam Shing Estate Chun Yu House	Res	4.4	70	1.5	80	-	50	N/A	Construction [8]
C309	The Salvation Army Sam Shing Transitional Housing	Res	4.5	25	1.5	30	-	110	N/A	Construction [8]
C310	On Ting Estate Ting Tak House	Res	5.6	50	1.5	50	-	200	N/A	Construction [9]
C311	Yau Oi Estate Oi Yee House	Res	5.2	65	1.5	80	-	50	N/A	Construction [9]
C312	Yau Oi Estate Football Field	Rec	4.9	N/A	1.5	1.5	-	40	N/A	Construction [9]
C313	Yau Oi Estate Oi Shun House	Res	4.9	65	1.5	80	-	60	N/A	Construction [9]
C314	Yau Oi Sports Centre	Rec	4.8	15	1.5	15	-	80	N/A	Construction [9]
C315	Yan Chai Hospital Ho Sik Nam Primary School	Edu	4.8	25	1.5	30	-	120	N/A	Construction [9]
C316	Yan Chai Hospital Ho Sik Nam Primary School Basketball Court	Rec	4.8	N/A	1.5	1.5	-	100	N/A	Construction [9]
C317	Fung On Street Children's Playground	Rec	5.3	N/A	1.5	1.5	-	10	N/A	Construction [9]
C318	Goodview Garden Tower 1	Res	4.2	105	1.5	120	-	30	N/A	Construction [9]
C319	Tsui Ning Garden Block 1	Res	4.7	100	1.5	120	-	30	N/A	Construction [9]
C320	Pok Oi Hospital Tuen Mun Nursing Home	Res	5.7	25	1.5	30	-	170	N/A	Construction [9]
Planned/Committed ASRs										
P301	Proposed Reprovision of Wah Fat Playground	Rec	4.7	N/A	1.5	1.5	2025	Within Boundary	N/A	Construction [7]

Notes:

[1] Com – Commercial; Edu – Education; GIC – Government, Institution and Community; Hos – Hospital/Clinic; Off – Office; Rec – Park/ Recreational; Res – Residential; and Wor – Worship.

[2] ASR location, height, the lowest and highest floor with air sensitive use (i.e. lowest and highest assessment heights) are determined based on site survey, building plan and latest layout plan, where available and applicable. For all planned ASRs, the lowest assessment height is assumed to be 1.5m.
[3] Building heights are rounded up to the nearest 5m. Height of village houses are assumed to be 10m, which is the common height of a typical 3-storey village house.
[4] The assessment heights are set at 10 levels (1.5, 5, 10, 15, 20, 30, 50, 80, 120 and 180 mAG) (see details in **Table 3.21**). The highest assessment height of each ASR has covered the top level of the building, e.g. for P021, the building height is 40m, the highest assessment height is up to 50m.
[5] Population intake years are only presented for committed/planned ASRs.
[6] The Project during Construction Phase refers to the boundary of the Project Site and associated works and temporary work site / works area, and the Project during Operation Phase refers to road and highway / tunnel and their associated operation and maintenance facilities during operational phase.
[7] The Wah Fat Playground (A340) would be used as construction works area during construction phase of the Project and then would be re-instated during operational phase of the Project. There would be no recreational uses at Wah Fat Playground during construction phase and hence it is not considered as ASR during construction stage. There would be temporary Reprovision of Wah Fat Playground (P301) during construction phase of the Project and it would no longer exist after commencement of the Project (i.e. 2033). Hence, it is not considered as representative ASR during operational phase.
[8] These ASRs are not representative ASRs during operational phase since there are other ASRs which are located closer to the project alignment and their associated operation and maintenance facilities, and are more representative. Nonetheless, they are also covered in the contour plots.
[9] These ASRs are not representative ASRs during operational phase since they are beyond 500m assessment area of operational phase.

Table 3.11 Representative ASRs for Air Quality Impact Assessment in Siu Lam Area

ASR ID	Location	Land Use [1]	Base Elevation (mPD)	Building Height [2] [3] (mAG)	Lowest Assessment Height [2] (mAG)	Highest Assessment Height [2] [4] (mAG)	Intake Year [5]	Approx. distance from Project during Construction Phase[6] (m)	Approx. distance from Project during Operational Phase[6] (m)	Operation/ Construction Phase ASR
Existing ASRs										
C501	Siu Lam Village House	Res	46.5	10	1.5	10	-	450	N/A	Construction [7]
C502	Siu Lam Village House	Res	42.9	10	1.5	10	-	420	N/A	Construction [7]
C503	Treatment Centre – Glorious Praise Fellowship (Hong Kong)	GIC	35.5	10	1.5	10	-	390	N/A	Construction [7]
C504	Siu Lam Village House	Res	30.6	10	1.5	10	-	360	N/A	Construction [7]
C505	Siu Lam Village House	Res	31.2	10	1.5	10	-	400	N/A	Construction [7]
C506	Peak Castle House 22	Res	35	20	1.5	20	-	400	N/A	Construction [7]
C507	1001 Grandview Terrace	Res	98.8	10	1.5	10	-	210	N/A	Construction [7]
C508	1002 Grandview Terrace	Res	84.1	10	1.5	10	-	300	N/A	Construction [7]

ASR ID	Location	Land Use [1]	Base Elevation (mPD)	Building Height [2] [3] (mAG)	Lowest Assessment Height [2] (mAG)	Highest Assessment Height [2] [4] (mAG)	Intake Year [5]	Approx. distance from Project during Construction Phase[6] (m)	Approx. distance from Project during Operational Phase[6] (m)	Operation/ Construction Phase ASR
C509	1005 Grandview Terrace	Res	99.1	10	1.5	10	-	290	N/A	Construction [7]
C510	A.D.& F.D. Of Pok Oi Hospital Mrs Cheng Yam On Millennium School	Edu	30.1	30	1.5	30	-	490	N/A	Construction [7]
C511	Lepont Tower 3B	Res	29.1	65	1.5	80	-	390	N/A	Construction [7]
C512	Siu Lam Village House	Res	9.5	10	1.5	10	-	340	N/A	Construction [7]
C513	So Kwun Wat San Tsuen Area 3 House 23	Res	7.8	10	1.5	10	-	390	N/A	Construction [7]
C514	So Kwun Wat San Tsuen Village House	Res	8.7	10	1.5	10	-	340	N/A	Construction [7]
C515	So Kwun Wat San Tsuen House 45	Res	11.6	10	1.5	10	-	350	N/A	Construction [7]

Notes:

[1] Com – Commercial; Edu – Education; GIC – Government, Institution and Community; Hos – Hospital/Clinic; Off – Office; Rec – Park/ Recreational; Res – Residential; and Wor – Worship.

[2] ASR location, height, the lowest and highest floor with air sensitive use (i.e. lowest and highest assessment heights) are determined based on site survey, building plan and latest layout plan, where available and applicable. For all planned ASRs, the lowest assessment height is assumed to be 1.5m.

[3] Building heights are rounded up to the nearest 5m. Height of village houses are assumed to be 10m, which is the common height of a typical 3-storey village house.

[4] The assessment heights are set at 10 levels (1.5, 5, 10, 15, 20, 30, 50, 80, 120 and 180 mAG) (see details in **Table 3.21**). The highest assessment height of each ASR has covered the top level of the building, e.g. for P021, the building height is 40m, the highest assessment height is up to 50m.

[5] Population intake years are only presented for committed/planned ASRs. There is no planned/committed ASRs in Siu Lam Area.

[6] The Project during Construction Phase refers to the boundary of the Project Site and associated works and temporary work site / works area, and the Project during Operation Phase refers to road and highway / tunnel and their associated operation and maintenance facilities during operational phase.

[7] These ASRs are not representative ASRs during operational phase since they are beyond 500m assessment area of operational phase.

3.4 Construction Impacts

3.4.1 General

3.4.1.1 According to Clause 3.4.4.2 of the EIA Study brief (ESB – 348/2021), the assessment area for air quality impact assessment shall be defined by a distance of 500m from the boundary of the Project Area and the associated work sites / areas, which shall be extended to include major existing, committed and planned air pollutant emission sources identified to have a bearing on the environmental acceptability of the Project. **Figures 3.2a** to **d** illustrate the assessment area.

3.4.2 Identification of Pollution Sources and Emission Inventory

3.4.2.1 **Section 4.4.2** has discussed the tentative construction plant inventory envisioned at this stage. It is noted that the Contractor would consider the engineering data available at the time of construction, and review and update the tentative construction plant inventory as necessary. The Contractor would also review the contemporary circumstances and site constraints, and optimise the quantity of on-site machinery. This would help to reduce the gaseous and particulate matters emission for construction site. A summary of the key construction activities is given below.

- Site clearance and formation;
- Construction of at-grade/elevated carriageways and slip roads;
- Construction of satellite control buildings at Lam Tei;
- Construction of administration buildings at Pillar Point;
- Construction of ventilation buildings (VBs) at Lam Tei, Pillar Point and Sam Shing;
- Construction of tunnel sections from Lam Tei to Pillar Point;
- Construction of tunnel portal structures at Lam Tei and Pillar Point;
- Re-provisioning of basketball court, toilet and carpark at Sam Shing;
- Construction and demolition of explosive magazine sites;
- Construction and demolition of barging facilities, slurry treatment plant, haul roads, stockpiling areas etc;
- Slope works, including blasting works;
- Geotechnical works; and
- Landscaping works.

3.4.2.2 The key project-induced emission source that may potentially affect air quality during construction phase is the dust emission associated with various construction activities as discussed above. **Appendix 3.1** shows the tentative locations of the above key construction activities. These locations are the latest information at this stage and the Constructor will review and adjust during the construction phase as necessary. **Appendix 3.1** also includes the separation distances between representative ASRs and key construction activities. **Section 2.6** and **Section 2.9** have also summarised both the

construction methodology and construction programme envisioned at this stage. The tentative construction period is from Year 2025 to Year 2033, and the tentative typical working hours is 7:00am to 7:00pm from Monday to Saturday for general works and 24 hours a day for tunnelling works. The Detailed Designer and the Contractor would conduct a more detailed review on both the construction programme and construction methodology when more detailed engineering information and ground investigation (GI) data becomes available in the next stage.

3.4.2.3 Many of the above construction activities would involve earthworks of different scale. In order to reduce the associated dust emission, regular watering on all exposed construction areas with dust emission (see **Section 3.4.5**) as a good site practice will be implemented. Vehicle washing facilities will also be provided at every designated vehicular exit point. Since all vehicles will be washed at exit points and vehicle loaded with the dusty materials will be covered by clean and impervious sheeting before leaving construction sites, dust nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

3.4.3 Review of Dust Monitoring Data

3.4.3.1 A review of dust monitoring data during the construction phase of recent infrastructure projects, including Tung Chung New Town Extension (TCNTE), Central-Wan Chai Bypass (CWB), Central Kowloon Route (CKR) and Tseung Kwan O – Lam Tin Tunnel (TKOLTT), Development of Anderson Road Quarry site – Road Improvement Works (ARQRIW) and Widening and Reconstruction of Tai Po Road (Sha Tin Section) (TPR) have also been conducted. According to their respective EIA Reports, none of these projects has involved open blasting but different types of other construction activities have been carried out. TCNTE is a large-scale development project which involves a large extent of reclamation works (i.e. around 129ha) and the associated road works, while CWB, CKR and TKOLTT are mega road and tunnel projects with a smaller reclamation area ranging from around 1ha to around 4ha. Tunnelling works such as cut-and-cover, drill-and-blast as well as drill-and-break have been carried out. ARQRIW is a road improvement project with some slope-cutting works, while TPR is a road project of smaller scale, where both of them are located in close vicinity of ASRs. Good site practices and standard dust control measures such as regular watering were adopted in all these projects. Some existing ASRs were located in close vicinity of the construction works and therefore selected as Dust Monitoring Stations (DMSs) for impact monitoring during the construction phase of the projects. DMSs which are located close to the construction works of the abovementioned projects have been selected for review.

3.4.3.2 For TCNTE, 99% of the measured 1-hr TSP levels were below 200$\mu g/m^3$ and all of them were below 250 $\mu g/m^3$, in spite of the large extent of reclamation works of around 129ha and associated road works on the reclaimed land being carried out at a short distance of around 15m away from the DMS. Only 1 measurement event (i.e. 0.1% of the 858 measurement events in total) of exceedance of action level was recorded during the construction phase. It was also found that the exceedance was likely due to the hazy weather condition instead of the construction activities of the Project upon investigation. No exceedance of limit level was recorded.

3.4.3.3 For CKR, the selected DMSs were located at a distance of around 45m from the portal of drill-and-blast tunnel as well as cut-and-cover tunnel, and around 150m to around 210m from the reclamation works, and around 75m to the road works. The measured 1-hr TSP levels were very low and below 150μg/m^3. No exceedance of action levels nor limit levels was recorded.

3.4.3.4 For CWB, the selected DMSs were located at a distance of around 5m to 50m from the reclamation works, cut-and-cover tunnelling works and road works. It is observed that 95% to 99% of the measured 1-hr TSP levels were below 250μg/m^3, and most of the records were below 450μg/m^3 (only 1 measurement event above 500μg/m^3). Out of the 4002 measurement records, there were only 7 measurement events of exceedance of action level (<0.5%) and 1 measurement event of exceedance of limit level (<0.1%). All of the exceedances were not related to the construction of the projects. Despite that there was an exceedance of limit level recorded, it was due to the construction activities of other projects nearby as well as the high level of background air pollution as supported by the high air quality health index in that district on that day.

3.4.3.5 For TKOLTT, the selected DMS was located at a distance of around 15m from reclamation works and around 50m from the cut-and-cover tunnelling works. All of the measured 1-hr TSP levels were below 300μg/m^3. No exceedance of action levels nor limit levels was recorded.

3.4.3.6 For ARQ, the selected DMSs were located at a distance of around 8m to around 20m from the slope works and road works. Most of the measured 1-hr TSP levels (except 1 measurement event) were below 300μg/m^3, in spite of the very small separation distance from the construction works. Only 2 measurement events (i.e. 0.2% of the 831 measurement events in total) of exceedance of action level were recorded at one of the DMSs during the construction phase. It was also found that the exceedances were not related to the construction activities of the Project upon investigation. No exceedance of limit level was recorded.

3.4.3.7 For TPR, the selected DMSs were located at a distance of around 15m to around 175m from the road works. All of the measured 1-hr TSP levels were very low and below 150μg/m^3, in spite of the small separation distance from the construction works at some DMSs. No exceedance of action levels nor limit levels was recorded.

3.4.4 Prediction and Evaluation of Construction Impact

3.4.4.1 As discussed in **Section 2.8**, the Project comprises of a combination of tunnel, viaduct / at-grade road and vehicular bridge sections, etc. in different areas. The following sections discuss the prediction and evaluation of construction dust impacts for different areas.

Lam Tei Area

3.4.4.2 The construction works in Lam Tei Area include site formation works, slope works, stockpiling, haul roads, construction of the underground magazine site, construction of at-grade road, tunnel portal, satellite control building and ventilation building, in the vicinity of the existing Lam Tei Quarry. About 50% of the spoil generated by the Project in the vicinity of the Lam Tei Quarry would be conveyed back to the Lam Tei Quarry for processing and Lam Tei Quarry would have the capacity to handle those spoil. This would avoid unnecessary double handling of spoil and is a positive step to minimise dust

generation as much as practicable. Where practicable, a conveyor system would also be adopted to convey the spoil from tunnelling works to Lam Tei Quarry. The Contractor will review the possibility of powering the conveyor system by electricity to avoid gaseous emission from the conveyor system as far as practicable. This conveyor system would also be suitably installed with dust enclosure where practicable to minimise dust generation as well. This would also minimise on-site lorry movements and hence the associated dust generation.

3.4.4.3 The ASRs in the vicinity of existing Lam Tei Quarry include residential uses (e.g. village houses) in Fuk Hang Tsuen and those along Yuen Long Highway. The separation distance between the ASRs and slope works, tunnel portal, satellite control building, ventilation buildings, etc. would be generally in the order of more than 100m. As discussed in **Section 3.4.3**, the dust monitoring records from other infrastructure projects of similar scale and nature have demonstrated that dust impacts could be readily mitigated by good practices including but not limited to watering. Also, sequence of construction works would be adopted to avoid dusty construction activities to be carried out simultaneously close to ASRs as far as practicable. The Contractor shall consider actual site constraints and circumstances, and devise the practicable approach to implement suitable phasing. Hence, adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

3.4.4.4 Blasting will be required for construction of tunnel sections at Lam Tei and some of the slope works. For tunnel sections, the separation distances from the ASRs are in the order of more than 200m from the tunnel portal. Enclosures would be used to confine dust and filters would be installed at exhaust and fresh air intake (FAI) locations of the enclosures, with TSP and RSP removal efficiency of 99% or above. For open blasting for slope works, the blast face is typically in the order of 500 to 1500m^2 and blasting would only be conducted typically 1 to 2 times a day (but subject to actual site conditions). The separation distances from the ASRs are in the order of more than 100m from the open blasting for slope works. According to the Air Pollution Control (Construction Dust) Regulation, the areas within 30m from the blasting area will be wetted with water prior to blasting and blasting shall not be carried out when the strong wind signal or tropical cyclone warning signal No. 3 or higher is hoisted. Where necessary, mist spraying measures will be installed at the mucking out locations. With all these proper designs, best site practices and appropriate mitigation measures in place, adverse dust impact due to blasting for tunnel sections and slope works is not anticipated.

3.4.4.5 The construction in the vicinity of Lam Tei Quarry would also need a stockpiling area of 4,000 m^2 with capacity of 10,000 m^3 and a concrete batching plant (by another project) in the vicinity of the Lam Tei Quarry. Stockpiling of spoil would require suitable watering, tarpaulin cover, etc. to minimise the impacts caused by wind erosion. While many of the spoil generated from the tunnelling work would be conveyed back to the Lam Tei Quarry as explained above, some of the spoil would still need to be transported off-site for further processing in designated facilities (e.g. fill bank). Besides, construction vehicles would also be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Fuk Hang Tsuen Road, Castle Peak Road, etc.), the Contractor will implement traffic measures to minimize the amount of induced traffic, optimize the non-peak hours for travelling and design the travelling routes to maximize the distance from the nearby ASRs, etc. where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in Lam Tei Area as discussed above (including tunnelling, stockpiling, slope works, construction

of satellite control building and ventilation buildings, etc.) would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period which would constitute a relatively shorter period. The Consultant in Detailed Design stage and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For Lam Tei Area in particular, the latest available information at this stage suggests that the construction traffic generated along Fuk Hang Tsuen Road and Castle Peak Road would be typically in the order of 12 construction vehicles per hour per direction during advance works / site formation activities. During the drill-and-blast excavation activities, the construction traffic generated may increase to 24 trucks per hour per direction (approximately less than 20% of the overall construction period in Lam Tei Area). As explained above, vehicle washing facilities will be provided at every designated vehicular exit point. Since all vehicles will be washed at exit points and vehicles loaded with the dusty materials will be covered by clean and impervious sheeting before leaving construction sites, dust nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

Sam Shing Area

3.4.4.6 The construction works in Sam Shing Area include construction of middle ventilation building in the vicinity of Wah Fat Playground and temporary re-provisioning of facilities near Sam Shing. For area near Wah Fat Playground, construction activities include site formation works, slope works, construction of ventilation building, temporary adit, stockpiling, erection of site offices and erection of noise enclosure for construction phase. The size of excavation / site formation area is around 23,500m^2 and the amount of excavated materials is around 290,500m^3. The ASRs in the vicinity include residential uses (e.g. Kam Fai Building, Harvest Garden, etc.). Few of the ASRs would have a relatively short separation from the site boundary, in the order of around 20m. The separation distance between ASRs and slope works, ventilation building, stockpiling, etc. would be relatively larger, generally in the order of more than 50m. The construction site of the ventilation building will generate excavated materials while the temporary adit at Wah Fat Playground would be adopted as the mucking out for the underground tunnel sections connecting to Lam Tei and Sam Shing Estate. In order to reduce the dispersion of dust, the current design has allowed for 2 temporary noise enclosures, with one covering the temporary adit portal and spoil storage area, and with the other one covering the excavation for the ventilation building. For the temporary adit portal and the spoil storage area, the temporary full noise enclosure would be installed prior to the construction of the adit and spoil storage area. The entrance of this temporary full noise enclosure would be designed with acoustic seals or the equivalent and should be normally closed unless lorries enter or leave this temporary noise enclosure. In addition, filtering system will be installed at the exhausts of the proposed noise enclosures to minimize the dust impact via the exhausts.

3.4.4.7 For the construction of the ventilation building, another full noise enclosure is proposed to be installed prior to the bulk excavation of the basement, which would help alleviating the dust impact from the excavation activities. In addition, filtering system will be installed at the exhausts of the proposed noise enclosures to minimize the dust impact via the exhausts. The temporary full noise enclosure should be decommissioned only when most of the excavation works are completed. In addition, the ventilation exhausts of both temporary full noise enclosures would be located away from the ASRs as far as practicable. The exact locations would be subject to detailed design stage. The subsequent

detailed design should also explore the practicability of locating the community liaison centre between the construction site and Kam Fat Garden, which would provide a buffer between the construction site and Kam Fat Garden, and hence further alleviate the dust nuisance.

3.4.4.8 As discussed in **Section 3.4.3**, the dust monitoring records from other infrastructure projects of similar scale and nature have demonstrated that dust impacts could be readily mitigated by good practices including but not limited to watering. Also, sequence of construction works would be adopted to avoid dusty construction activities to be carried out simultaneously close to ASRs as far as practicable. The Contractor shall consider actual site constraints and circumstances, and devise the practicable approach to implement suitable phasing. Hence, adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

3.4.4.9 The construction in the vicinity of Wah Fat Playground would also need stockpiling areas of 450m^2 with capacity of 900m^3 in the vicinity of Wah Fat Street. Stockpiling of spoil would require suitable watering, tarpaulin cover, etc., to minimise the impacts caused by wind erosion. Construction vehicles would be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Hoi Wing Road, Lung Mun Road, etc.), the Contractor will implement traffic measures to minimize the amount of induced traffic, optimize the non-peak hours of traffic for travelling and design the travelling routes to maximize the distance from the nearby ASRs, etc. where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in Sam Shing Area as discussed above (including slope works, construction of ventilation buildings, stockpiling etc.) would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period which would constitute a relatively shorter period. The Consultant in Detailed Design stage and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For Sam Shing Area in particular, the latest available information at this stage suggests that the construction traffic generated along Hoi Wing Road and Lung Mun Road would be typically in the order of 23 construction vehicles per hour per direction during advance works / site formation activities. During the drill-and-blast excavation activities, which is considered as peak construction period, the construction traffic generated may increase to an average of 47 trucks per hour per direction for Hoi Wing Road and Lung Mun Road. The maximum construction traffic is up to 53 trucks per hour direction which will last for less than approximately 20% of the overall construction period in Sam Shing Area only. As explained above, the Contractor will implement traffic measures such as allocating the construction traffic during non-peak hours to minimise the dust nuisance from traffic impacts. In addition, vehicle washing facilities will be provided at every designated vehicular exit point. Since all vehicles will be washed at exit points and vehicles loaded with the dusty materials will be covered by clean and impervious sheeting before leaving construction sites, dust nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

3.4.4.10 Temporary re provisioning of basketball court and toilet is proposed at the existing carpark near Sam Shing Hui (KW carpark), while temporary re-provisioning of carpark (rearrangement of the carpark) is proposed at Fung On Street, where carpark enlargement works will be carried out. As both sites are existing car parks and are well-paved, minor works, e.g. site clearance and superstructure works (e.g. construction of toilet) are

anticipated. Neither extensive excavation nor dusty activities are anticipated. Adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

Pillar Point Area

3.4.4.11 The construction works in Pillar Point Area include site formation works, slope works, construction of tunnel portals, at-grade road/ viaduct construction, construction of administration building and ventilation building, stockpiling, construction of the magazine site, erection of site offices, slurry treatment plant, etc. The ASRs in the vicinity include industrial / office uses (e.g. warehouse, sawmill, etc.) in the vicinity of Tuen Mun Chek Lap Kok Tunnel Road and TMCLK Northern Landfall. Few of the ASRs would have a relatively short separation from the site boundary, in the order of less than 20m. The separation distance between ASRs and major slope works, tunnel portal, etc. would be relatively larger, in the order of more than 150m, while that of stockpiling area is more than 60m. As discussed in **Section 3.4.3**, the dust monitoring records from other infrastructure projects of similar scale and nature have demonstrated that dust impacts could be readily mitigated by good practices including but not limited to watering. Also, sequence of construction works would be adopted to avoid dusty construction activities to be carried out simultaneously close to ASRs as far as practicable. The Contractor shall consider actual site constraints and circumstances, and devise the practicable approach to implement suitable phasing. Hence, adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

3.4.4.12 For the construction of viaduct, other than some site formation works, bored piling would be required for the foundation and columns. Where practicable, pre-cast segments would be adopted for the deck sections. The dust generated by bored piling and installation of the pre-cast segments is not anticipated to be significant. The separation distances from the ASRs are relatively short, in the order of less than 20m from foundation / pile works. Nevertheless, with the implementation of the mitigation measures as in **Section 3.4.5** to control the generation of dust in this area, adverse dust impacts due to foundation works and column construction are therefore not anticipated.

3.4.4.13 Dust generation is anticipated from the operation of the slurry treatment plant at Mong Fat Street. The separation distance between ASRs and the slurry treatment plant would be more than 110m. Nevertheless, temporary full noise enclosure is proposed to be installed at the slurry treatment plant, which would help in alleviating the dust impact. The ventilation exhaust of the temporary full noise enclosure would be located away from the ASRs as far as practicable. The exact location would be subject to detailed design stage. In addition, filtering system will be installed at the exhausts of the proposed noise enclosures to minimize the dust impact via the exhausts. Besides, no chimneys nor gaseous emissions would be involved from the slurry treatment plant. Adverse dust impacts are therefore not anticipated.

3.4.4.14 The construction in the vicinity of Pillar Point Area would also need stockpiling areas of 1,500m^2 with capacity of 3,000m^3 and 800m^2 with capacity of 1,600m^3 in the vicinity of Mong Fat Street and TMCLK Northern Landfall respectively. Stockpiling of spoil would require suitable watering, tarpaulin cover etc., to minimise the impacts caused by wind erosion. Construction vehicles would be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Lung Mun Road etc.), the Contractor will implement traffic measures to minimize the amount of induced traffic, optimize the non-peak hours for travelling and

design the travelling routes to maximize the distance from the nearby ASRs, etc. where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in Pillar Point Area as discussed above (including tunnelling, slope works and ventilation building, etc.) would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period. The Consultant in Detailed Design stage and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For Pillar Point in particular, the latest available information at this stage suggests that the construction traffic generated along Lung Mun Road would be typically in the order of 14 construction vehicles per hour per direction during advance works / site formation activities. During the excavation activities by tunnel boring machine, the construction traffic generated may increase to 62 trucks per hour per direction (approximately 50% of the overall construction period in Pillar Point Area). As explained above, vehicle washing facilities will be provided at every designated vehicular exit point. Since all vehicles will be washed at exit points and vehicles loaded with the dusty materials will be covered by clean and impervious sheeting before leaving construction sites, dust nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

Explosive Magazine Sites

3.4.4.15 In order to facilitate the drill-and-blast tunnelling works, a total of 3 explosive magazine sites (1 at Lam Tei, 1 at Siu Lam, and 1 at Pillar Point) are required, which would be share used with the construction of R11. As explained in Section 2, the proposed magazine site at Lam Tei would take the form as an underground magazine site. Some underground blasting would be required for the construction of the underground magazine. The explosive magazine site at Siu Lam was once used for explosive magazine site and the explosive magazine site at Pillar Point was also once used for other purposes. Hence extensive site formation and excavation is also not required for Siu Lam and Pillar Point. However, some at-grade structures would be constructed to facilitate the storage of explosives. These at-grade structures would be dismantled prior to the end of the construction period.

3.4.4.16 The ASRs in the vicinity of explosive magazine site at Lam Tei include residential uses (e.g. village houses) in Lo Fu Hang and those along Yuen Long Highway and have a separation distance of 150m. Enclosures would be used to confine dust and filters would be installed at exhaust and FAI locations of the enclosures, with TSP and RSP removal efficiency of 99% or above. According to the Air Pollution Control (Construction Dust) Regulation, the areas within 30m from the blasting area will be wetted with water prior to blasting and blasting shall not be carried out when the strong wind signal or tropical cyclone warning signal No. 3 or higher is hoisted. Where necessary, mist spraying measures will be installed at the mucking out locations. With all these proper designs, best site practices and appropriate mitigation measures in place, adverse dust impact due to blasting for the underground magazine site is not anticipated.

3.4.4.17 As the site formation work for the explosive magazine site at Siu Lam has been largely completed, the remaining work would be mainly for the superstructure of the explosive storage area, which is unlikely to generate significant dust. ASRs in the vicinity include residential uses (e.g. Grandview Terrace) in the vicinity of Siu Sau Village, which have a

separation distance of about 250m. Adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

3.4.4.18 Similar to the explosive magazine site at Siu Lam, the site formation work for the explosive magazine site at Pillar Point has been largely completed. The remaining work would be mainly for the superstructure of the explosive storage area, which is unlikely to generate significant dust. ASRs in the vicinity include office/ industrial uses (e.g. Goodman Westlink and Hong Kong Science Museum Exhibition Workshop) in the vicinity of Siu Lang Shui, which have a separation distance of more than 350m. Adverse dust impacts are not anticipated provided that the good practices as included in **Section 3.4.5** are implemented by the Contractor.

3.4.4.19 Once the blasting works are completed, the superstructure of these 3 explosive magazine sites would be demolished. Suitable landscaping works would be implemented. Adverse dust impacts are not anticipated for the decommissioning of these explosive magazine sites.

Barging Facilities

3.4.4.20 There will be 3 barging points and 1 delivery point for the Project, located at the TMCLK Northern Landfall. Only the 3 barging points would be responsible for the spoil transportation. The delivery point would only involve delivery of equipment and construction materials, which would not contribute to significant dust emissions. The TMCLK Northern Landfall currently serves as cargo handling area and the surface area are largely paved. The nearest ASRs include industrial and office uses nearby which are located at approximately 40m away from the barging points. In general, the spoil will be unloaded to the barges directly from trucks.

3.4.4.21 According to the current construction planning, the number of construction vessels, either from tug boat or the barge, would be limited to 3 trips per day for each barging point and delivery point at TMCLK Northern Landfall. Given the separation distance from the ASRs and the low number of barges utilisation, adverse dust impacts are not anticipated provided good design measures are implemented. To suppress the dust emission, all unloading activities at the berths of the barging facility will be carried out inside an enclosed system with a 3-side screen with top cover and provision of a water spraying system. Regular watering on all exposed stockpile as a good site practice will also be implemented.

3.4.4.22 Construction vehicles from Lam Tei Area, Sam Shing Area and Pillar Point Area will access the barging points during the construction period. The latest available information at this stage suggests that the number of construction traffic generated from the areas would be typically in the order of 49 vehicles per hour per direction during advance works / site formation activities. All construction vehicles will be washed at the exit before leaving the construction worksites. Besides, the entire area of the barging facility will be properly paved with concrete, bituminous materials or hardcores to avoid dusty material on the road surface. After unloading the spoil onto barge inside the enclosed system with a 3-side screen with top cover, the trucks would be sprayed by water inside the unloading point. All vehicles would also be washed at the exit point before leaving the barging facility. With frequent vehicle washing and proper road paving, it could effectively reduce the resuspension of loose material on the road surface due to vehicle movement within the barging facility. In addition, as discussed, the Contractor will implement traffic measures

to minimize the amount of induced traffic, optimize the non-peak hours for travelling and design the travelling routes to maximize the distance from the nearby ASRs, etc. where practicable. Dust emission from construction truck movement is therefore considered insignificant. These barging facilities would be decommissioned after use.

Others

3.4.4.23 GI works would also be required to facilitate the detailed design and construction of the Project. These GI works would require using some GI rigs at certain locations to be determined during the detailed design stage and the construction phase. Given the relatively small scale of using the drilling rigs, it is unlikely to generate adverse dust impacts.

3.4.4.24 Landscaping works would also be required to enhance the design of the Project. These landscaping would involve some relatively minor earthworks to facilitate planting of trees, scrubs and other landscaping elements. It is unlikely that landscaping works would generate adverse dust impacts.

Consideration of Cumulative Impacts

3.4.4.25 **Section 2.10** has identified a list of concurrent projects to be considered in this EIA to address any significant cumulative impacts. The following sections discuss the cumulative impacts for each area.

3.4.4.26 For Lam Tei Area, concurrent projects include R11, Underground Quarrying at Lam Tei, Tuen Mun and Development at Lam Tei North East. For R11, although the works area in Lam Tei Area would be larger than that of the Project, the project proponent of R11 is the same as the Project and would implement the equivalent set of dust control measures as the Project. Close liaison between the contractors of R11 and the Project would be maintained to minimise dusty activities to be conducted concurrently as far as practicable. Adverse cumulative dust impacts from R11 are therefore not anticipated.

3.4.4.27 The Planning Study for the Underground Quarrying at Lam Tei, Tuen Mun and Development at Lam Tei North East are still on-going and there are no definitive design information at the time of preparing this EIA. Nevertheless, it is anticipated that their studies would consider all committed projects in the vicinity, including but not limited to the Project during their subsequent study. As any other studies by government, it is anticipated that they will also implement all the best practices to abate dust impacts where practicable. Close liaison between the contractors of TMB and the concurrent projects would also be maintained to minimise dusty activities to be conducted concurrently as far as practicable. On this basis, adverse cumulative dust impacts from these projects are therefore not anticipated.

3.4.4.28 For Sam Shing Area, the concurrent projects include the Cycle Track between Tsuen Wan and Tuen Mun and Traffic Improvement Scheme in Tuen Mun - Widening and Addition of Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road. For Cycle Track between Tsuen Wan and Tuen Mun, given the relatively small scale of the cycle track, together with the good practices that they would implement, adverse cumulative dust impacts are therefore not anticipated. For Traffic Improvement Scheme in Tuen Mun- Widening and Addition of Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road, the proposed widening of Tuen Mun Road/ Wong Chu

Road Slip Road and additional Tuen Mun Road/ Hoi Wing Road Slip Road would be located in the vicinity. Nevertheless, the scale of road works is anticipated to be small and the potential dust impacts are anticipated to be limited. Close liaison between the contractors of TMB and the concurrent projects would also be maintained to minimise dusty activities to be conducted concurrently as far as practicable. Adverse cumulative dust impacts are not anticipated with the good site practices that they would implement.

3.4.4.29 The concurrent projects in Tuen Mun, including Reprovision of Tuen Mun Swimming Pool and Tuen Mun centre Golf Centre Practice Green, Tuen Mun South Extension, Planned Property Development at Area 16, Tuen Mun, Sports Ground and Open Space with Public Vehicle Park, Tuen Mun and Site Formation and Infrastructure Works for Public Housing Developments at Tuen Mun Central- Wu Shan Road, are located within 500m from the underground tunnel of the Project and outside of 500m from the aboveground works at Sam Shing area. As the construction activities of the Project would be underground and the construction of the ventilation building of the Project would be more than 500m away from these concurrent projects, no adverse cumulative impacts are therefore anticipated.

3.4.4.30 For Pillar Point Area, the concurrent project includes Lung Kwu Tan Reclamation and the Replanning of Tuen Mun West Area. The project is still undergoing its respective studies and there is no definitive design information at the time of preparing this EIA. Nevertheless, it is anticipated that their study would consider all committed projects in the vicinity, including but not limited to the Project during their subsequent study. As any other studies by government, it is anticipated that they will also implement all the best practices to abate dust impacts where practicable. Close liaison between the contractors of TMB and the concurrent projects would also be maintained to minimise dusty activities to be conducted concurrently, if any, as far as practicable. On this basis, adverse cumulative dust impact from the concurrent project is therefore not anticipated.

3.4.5 Good Site Practice and Recommendations

3.4.5.1 Good site practices and recommendations are suggested below to minimise any air quality impact during construction works. The dust levels would also be monitored and managed under an Environmental Monitoring and Audit (EM&A) programme as specified in the EM&A Manual to ensure that nearby ASRs will not be subject to adverse air quality impact.

Construction Dust Control

3.4.5.2 The Contractor is also obliged to follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation and good site practice as follows:

- Any excavated or stockpile of dusty material including those on barges should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable for the excavation or unloading;
- Site hoardings of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Subject to site constraints, the Contractor may review the practicability of taller site hoarding for ASRs in close vicinity to the site boundary. Good site practice shall also be adopted by the Contractor

to ensure the conditions of the hoardings are properly maintained throughout the construction period;

- Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- Any skip hoist for material transport should be totally enclosed by impervious sheeting;
- Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;
- Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;
- Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and
- Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabilisers within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

Emission control on Non-Road Mobile Machinery (NRMMs)

3.4.5.3 Fuel combustion from the use of powered mechanical equipment (PME) during construction works would be a source of air emission. To improve air quality, EPD has introduced the Air Pollution Control (NRMMs) (Emission) Regulation, which came into operation in 2015 to regulate emissions from machines and non-road vehicles. Ultra-low sulphur diesel (ULSD) with a sulphur content of not more than 0.005% by weight and a viscosity of not more than 6 centistokes at 40^{o}C will be used as much as practicable to minimise SO_2 emissions. Under the Regulation, NRMMs, except those exempted, are required to comply with the prescribed emission standards. All regulated machines sold or leased for use in Hong Kong must be approved or exempted with a proper label in a prescribed format issued by EPD. Only approved or exempted NRMMs with a proper label are allowed to be used in specified activities and locations including construction sites. The Contractor would also review the contemporary circumstances and site constraints and optimise the quantity of on-site machinery. This would help to reduce the gaseous and PM emission for construction site.

3.4.5.4 In addition, the following good site practices that can control and reduce the emission from the use of NRMMs from the Project are recommended:

- Regulated machines shall be used and exempted NRMMs should be avoided where practicable;
- Optimise the number of on-site machinery to minimize gaseous and PM emissions for each construction site with consideration of actual site constraints or circumstances;
- Use cleaner fuel such as ultra-low sulphur diesel in diesel-operated construction plant to reduce sulphur dioxide emission;
- Zero emission or clean fuels shall be considered as far as practicable for transportation activities;

- Use of electric PMEs where practicable;
- Connect construction plant and equipment to main electricity supply and avoid use of diesel generators and diesel-powered equipment as far as practicable;
- Switch off the engine of PMEs when idling;
- Implement regular and proper maintenance for plant and equipment; and
- Employ plant and equipment of adequate size and power output and avoid overloading of the plant.

Emission Control Measures for Drill-and-Blast Activities

3.4.5.5 The following measures related to drill-and-blast activities should be incorporated:

- Impermeable blast covers at the mucking out locations should be shut;
- The blasting should only be carried out in a fully enclosed environment;
- All neighbouring construction activities should be suspended during blasting;
- The areas within 30m from the blasting area should be wetted with water prior to blasting and blasting shall not be carried out when the strong wind signal or tropical cyclone warning signal No. 3 or higher is hoisted; and
- Where necessary, mist spraying measures should be installed at the mucking out locations.

Emission Control Measures for Open Blasting Activities

3.4.5.6 The following measures related to open blasting activities should be incorporated:

- Provision of blast cages or roof-over protective cover, which are risk control measure, but also help to reduce a large amount of dust emission;
- Water spray before blasting and on blasted material prior to transportation;
- Minimise the distance fall and drop height from conveyors during loading and unloading; and
- Covered conveyors, transfer and unloading points with dust extraction system.

Emission Control Measures for Barging Facilities

3.4.5.7 Vehicle washing facilities will be provided at every designated exit point of the construction worksites. All construction vehicles will be washed at the exit before leaving the construction worksites. As a good practice, the entire area of the barging facility should be paved with concrete, bituminous materials or hardcores. All vehicles would also be washed at the exit point before leaving the barging facility. For the unloading of the spoil at the berth, the unloading points at the barging facility are recommended to be provided with an enclosed system with 3-side screen with top cover and provision of water spraying system. The same design has also been recommended and adopted in other projects such as Central Kowloon Route, Shatin to Central Link, Hong Kong Express Rail Link. Besides, regular watering once per hour on all exposed stockpiles shall be implemented to achieve a dust removal efficiency of 50% or above. After unloading the spoil into barge inside the enclosed system, the trucks should be sprayed by water inside

the unloading point. If barges would need to stay overnight at the barging point, spoils on the deck of the barges shall be covered by tarpaulin to avoid dust emission. In addition, the engine of the barge shall be switched-off during berthing as far as practicable. Provision of on-shore power supply shall also be considered wherever possible to minimize air quality impact from the marine vessels, with consideration of actual site constraints or circumstances to be further reviewed during detail design stage.

3.4.6 Residual Impacts

3.4.6.1 With implementation of dust control measures specified in Air Pollution Control (Construction Dust) Regulation and other relevant statutory requirements, and also implementation of comprehensive EM&A programme throughout the construction stage, the dust levels will be properly controlled and monitored to ensure that no nearby ASRs will be subject to adverse residual dust impact.

3.5 Operational Impacts

3.5.1 General

3.5.1.1 The assessment area for air quality impact assessment during operational phase shall be defined by a distance of 500m from the Project Road and highway / tunnel operation and maintenance facilities as identified in the EIA study, which shall be extended to include major existing, committed and planned air pollutant emission sources identified to have a bearing on the environmental acceptability of the Project. **Figures 3.1a** to **c** illustrate the 500m study area from the boundary of the Project site.

3.5.1.2 The assessment shall take into account the impacts of emission sources from vehicles from open roads and viaducts of the Project and the existing road network within the assessment area, proposed tunnel portals and ventilation buildings of the Project, industrial chimneys, marine vessels within the assessment area, and major point sources within 4 km from the project boundary, which should be modelled by dispersion model to account for the spatial variations in concentrations induced by them. The assessment shall also take into account the impacts of emission sources from nearby concurrent projects.

3.5.2 Identification of Representative Air Pollutants

3.5.2.1 According to Appendix B, Clause 5 (ii) of the EIA Study Brief, the key / representative air pollutant parameters for the project shall be identified, including the types of pollutants and their averaging time concentration.

3.5.2.2 The air quality pollutant source during the operational phase of the Project would be the emission from vehicles travelling on the new and existing roads. The tailpipe emission would comprise various pollutants, including Nitrogen Oxides (NO_x), Respirable Suspended Particulates (RSP), Fine Suspended Particulates (FSP), Sulphur Dioxides (SO_2), Carbon Monoxide (CO), Lead (Pb), Toxic Air Pollutants (TAP), etc.

3.5.2.3 EPD has tightened the statutory motor vehicle diesel and unleaded petrol specification to EURO V level, which has capped the sulphur content from 0.005% to 0.001 % since December 2007. The road transport only contributes a very small amount of SO_2 emission. It can also be seen from **Section 3.2** that the SO_2 background concentrations are very low (14% of AQO for 4th highest 10-minute SO_2 and 30% of AQO for 4th highest 24-hour SO_2). SO_2 is not a critical air pollutant of concern for this road project. Similarly, the monitored CO background concentrations are very low, only 6% and 16% of the AQO for the maximum 1-hour CO and maximum 8-hour CO respectively. CO is also not a critical air pollutant of concern for this road project.

3.5.2.4 According to the EPD's "Air Quality in Hong Kong 2021", O_3 is a regional air pollution problem. It is not a pollutant directly emitted from pollution sources but formed by photochemical reaction between NO_x and VOCs in the presence of sunlight. In the presence of large amounts of NO_x in the roadside environment, O_3 reacts with NO to give NO_2 and thus results in O_3 removal. O_3 is therefore not considered as a key air pollutant for the operational air quality assessment of this road project.

3.5.2.5 As leaded petrol had been banned in Hong Kong in 1999, it is no longer considered as a primary source in Hong Kong. According to the "Annual Air Quality Monitoring Results - Air Quality in Hong Kong 2021" from EPD, the annual lead level ranged from 9 ng/m^3 (at Kwun Tong) to 11 ng/m^3 (at Kwai Chung, Tung Chung, Yuen Long and Tuen Mun), which is about 1.8% to 2.2% of AQO (i.e. 500 ng/m^3). The concentration was much lower than the AQO of 0.5 µg/m^3. Therefore, lead is also not considered as a key / representative air pollutant for the operational air quality assessment for this road project.

3.5.2.6 According to the EPD's "Assessment of Toxic Air Pollutant Measurements in Hong Kong Final Report, 2003", dioxins, carbonyls, PCBs and most toxic elemental species are not considered as primary sources of vehicular emissions. Therefore, these pollutants are not considered as key pollutants for this road project.

3.5.2.7 Vehicular emissions may be a source of diesel particulate matters, Polycylic aromatic hydrocarbons (PAHs), and VOCs. Elemental carbon, which constitutes a large portion of diesel particulate matters mass, is commonly used as a surrogate for diesel particulate matter. According to EPD's "Assessment of Toxic Air Pollutant Measurements in Hong Kong Final Report, 2003", the Government has put great efforts to reduce particulate emission from the vehicular fleet. Based on "Measurements and Validation for the Twelve-month Particulate Matter Study in Hong Kong in 2021", the elemental carbon showed a significant decrease in concentration in Kwai Chung Station by 36% from 2015 to 2021 (data before 2015 is not available), in Clear Water Bay Station by 59% from 2011 to 2021 (data before 2011 is not available), as well as in Mong Kok, Yuen Long and Tsuen Wan by 84%, 76% and 72% from 2000 to 2021 respectively. With the continual efforts by EPD to reduce particulate emission from the vehicles, it is not considered as a key air pollutant for the operational air quality assessment of this road project.

3.5.2.8 The most important PAH is Benzo[a]pyrene (BaP) because of its high cancer risk, and it is often selected as a marker for PAH group. With reference to US and European Community air quality guidelines, the European commission sets a very stringent guideline for annual concentration of 1 ng/m^3 for BaP. According to the latest EPD's Air Quality in Hong Kong 2021, the concentration of BaP level was 0.05 ng/m^3 and 0.09 ng/m^3 monitored at Tsuen Wan and Central/Western stations respectively in 2021, which was far below the guidelines of European Communities of 1 ng/m^3. Hence, PAHs are not considered as a key air pollutant for quantitative air quality assessment for this road project.

3.5.2.9 According to EPD's "Assessment of Toxic Air Pollutant Measurements in Hong Kong Final Report, 2003", benzene and 1,3-butadiene amongst the VOC compounds are the most significant for Hong Kong. With reference to US and European Community air quality guidelines, the European commission sets a very stringent guideline for annual concentration of 5 µg/m^3 for benzene. The UK Air Quality Standard for 1,3-butadiene is 2.25 µg/m^3. According to the "Air Quality in Hong Kong 2021", the concentrations of benzene and 1,3-butadiene were 0.45 µg/m^3 and 0.04 µg/m^3 at Tsuen Wan station, as well as 0.67 µg/m^3 and 0.04 µg/m^3 at Central/Western station in 2021, which were far below the guidelines of European Communities of 5 µg/m^3 and the UK Air Quality Standard of 2.25 µg/m^3. Hence, VOCs are also not considered as a key air pollutant for quantitative air quality assessment for this road project.

3.5.2.10 As concluded, only the NOx, RSP and FSP are considered as the key representative pollutant for the operational air quality assessment of the Project. The 1-hour and annual average NO_2 concentrations, 24-hour and annual average RSP and FSP concentrations at each identified ASR are assessed and compared with the AQO to determine their compliance.

3.5.3 Identification of Pollution Sources

Project-induced Emission Sources

3.5.3.1 Vehicular emission is the major air pollution source during operational phase of the Project. The alignment of Project can be generally divided into three sections: Northern connection point with R11 at Lam Tei Quarry; Middle tunnel section within Tai Lam Country Park; and Southern interchange at Pillar Point. Detailed description of the alignment shall be referred to **Section 2** and **Figure 1.1**.

3.5.3.2 Vehicular emissions are anticipated from the proposed connection point at Lam Tei Quarry, as well as the connecting roads to Lung Mun Road and Tuen Mun Chek Lap Kok Tunnel Road.

3.5.3.3 Besides, vehicular emissions inside the proposed tunnel would be emitted via the northern and southern tunnel portals, and three proposed ventilation buildings (i.e. Northern Ventilation Building (NVB) at Lam Tei, Middle Ventilation Building (MVB) at Sam Shing and South Ventilation Building (SVB) at Pillar Point) (**Figure 1.1**). The tunnel ventilation system will be designed to remove/dilute vehicular emission to achieve the air quality standards specified in EPD's "Practice Note on Control of Air Pollution in Vehicle Tunnels", and to reduce discharge of emission from the portals.

Other Major Pollution Emissions in the Immediate Neighbourhood

Vehicular Emission from Existing Roads and Concurrent Projects

3.5.3.4 Other than the Project roads, vehicular emissions from the existing road networks, other concurrent road projects including R11, Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange, Widening of Fuk Hang Tsuen Road, Traffic Improvement Scheme in Tuen Mun - Widening and Addition of slip roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road, Widening of Castle Peak Road – Castle Peak Bay, and induced traffic from planned development projects and their associated road infrastructures, such as the Hung Shui Kiu/Ha Tsuen New Development Area, Development at Lam Tei North East, Proposed Public Housing at Ping Shan South, Lam Tei North and Nai Wai Development, etc. within the assessment area would also have cumulative air quality impact on nearby ASRs. The table below shows a summary of concurrent projects that would generate cumulative impact from open road and induced traffic. **Figure 2.8** shows the location of the concurrent projects.

3.5.3.5 It should be noted that the traffic forecast for operational air quality assessment has also included the induced traffic from Lung Kwu Tan Reclamation and the Re-planning of Tuen Mun West Area which would be in place progressively; while River Trade Terminal (RTT) is assumed to still exist since there is no available information/confirmed plan for its relocation. The traffic forecast is therefore on conservative side for assessment purpose.

Table 3.12 Concurrent Projects included in the Operational Air Quality Assessment

Concurrent Projects	Tentative Commissioning Year
Route 11	2033
Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange)	2033
Widening of Fuk Hang Tsuen Road	First Quarter of 2025
Traffic Improvement Scheme in Tuen Mun - Widening and Addition of slip roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road	2031
Widening of Castle Peak Road – Castle Peak Bay	Second Quarter of 2024
Hung Shui Kiu/Ha Tsuen New Development Area	First stage: Year 2024-2025; Second stage: Year 2030-2032; and Third stage in Year 2036
Proposed Public Housing at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai Development	Programme is under review and to be commissioned after TMB is in place.
Lung Kwu Tang Reclamation and the Replanning of Tuen Mun West Area	No confirmed programme, but induced traffic included

Emission from Public Transport Interchanges (PTIs), Heavy Goods Vehicle (HGV)/ Coach Parking and River Trade Terminal (RTT)

3.5.3.6 The Public Transport Interchanges (PTIs), Heavy Goods Vehicle (HGV)/ coach parking, vehicle depot and RTT are potential vehicular emission sources. All existing and planned PTIs (with available information and implementation programme) as well as major HGV/coach parking sites have been identified. There are a total of 2 planned PTIs, 1 existing PTI, 12 existing HGV/ coach parking (including 4 inside RTT), and 1 vehicle depot that are identified as major air pollution sources within the 500m distance from the Project boundary as shown in **Figure 3.4a** to **c**. They include the following:

Planned PTIs	• Planned PTI at Proposed Public Housing at Nai Wai, Lam Tei (PTI05) (to be commissioned after TMB is in place, as advised by CEDD.) • Planned PTI at Proposed Public Housing at Lam Tei North, Lam Tei, Tuen Mun (PTI06) (to be commissioned after TMB is in place, as advised by CEDD.)
Existing PTI	• Castle Peak Bay Bus Terminus (PTI04) at Sam Shing
Major Existing HGV/ Coach Parking and vehicle depot	• Carpark near Tung Lei Path (HCP02b), Lam Tei • Carpark near Tat Fuk Road (HCP04), Lam Tei • Carpark near To Lai Road (HCP09), Lam Tei • Carpark near Fu Hang Tsuen Road (HCP11), Lam Tei • Carpark near Butterfly Beach Park (HCP36), Pillar Point • Ho Choi Lane Meter Parking (HCP25), Pillar Point • Ho Hoi Street Meter Parking (HCP26), Pillar Point • FEHD Tuen Mun Depot (DEP04), Pillar Point • Tuen Mun Fill Bank Carpark (HCP34), Pillar Point
RTT	• 4 carparks inside RTT (HCP24, HCP31, HCP32, HCP35) • Other areas inside RTT through Gate 1 (RTT_OTH_G1) • Other areas inside RTT through Gate 2 (RTT_OTH_G2)

3.5.3.7 In addition to the above, all other parking sites within the 500m assessment area have also been considered in the air quality impact assessment by broad-brush approach.

Industrial Emissions

3.5.3.8 Industrial emissions are one of the potential air pollution sources during operational stage of the Project. Chimney survey and desktop study have been conducted in April 2022 and May 2023 to identify existing and planned chimneys within 500m of the Project site boundary.

3.5.3.9 One existing chimney at Polystyrene Foam Products Factory Limited at Fuk Hang Tsuen Road, Lam Tei has been identified (**Figure 3.5a**). The chimney was also identified in the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016). Nonetheless, based on site verification, location of the chimney has been updated. The chimney emission has been included in the assessment. Besides, there are other chimneys identified in the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016). However, except the chimney at Polystyrene Foam Products Factory Limited, all other chimneys are outside the 500m assessment area of the Project.

3.5.3.10 In addition, a chimney was also identified at Wan Hing Machine Factory in Nai Wai, Lam Tei. However, the industrial premise including the chimney is within the site boundary of the Proposed Public Housing Development at Nai Wai. As checked with CEDD, the land shall be resumed and the industrial premise including the chimney will be removed before commissioning of TMB in 2033. Therefore, this chimney is not considered in the assessment.

3.5.3.11 Within 500m assessment area, there is one existing SP, i.e. the Lam Tei Quarry. According to CEDD's Departmental Report 2015-2019, Lam Tei Quarry and the associated asphalt plant will cease operation in Year 2022/23 [1] . The Lam Tei Underground Quarry is being planned under Agreement No. CE51/2020(GE) Underground Quarrying at Lam Tei, Tuen Mun – Investigation, Design and Construction (**Figure 2.11**). As advised by CEDD, the underground quarry will be commissioned in Year 2025. However, since the design of the Lam Tei Underground Quarry is yet to be confirmed at the time of preparing this EIA, as agreed with CEDD, its cumulative air quality impact will be assessed and addressed in the respective EIA.

3.5.3.12 There is no existing and planned chimney within assessment area of the proposed MVB in Sam Shing. In Pillar Point, one chimney at Pillar Point Valley Landfill Flare System, three chimneys at Butterfly Beach Laundry, and two Specified Process (Hong Kong China Concrete Company Limited and Multi-Way Industries Limited) are identified within 500m assessment area (**Figure 3.5b**). All these chimney and industrial emissions have been included in the assessment.

[1] Civil Engineering and Development Department, 2019. Management of Quarries (https://www.ceddreport201519.gov.hk/en/projects-services-detail/quarrying)

Marine Emissions

3.5.3.13 The Tuen Mun Landing Area 40, Chu Kong Shipping Facilities and RTT are partially within the 500m assessment area in Pillar Point (**Figure 3.5b**). The marine traffic activities consist of river trade vessels (RTVs) and local vessels, which are major air pollution sources. Cumulative air quality impact due to the gaseous emission from marine vessels has been considered.

Major Emission Point Sources within 4km

3.5.3.14 Major point sources within 4km from the Project that may also have influence on the air quality include one chimney from Green Island Cement Company Limited, which is located approximately 1.5 km away from the Project, and two chimneys from Castle Peak Power Station, which are located approximately 1.8 km and 2.1 km away from the Project respectively (**Figure 3.5b**).

3.5.4 Assessment Methodology

3.5.4.1 The assessment has been conducted based on the best available information at the time of preparing the EIA and has considered the impacts of emission sources from road vehicles, nearby industrial and marine emission sources within the assessment area, as well as major point sources within 4 km from the Project which should be modelled by dispersion models to account for the spatial variations in concentrations induced by them.

3.5.4.2 The air quality impact assessments have been carried out according to Guidelines on Assessing the 'TOTAL' Air Quality Impacts to include the following three tiers of emission source contribution as appropriate:

Tier 1 Primary contribution from the project-induced emission sources including:

- Vehicular emission from the open roads of the proposed TMB
- Vehicular emission from the proposed tunnel portals and ventilation buildings of TMB

Tier 2 Secondary contribution due to the pollutant-emitting activities in the immediate neighbourhood within the assessment area and major point source within 4km including:

Major Emission Sources within 500m of the Project

- Vehicular emission from the existing road networks and other planned concurrent projects (including road projects and planned development projects as described in **Section 3.5.3** above)
- Vehicular emission from the identified existing and planned PTIs, and major HGV /coach parking sites, as well as RTT by precise approach and all other parking sites within the 500 m assessment area by broad-brush approach
- Industrial emission from the existing chimneys at Polystyrene Foam Products Factory Limited, Hong Kong China Concrete Company Limited, Multi-Way Industries Limited, Pillar Point Valley Landfill Flare and Butterfly Beach Laundry
- Marine emission at Tuen Mun Landing Area 40, Chu Kong Shipping Facilities and RTT

Major Point Sources within 4km of the Project

- Emission from Green Island Cement Company Limited and Castle Peak Power Station

Tier 3 Background contribution including:

- Other sources, such as territory-wide road, Hong Kong International Airport, power plants, marine emission from ocean going vessels, passenger ferries and container terminals, other major point sources outside 4km, etc.

3.5.4.3 The corresponding Tier 1 and Tier 2 emissions are modelled in near-field dispersion models, while the Tier 3 emissions are modelled in far-field dispersion model PATH. The cumulative operational air quality impact is the combination of the contributions from all near-field and far-field sources.

Determination of Assessment Year

3.5.4.4 According to the EIA Study Brief No. ESB-348/2021, the air pollution impacts of future road traffic are calculated based on the highest emission strength from road vehicles in the assessment area within the next 15 years upon commissioning of the Project. The selected year of assessment should represent the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year.

3.5.4.5 Based on the current programme, TMB is planned for commissioning in Year 2033. Sensitivity tests have been carried out for Year 2033 (TMB commissioning), 2036, 2041, 2046 and 2048 (15 years after TMB commissioning) to determine the highest emission scenario. Vehicular tailpipe emissions from roads are calculated using EMFAC-HK version 4.3. The traffic forecast data provided by the Project Traffic Engineer, which has been endorsed by the Transport Department, are given in **Appendix 3.2**. Results of the sensitivity tests are summarised in **Table 3.13** below. It can be found that the highest emission scenario is found to be Year 2048 for both NOx and PM (i.e. RSP and FSP).

Table 3.13 Summary Results of Sensitivity Tests

Year	Annual Vehicular Emission (tonnes)		
	NO_x	RSP	FSP
2033	113	5.5	5.1
2036	105	5.0	4.6
2041	116	5.4	5.0
2046	126	5.7	5.3
2048	**134**	**5.9**	**5.5**

Vehicular Emission from Open Roads

3.5.4.6 Vehicular emissions have been predicted using the EMFAC-HK v4.3. As mentioned above, Year 2048 for NOx and PM is selected as the worst assessment year for the air pollution impacts of future road traffic during operational phase. Since the PATH model has been rerun with removal of the vehicular emission within the respective grids to avoid double-counting (see **Section 3.5.4.47** for details), the coverage of the road network in the near-field assessment has been extended beyond 500m of the open roads. The extent of the road coverage including the Project roads, existing roads and concurrent planned roads for Year 2048 are given in **Appendix 3.3**.

3.5.4.7 As mentioned in **Section 3.5.3.5** above, the traffic forecast in Pillar Point area has included the induced traffic from Tuen Mun West Replanning and Lung Kwu Tan Development,

in addition to those from RTT. The traffic forecast is on conservative side for assessment purpose.

3.5.4.8 The running emission factors for each vehicle class travelling at different speeds have been determined using the daily profile of the lowest temperature and relative humidity for each month derived from Year 2021 data from the nearest weather station (i.e. Tuen Mun Children and Juvenile Home Weather Station) for assessing the short-term air quality impact. For long term impact, the daily profile of average temperature and relative humidity for each month has been adopted (**Appendix 3.5**). The maximum speed of medium goods vehicle, heavy goods vehicle and bus travelling on any road at a speed in excess of 70kph shall be limited to 70kph; while that of public light bus on any road at a speed in excess of 80kph shall be limited to 80kph according to Road Traffic Ordinance (Cap. 374). The speeds for these types of vehicles for calculation of the running emission factors have therefore been capped accordingly.

3.5.4.9 The start emission for all types of vehicles other than franchised buses and container truck (i.e. HGV9) from RTT has been assessed on roads. There is no start emission on expressways, trunk roads, primary distributors, and district distributors. The road network assumed with no cold start and with cold start is shown in **Appendix 3.3**. Since there is no project-specific vehicle population data and the VKT is related to vehicle population, the number of trips from the local roads within the study area are estimated based on its vehicle-kilometre-travelled (VKT) and ratio of the default trip to default VKT of the whole territory of Hong Kong in the EMFAC-HK model adjusted by percentage of minor road network from Annual Traffic Census 2021 (see **Appendix 3.4**). Similar to running emission factors, the daily profile of the lowest temperature and relative humidity for short term impact and daily profile of the average temperature and relative humidity for long term impact for each month has been adopted. The maximum start emission factors among different sitting times (from 5min to 720min) have been used for estimation of the cold start emission for conservative assessment.

3.5.4.10 According to EPD's "Guidelines on Choice of Models and Model Parameters", the individual initial tailpipe NO_2/NO_X ratio of each EMFAC-HK vehicle type has been adopted to calculate the initial NO_2 and residual NO tailpipe emission rates. The initial NO_2 emissions for each vehicle type predicted by EmFAC-HK v4.3 have been directly adopted.

3.5.4.11 The composite vehicular emission factors for each road link for Year 2048 are given in **Appendix 3.5**.

3.5.4.12 The USEPA approved near-field air dispersion model, CALINE4 developed by the California Department of Transport is used to assess vehicular emissions impact from all existing and planned open road network. The existing and at-source noise mitigation measures as proposed in **Section 4** including the roadside barriers and semi-enclosures have been considered in the model and their locations shall be referred to **Appendix 3.5**.

3.5.4.13 Grid-specific meteorological data extracted from the latest EPD's PATH v2.1 model is adopted in CALINE4 model, including relevant temperature, wind speed, wind direction and mixing height. The stability classes are modelled from PCRAMMET model. The mixing height is capped between 131m and 1,941m as per the real meteorological data in Year 2015. For the treatment of calm hours, the wind speeds are limited to 1m/s for those lower than 1m/s as per the PATH v2.1 model.

3.5.4.14 Surface roughness and the wind standard deviation are estimated in accordance with the "Guideline on Air Quality Models (Revised), 1986", as summarised in **Table 3.14**.

Table 3.14 Summary of Wind Standard Deviation for Surface Roughness

Period / Location/ Parameters		Assumptions
Grid 16_39, 17_38, 17_39, 18_39, 21_40, 21_41, 22_43	Surface roughness (cm)	50
	Wind standard deviation (degrees)	1) 28.6 for A & B Stability Classes; 2) 22.3 for C Stability Class; 3) 15.9 for D Stability Class; 4) 9.5 for E Stability Class; and 5) 4.8 for F Stability Class.
Grid 20_40, 21_43, 21_44, 21_45, 22_44, 22_45	Surface roughness (cm)	100
	Wind standard deviation (degrees)	1) 32.9 for A & B Stability Classes; 2) 25.6 for C Stability Class; 3) 18.3 for D Stability Class; 4) 11 for E Stability Class; and 5) 5.6 for F Stability Class.

3.5.4.15 Owing to the limitation of CALINE4 model, road elevation is limited to 10m which may underestimate the pollutant concentrations at ASRs located 10mPD or above. Some elevated roads or viaducts within the 500m Assessment Area are higher than 10mPD (in range of 1mPD to 60mPD). Thus, contribution from the elevated roads over 10mPD is modelled separately from the other roads. For the roads below 10mPD, both the actual heights of ASR and roads are adopted. For the section of elevated roads higher than 10mPD, adjustment on both heights of roads and ASR has been made so that height variation for roads higher than 10mPD can be reflected in the dispersion model for a conservative assessment. **Table 3.15** provides an example of the adjusted heights adopted in the models.

Table 3.15 Example of Adjusted Height adopted in CALINE4 Models

ASR Level (mPD)	Road Level (Road Group)			
	0-10 mPD (Group 1)	11-20 mPD (Group 2)	21-30 mPD (Group 3)	31-40 mPD (Group 4)
⩽ 10	1. No adjustment for both road and ASR height	1. Adjusted Road Height: Cap at 10m 2. No adjustment for ASR	1. Adjusted Road Height: Cap at 10m 2. Adjusted Height for ASR: 1.5m	
>10 and ⩽ 20		1. Adjusted Road Height: -10m 2. Adjusted height for ASR: -10m	1. Adjusted Road Height: Cap at 10m 2. Adjusted height for ASR: -10m	1. Adjusted Road Height: Cap at 10m 2. Adjusted Height for ASR: 1.5m
>20 and ⩽ 30			1. Adjusted Road Height: -20m 2. Adjusted height for ASR: -20m	1. Adjusted Road Height: Cap at 10m 2. Adjusted height for ASR: -20m
>30				1. Adjusted Road Height: -30m 2. Adjusted height for ASR: -30m

Note:

[1] Only example (i.e. for roads up to 40mPD) is given in the table above. Same approach of height adjustment is applied to road levels higher than 40mPD in the assessment.

3.5.4.16 In addition, for barriers along existing roads or proposed noise barriers (see **Appendix 3.5**), the line source is modelled at the tip of the barrier and the mixing width is limited to the actual uncovered road width in order to address the associated secondary environmental impact.

3.5.4.17 A summary of modelling parameters for CALINE4 are listed in **Table 3.16**.

Table 3.16 Model Parameters for CALINE4

Parameter	Input
Meteorological Data	Year 2015 MCIP data extracted from PATH model
Mixing Height	Year 2015 MCIP data extracted from PATH model and is capped to between 131m and 1941m as per the real meteorological data recorded by Hong Kong Observatory in Year 2015
Stability Class	Year 2015 MCIP data extracted from PATH model
NO_x to NO_2 Ratio	Ozone Limiting Method (OLM) for 1-hour NO_2 OLM/Jenkin's Method for annual NO_2 (Details refer to **Section 3.5.4.52**)
Assessment heights	1.5m, 5m, 10m, 15m, 20m, 30m, 50m, 80m, 120m and 180m above ground

Emission from Proposed / Existing Tunnel Portals and Ventilation Buildings

3.5.4.18 Based on current design of TMB provided by Project Engineer, vehicular emission inside the proposed tunnels will be dispersed into atmosphere via the following portals at both ends and the three ventilation buildings (**Appendix 3.6**):

Table 3.17 Discharge of Proposed TMB Portals and Ventilation Buildings

Tunnel Section	Tunnel Portal	Ventilation Buildings (VBs)	Discharge Split between Portals and VBs[1]	Discharge Split for VBs[1]
TMB	• TMB-North Portal • TMB-South Portal	• TMB- North Ventilation Building (TMB-NVB) • TMB- Middle Ventilation Building (TMB-MVB) • TMB- South Ventilation Building (TMB-SVB)	40 : 60	1/3 from each VB

Note:

[1] The discharge split between portals and ventilation buildings is based on current design which was advised by the Project Engineer.

3.5.4.19 Besides, the cumulative air quality impacts due to the proposed North Tunnel Portal of R11 and its associated North Ventilation Building in Lam Tei have been addressed. Based on preliminary design of R11 provided by the Project Engineer, the discharge splits at the tunnel portals and ventilation buildings are given in the following:

Table 3.18 Discharge of Proposed R11 Tunnel Portals and Ventilation Buildings

Tunnel Section	Tunnel Portal	Ventilation Buildings (VBs)	Discharge Split between Portals and VBs [2]	Discharge Split for VBs [2]
Route 11 Lam Tei Tunnel (LTT)	• LTT- North Portal [1] • LTT- South Portal	• LTT- North Ventilation Building (LTT-NVB) [1] • LTT- South Ventilation Building (LTT-SVB)	40 : 60	1/2 from each VB

Notes:
[1] Only north portal and north ventilation building of R11 are within 500m assessment area of TMB and hence included in the assessment.
[2] The discharge split between portals and ventilation buildings for R11 is based on current design which was advised by the respective Project Engineer.

3.5.4.20 It should be noted that the ventilation schemes as presented in **Table 3.17** and **Table 3.18** are the best available information provided by the Project Engineer at the time of preparing this EIA. During the subsequent design stage and the operational stage, the ventilation engineer should conduct reviews on the ventilation scheme covering different periods of a day, taking into account the contemporary circumstance such as latest traffic forecast, traffic composition, update on the ambient air quality, etc., and then review and update the air quality assessment as necessary to demonstrate full compliance of the AQO. These reviews would allow the designer and operator to optimize the operation of the ventilation system without compromising the compliance of AQO.

3.5.4.21 In addition, cumulative air quality impacts due to the existing Tuen Mun Chek Lap Kok Link have been included in the assessment with reference to the following discharge splits at the tunnel portals and ventilation buildings:

Table 3.19 Discharge of Existing Tuen Mun Chek Lap Kok Link Portals

Tunnel Section	Tunnel Portal	Ventilation Buildings (VBs) [1]	Discharge Split between Portals and VBs [1]
Tuen Mun Chek Lap Kok Link Tunnel Road (TMCLKL)	• TMCLKL - Underpass Portal	No Ventilation Building	100% from Portal
	• TMCLKL - Tuen Mun Portal	All Ventilation Buildings are outside 500m assessment area	10 : 90

Note:
[1] The discharge split between portals and ventilation buildings for TMCLKL is based on "Final Report on Management, Operation and Maintenance of Tunnels, Including the Tunnel Operation and Control System and Recurrent Consequence Requirement, Tuen Mun – Chek Lap Kok Link – Design and Construction" as provided by HyD.

3.5.4.22 Vehicular emissions inside the tunnels of TMB, R11 and TMCLK tunnel are determined based on the traffic flow and the emission factors from the EMFAC-HK v4.3 similar to those for open roads as discussed above. The portal emissions are modelled in accordance with the Permanent International Association of Road Congress Report published in 1991 (PIARC, 1991). It is assumed that the pollutant will be ejected from the portal as a portal jet such that 2/3 of the total emissions will be dispersed within the first 50m from the portal, and 1/3 of the total emissions within the second 50m. To take into account the horizontal jet effect, portal emission is modelled as "Volume" sources in AERMOD. Detailed calculations of portal emission are given in **Appendix 3.6**. A summary of AERMOD modelling parameters is given in **Table 3.21**.

3.5.4.23 Based on the current design of TMB, the emission from all ventilation buildings (i.e. TMB-NVB, TMB-MVB and TMB-SVB) will be discharged in a horizontal direction through wall louvre. The LTT-NVB from the concurrent Project R11 will be discharged in an upward direction at roof. The latest design parameters of different ventilation buildings are summarised in **Table 3.19** below, and detailed calculations of the emission discharge are given in **Appendix 3.6**. The emissions from ventilation buildings are modelled as "Pointhor" for TMB and "Point" sources for R11 in AERMOD. A summary of AERMOD modelling parameters is given in **Table 3.21**.

Table 3.20 Latest Design Parameters of Ventilation Buildings

Tunnel Section	Ventilation Buildings	Discharge Area (m^2)	Discharge Direction	Discharge Louvre Bottom Level (mAG)	Discharge Velocity (m/s)
Tuen Mun Bypass (TMB)	TMB - NVB	120	Horizontal	21	3
	TMB - MVB	117	Horizontal	9.5	4
	TMB - SVB	120	Horizontal	15.5	3
Route 11 Lam Tei Tunnel (LTT)	LTT - NVB	360	Upward	24	6

Table 3.21 Modelling Parameters in AERMOD

Parameters	Input
Modelling Mode	Urban with terrain option
Meteorological data	Year 2015 MCIP data extracted from PATH v2.1 model is provided by EPD. The wind speeds are capped at 1m/s for those from PATH v2.1 below 1m/s
Mixing Height	Year 2015 MCIP data extracted from PATH model and is capped to between 131m and 1941m as per the real meteorological data recorded by Hong Kong Observatory in Year 2015
Anemometer Height	9m (According to EPD's Guidelines on Choice of Models and Model Parameters)
Albedo	Determined within 10km x 10km region from the Project
Bowen Ratio	Determined within 10km x 10km region from the Project
Surface Roughness	Surface characteristic determined within 1km for each PATH grid
Assessment heights	1.5m, 5m, 10m, 15m, 20m, 30m, 50m, 80m, 120m and 180m above ground

Emission from Public Transport Interchanges

3.5.4.24 The traffic data of the existing PTI (i.e. Castle Peak Bay Bus Terminus in Sam Shing) is based on 24-hour survey and the published bus service schedule. The sitting time is also derived from the 24-hour survey at the bus terminus, while the idling time and traveling speed are estimated based on site observation. The emission has been assessed using precise approach in accordance with EPD's guideline "Calculation of Start Emissions in Air Quality Impact Assessment".

3.5.4.25 Similarly, the start emissions from the two planned PTIs at Proposed Public Housing at Nai Wai and Proposed Public Housing at Lam Tei North are assessed using precise approach. The traffic data of the two planned PTIs are provided by the Project Traffic Consultant. The bus services for the two planned PTIs are obtained from CEDD's Study on Site Formation and Infrastructure Works for proposed Public housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun; and sitting time, idling time and traveling speed are derived based on site observation on some existing PTIs in New Territories West covering Hung Shui Kiu and Tuen Mun.

3.5.4.26 According to PN1/22 Practice Note for Control of Air Pollution in Semi-Confined Public Transport Interchanges, all drivers using the PTI shall generally switch off the vehicle engines while waiting. Idling emission should be minimized. For conservative assessment, idling emission inside PTIs has also been considered in the assessment. The cold idling emission factors have been made reference to EPD's Note on Calculation of Start Emissions in Air Quality Impact Assessment; while the warm idling emission are estimated based on the emission factors for different Euro engine types in accordance with PIARC Road Tunnels: Vehicle Emissions and Air Demand for Ventilation, 2019. The calculation of the idling emissions for the PTIs are given in **Appendix 3.7**.

3.5.4.27 For buses with Selective Catalytic Reduction Device (SCR), the "adjusted" start emissions (i.e. excluding idling emission for 1 min for buses) are released over a longer period (i.e. 700m) after the engine starts. Detailed calculation of the emissions for the 2 planned PTIs and 1 existing PTI is given in **Appendix 3.7**.

3.5.4.28 Both planned PTIs will be decked. However, detailed design for the planned PTI is not available during the stage of this EIA. It is assumed that the emissions from the PTI are dispersed at the entry and exit openings of the PTI and without forced mechanical ventilation. Emissions from the PTIs are modelled as "AREA" sources in AERMOD. While the existing Castle Peak Bay Bus Terminus (PTI04) at Sam Shing is in open form, emission within the terminus is modelled as "AREAPOLY" source. Start emission on spread distance outside the PTIs has been modelled as "Line" source in AERMOD with appropriate modelling parameters on the mixing width, source height and initial vertical dimension according to the USEPA guidelines "Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas". A summary of AERMOD modelling parameters is given in **Table 3.21** above and in **Appendix 3.7**.

Emission from HGV and Coach Parking Sites, Vehicle Depot and RTT

3.5.4.29 The start emissions from all parking sites have already been assessed on open roads based on the estimated trips from default trip and default VKT of the whole territory of Hong Kong in the EMFAC-HK model as described in **Section 3.5.4.7**. Nonetheless, there are 12 existing HGV and coach parking sites (including 4 inside RTT), 1 vehicle depot and other areas within RTT that are considered to contribute significantly to the air quality impacts, and thus their associated emissions have been also assessed using the same approach as PTI above and double-counted in the assessment.

3.5.4.30 The trip data and assumption on sitting time at the parking sites and vehicle depot are derived based on traffic survey and provided by the Project Traffic Consultant. These sites are for parking use and vehicle idling for passengers dropping off and picking up is not found. The travelling speed within the parking sites is estimated based on site observation. For RTT, the traffic records at each gate, usage of each parking areas and staying duration within RTT were directly provided by the operator. As advised, all vehicles are required to switch the engines off and hence no idling emission is expected.

3.5.4.31 The start emission has been assessed in accordance with EPD's guideline "Calculation of Start Emissions in Air Quality Impact Assessment". For petrol vehicle, the start emissions are instantly released at the time when the engine starts. The start emissions are released over a longer period (i.e. 700m for diesel vehicle with SCR) after the engine starts. Detailed calculation of the emissions for the parking sites and RTT is given in **Appendix 3.7.** All the HGV and coach parking sites, vehicle depot and RTT are open sites without mechanical ventilation and are modelled as AREAPOLY source by AERMOD. A summary of AERMOD modelling parameters is given in **Table 3.20** above and in **Appendix 3.7**.

Emission from Chimneys and Other Industrial Operation

3.5.4.32 Information for the chimney at Polystyrene Foam Products Factory Limited including emission rates and source parameters including stack height, exit temperature, exit velocity and internal diameter of the stack was not provided by the operators. Hence, the chimney information has been made reference to the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016).

3.5.4.33 For the two existing Specified Processes, i.e. Hong Kong China Concrete Company Limited and Multi-Way Industries Limited, their emission rates and source parameters are made reference to their respective latest SP registers and Air Pollution Control Plans (APCPs).

3.5.4.34 The maximum landfill gas and diesel fuel consumption rates at flaring system at Pillar Point Valley Landfill, as well as the stack information including release height, exit temperature, internal diameter, and exit velocity were provided by the operator. As advised by Hospital Authority, towngas is used at the chimneys of Butterfly Beach Laundry, and the maximum monthly gas consumption is 8,697,840 MJ. The operational periods and stack information including release height, exit temperature, internal diameter, and exit velocity were provided by Hospital Authority.

3.5.4.35 Major point sources within 4km from the Project site boundary, including Green Island Cement Company Limited and Castle Peak Power Station, have also been included in the near-field dispersion models. For Green Island Cement Company Limited, the emission rates, source parameters and operation hours are made reference to its SP register. For Castle Peak Power Station, its source parameters are made reference to its SP register and Air Pollution Control Plan of Black Point Power Station, and its emission rates are calculated based on the emission limit set out in the Ninth Technical Memorandum for Allocation of Emission Allowances in respect of Specified Licences. Temporal profiles from PATH 2.1 are adopted.

3.5.4.36 Detailed calculation of the emission rates for these chimneys and industrial operation and the modelling parameters are given in **Appendix 3.8**. A summary of AERMOD modelling parameters is given in **Table 3.21** above.

Marine Emission

3.5.4.37 As mentioned above, the Tuen Mun Landing Area 40, Chu Kong Shipping Facilities and RTT are partially within the 500m assessment area in Pillar Point. The marine traffic activities within these facilities and its inshore traffic zones include the following types of vessels:

Tuen Mun Landing Area 40

- River trade vessels (RTVs) comprising local lighter/barge/cargo junk, local bunker vessel, and tug and tow.

Chu Kong Shipping Facilities

- RTVs comprising container vessel, local lighter/barge/cargo junk, local bunker vessel, and tug and tow.

River Trade Terminal (RTT)

- RTVs comprising container vessel, local lighter/barge/cargo junk, local bunker vessel, and tug and tow at RTT; and
- Local vessels at RTT.

3.5.4.38 The marine traffic projection is provided by the Project Marine Traffic Consultant. As advised, there is a general growth in the marine traffic and hence Year 2048 marine traffic forecast for different types of the vessels has been adopted for conservative assessment. The marine traffic data for Year 2048 is presented in **Appendix 3.10a** to **c** and Marine Department's reply letter on the traffic data is given in **Appendix 3.9**.

3.5.4.39 For RTVs, the marine emissions have been estimated based on the engine powers, load factors and emission factors, in accordance with the methodology in EPD's "Study on Marine Emission Inventory". The travelling speeds in manoeuvring mode are provided by the Marine Traffic Consultant and are used for calculation of the Time-in-mode (TIM). Some berths at Tuen Mun Landing Area 40 and RTT are within the 500m assessment area. The hoteling time is also provided by the Project Marine Traffic Consultant for calculation of the emission. Detailed calculation of the emissions and assumptions have been presented in **Appendix 3.10a** to **c** and the documents referred therein.

3.5.4.40 Based on the data provided by the Project Marine Traffic Consultant, the local vessels at RTT contain the following vessel types:

- Small crafts – boat to support other marine vessel activities, refuelling and vessel maintenance services, etc.
- Small crafts – tugboats and workboats.

3.5.4.41 The engine power of the typical small crafts – boat is provided by the RTT operator. For small craft – tugboats, they are those of small size and hence it is considered equivalent to those tugs of GRT 0-499 class, i.e. same as the average of Grade II tug boat of locally licensed vessel according to EPD's "Study on Marine Emission Inventory". The small craft – workboats are mainly cargo junk as advised by Marine Traffic Consultant and hence engine power has been made reference to that of EPD's "Study on Marine Emission Inventory".

3.5.4.42 There is no relevant emission factor for small craft – boats in the EPD's "Study on Marine Emission Inventory". The emission factor has been made reference to the "Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder (USEPA, 2008)". Tier 2 emission factors are adopted, which assume the average age of all vessels is more than 40 years old in Year 2048 for conservative assessment. For small craft - tugboat and workboat, the emission factors have been made reference to those vessels of similar nature, type and scale in the EPD's "Study on Marine Emission Inventory".

3.5.4.43 The travelling speeds and hotelling times for local vessels are provided by the Marine Traffic Consultant and used for calculation of the TIM. Detailed calculation of the emissions and assumptions for different types of local vessels at RTT are presented in **Appendix 3.10a** and the documents referred therein.

3.5.4.44 The marine emissions within 500m Assessment Area are modelled as point sources / horizontal point sources in AERMOD. A summary of AERMOD modelling parameters is given in **Table 3.21** above. Detailed modelling parameters could be referred to **Appendix 3.10a** to **c**.

Far-field Source Contribution (i.e. Future Background Air Quality)

3.5.4.45 PATH (Pollutants in the Atmosphere and their Transport over Hongkong) is a regional air quality model developed by EPD to simulate air quality over Hong Kong against the Pearl River Delta (PRD) as background. The latest PATH v2.1 model has been adopted for predicting the future background in this study.

3.5.4.46 For Lam Tei and Sam Shing area, the Year 2030 PATH background concentrations have been directly adopted for calculation of cumulative impacts and near-field impacts are double-counted for conservative assessment.

3.5.4.47 For Pillar Point area, since the vehicular emission and marine emission within the concerned grids (i.e. Grid 16_38, 16_39, 17_38, 17_39 and 18_39 for vehicular emission and Grid 16_38, 17_38, 18_38 and 18_39 for marine emission) are modelled by the near-field dispersion models, PATH model has been rerun with the removal of these emissions from the respective grids to avoid the double counting in the cumulative assessment for Pillar Point Area.

3.5.4.48 It is anticipated that the emission control technology will be progressively improving in future years and hence the background concentrations shall be progressively reduced. In comparison of the PATH background pollutant concentrations between Years 2030 and 2035, the predicted concentrations are found higher in Year 2030. The PATH concentration is also expected to be higher compared to Year 2033 (the commencement year of the Project). The PATH model for Year 2030 used in the assessment is on conservative side. **Appendix 3.11** shows the removal of the emission in the PATH re-run.

Cumulative Impacts

3.5.4.49 The cumulative air quality impact is a combination of the emission impacts contributed from the near-field and far-field sources on an hourly basis.

3.5.4.50 In consideration of the number of exceedance allowance of the hourly and daily AQOs, the pollutant concentrations beyond the AQOs allowance limits (i.e. the 19th highest 1-hour NO_2 concentrations, the 10th highest 24-hour RSP and 19th highest 24-hour FSP concentrations) have been determined at each ASR. The annual predicted concentrations have also been assessed where applicable and all predicted levels are then compared with the respective AQOs.

3.5.4.51 For short term impact assessment, Ozone Limiting Method (OLM) is adopted for conversion of residual NO to NO_2, using the predicted O_3 levels from updated PATH model. In accordance with EPD's *"Guidelines on Choice of Models and Model Parameters"*, the initial NO_2:NO_x ratio for emissions from chimneys, industrial operation and marine emission are assumed to be 10%.

3.5.4.52 Whereas for long term impact assessment, OLM is also used for conversion of residual NO to NO_2, using the predicted O_3 levels from updated PATH model. However, the OLM method for prediction of long term impact is considered as conservative assessment. For critical ASRs, a more precise Jenkin's method is adopted. The annual NO_2 concentrations are estimated using project specific empirical relationship derived from the latest available monitoring results from EPD's General AQMSs (at Tap Mun and Yuen Long, North and Tuen Mun) and Roadside AQMSs (at Mong Kok and Central). The empirical relationship is described by a fitted curve of the selected annual NO_2 and NO_x monitoring data through the formula below[2],[3]:

[2] Jenkin M E, 2004a. Analysis of sources and partitioning of oxidant in the UK – Part 1: The NOx-dependence of annual mean concentrations of nitrogen dioxide and ozone. Atmospheric Environment, 38, 5117-5129.

[3] Environment Agency UK 2007. Review of methods for NO to NO2 conversion in plumes at short ranges (https://www.gov.uk/government/publications/review-of-methods-for-no-to-no2-conversion-in-plumes-at-short-ranges)

$$[NO_2] = \frac{-Z \pm \sqrt{Z^2 - 4[NO_x][OX]}}{2}$$

where $Z = ([NO_x] + [OX] + {}^{J}/_{K})$

$[NO_x]$ = NO_x concentration

$[NO_2]$ = NO_2 concentration

[Ox] = Sum of NO_2 and O_3 concentration

J = Photolysis rate of NO_2

K = Rate coefficient of the reaction between NO and O_3

3.5.4.53 It is found that the curve would fit the monitoring data when J/K is 18.7 and $[O_x]$ is 99 μg/m^3 without any underestimation (details refer to **Appendix 3.12**).

3.5.4.54 According to EPD's "Guidelines on Choice of Models and Model Parameters", PATH's output on RSP concentrations has also been adjusted as follows:

- 10th highest daily RSP concentration: add 11.0 μg/m^3;
- Annual RSP concentration: add 10.3 μg/m^3;
- 19th and 36th highest daily FSP concentration: Nil; and
- Annual FSP concentration: add 3.5 μg/m^3.

3.5.5 Prediction and Evaluation of Impacts

3.5.5.1 The predicted 19th highest 1-hour NO_2 concentrations, 10th highest 24-hour RSP concentrations, 19th highest 24-hour FSP concentrations and annual NO_2/RSP/FSP concentrations are calculated and presented in **Appendix 3.13**, and summarised in **Table 3.22** to **Table 3.24** below.

3.5.5.2 In Lam Tei area, higher pollutant concentrations are generally predicted at existing / planned ASRs (e.g. A036 Fuk Hang Tsuen Road House 18 and P007b Proposed Public Housing at Nai Wai Block 6 and Podium, etc.) located adjacent to the major roads (including Kong Sham Western Highway and Fuk Hang Tsuen Road, etc.). Nonetheless, the predicted annual NO2 concentrations (the most critical pollutant) range from 17μg/m^3 to 33μg/m^3, which are well within the respective AQO.

3.5.5.3 In Sam Shing area, the predicted annual NO_2 concentrations range from 18 μg/m^3 to 31μg/m^3, which are also well within the respective AQO. The proposed MVB is located at high elevation (16 m above ground). The predicted annual NO_2 concentrations at the nearest residential ASRs (i.e. A307 Harvest Garden Block 2) is 24 μg/m^3; while the19th highest hourly NO_2 concentrations at A340 Wah Fat Playground is 95 μg/m^3.

3.5.5.4 The Pillar Point area is mainly occupied by various kinds of industrial uses such as warehouses, vehicle repairing workshops, sawmills, RTT, sewage treatment plants, vehicle depots, etc. The air quality in this area is mainly influenced by both the marine traffic activities at Tuen Mun Landing Area 40, Chu Kong Shipping Facilities and RTT; as well as the vehicular emission from nearby roads. The predicted annual NO_2 concentrations are high. The predicted annual NO_2 concentrations range from 32 μg/m^3

to 40 μg/m^3 (The annual NO_2 concentrations of 40 μg/m^3 occur at A413 Sawmill at 25-33 Ho Yeung Street, A425 Chu Kong Warehouse Block 2 and A429 TMCLK Admin Building, which are precisely 39.9 μg/m^3, 39.6 μg/m^3 and 39.6 μg/m^3 respectively.) All ASRs are in compliance with the respective AQOs. The contribution breakdown is given in **Table 3.25** below.

3.5.5.5 All in all, it is concluded that the predicted cumulative 19th highest 1-hour NO_2 concentrations, 10th highest 24-hour RSP concentrations, 19th highest 24-hour FSP concentrations and annual NO_2/RSP/FSP concentrations at all identified representative ASRs are within the respective AQOs. Adverse air quality impacts are not anticipated during operational stage of the Project.

3.5.5.6 Based on the assessment results, the worst hit level is found at 1.5m, except for annual NO_2 in Pillar Point which are found to be at 1.5m, 5m and 10m. Hence, contours of 19th highest 1-hour NO_2 concentrations, 10th highest 24-hour RSP concentrations, 19th highest 24-hour FSP concentrations and annual NO_2/RSP/FSP concentrations at 1.5m are plotted for all areas (**Figures 3.6a** to **3.11c**). In addition, contours of annual NO_2 concentrations at 5m and 10m are also plotted for Pillar Point area (**Figures 3.7c** to **3.7d**). Contour plots indicate that there is no exceedance at all air sensitive uses, except for the TMB highway / tunnel operation and maintenance facilities (i.e. the northern ventilation building, satellite control building and operation area in Lam Tei, as well as maintenance compound and training ground and supporting area in Pillar Point) where exceedances of 19th highest 1-hour NO_2 concentrations and annual NO_2 concentrations are predicted.

3.5.5.7 In Lam Tei, the NO_2 exceedance zones identified in **Figure 3.6a** (19th highest 1-hour NO_2 concentrations) and **Figure 3.7a** (annual NO_2 concentrations) represents exceedance at 1.5mAG. As mentioned in above section, in Lam Tei area, the Year 2030 PATH background concentrations have been directly adopted for calculation of cumulative impacts and near-field impacts are double-counted. Hence, the concentration contours are indeed on conservative side. Based on the contour plots, the eastern part of the proposed Northern Ventilation Building, the whole satellite control building and a tiny portion of the operation area would fall within the exceedance zone.

3.5.5.8 The Northern Ventilation Building is unmanned and hence is not considered as air sensitive use. The proposed operation area is largely outside the exceedance zone. Since the uses, layout and design of the operation area are not yet available at EIA stage, it is feasible that it could be planned and designed to avoid adverse air quality impacts. If there are planned air sensitive uses, the operation area will be properly designed such that any openings, openable windows, and/or FAIs will be located and avoided from the predicted exceedance zone at 1.5mAG (e.g. by provision of fixed glazed window or blank facades, and FAIs to be located away or proposed air sensitive uses outside the exceedance zone). Further review of the layout and design of operation area will be conducted in Detailed Design Stage to re-affirm compliance of the AQOs. For the proposed satellite control building, it is recommended that air filtering system with at least 40% NO_2 removal efficiency[4] shall be installed in order to achieve AQO compliance. The air filtering system and NO_2 removal efficiency will be further reviewed in Detailed Design Stage to re-affirm that the air quality impacts at all sensitive uses at the proposed highway / tunnel operation and maintenance facilities could comply within the AQOs.

[4] The removal efficiency of 40% is deduced from modelling results of the worst concentrations of these areas at various heights in both long term and short term NO_2.

3.5.5.9 In Pillar Point, the southern portion of the proposed maintenance compound and a tiny portion of the proposed training ground and supporting area would also fall within the annual NO_2 exceedance zone at 1.5mAG (**Figure 3.7b**). The proposed training ground and supporting area is tentatively planned to be non-sensitive, but the uses, layout and design of the training ground and supporting area are subject to review in Detailed Design Stage. Since only a tiny portion of the training ground and supporting area is within the exceedance zone, it is feasible that, in future design, any openings, openable windows, and/or FAIs could be well planned to avoid from the predicted exceedance zone at 1.5mAG (e.g. by provision of fixed glazed window or blank facades, and FAIs to be located away or proposed air sensitive uses outside the exceedance zone). For the maintenance compound, the uses, layout and design of the maintenance compound are not yet available at EIA stage. Similarly, since the facility is largely outside the exceedance zone, it is recommended that it could be properly designed such that openings and openable windows, and/or FAIs shall be located and avoided from the predicted exceedance zone. In case FAIs are unavoidably to be planned within the exceedance zone at 1.5mAG, air filtering system with at least 30% NO_2 removal efficiency[5] shall be installed for the proposed maintenance compound. Again, the air filtering system if necessary and NO_2 removal efficiency shall be further reviewed in Detailed Design Stage to re-affirm that the air quality impacts at all sensitive uses at the TMB highway / tunnel operation and maintenance facilities could comply within the AQOs.

3.5.5.10 With proper design and implementation of necessary mitigation measures at TMB's highway / tunnel operation and maintenance facilities, adverse air quality impacts are therefore not anticipated during operational phase of the Project.

3.5.5.11 It should also be noted that the prediction is generally based on conservative assumptions. In particular, the assessment has not taken into account the use of electric vehicles. To further improve the air quality, the Government had released Hong Kong's first Roadmap on Popularisation of Electric Vehicles and the Clean Air Plan for Hong Kong 2035 in March and June 2021 respectively. It sets a target to stop new registration of fuel-propelled and hybrid Private Cars in 2035 or earlier. The Government has been also proactively encouraging the use of electric commercial vehicles by promoting trials for electric public transport as well as offering first registration tax concessions and a New Energy Transport Fund. With popularisation of electric vehicles, it is reasonably anticipated that the use of electric vehicles would become more common and vehicular emission impacts shall be progressively improving in long run.

Table 3.22 Cumulative NO_2, RSP and FSP Concentrations in Lam Tei Area

ASR ID	Location	Range of Pollutant Concentration (μg/m³) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
Existing ASRs							
A001	Wo Ping San Tsuen House 198	106	23	71	27	38	16
A002	Wo Ping San Tsuen Village House	105 to 106	23 to 24	71	27	38	16
A003	Wo Ping San Tsuen Village House	101 to 102	22 to 23	71	27	38	16
A004	Wo Ping San Tsuen House 145	101	22 to 23	71	27	38	16
A008	Tsoi Yuen Tsuen House 283	97 to 100	22 to 23	69	27	37	15

[5] The removal efficiency of 30% is deduced from modelling results of the worst concentrations of these areas at various heights in both long term and short term NO_2.

ASR ID	Location	Range of Pollutant Concentration (μg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
A009	Tsoi Yuen Tsuen House 282	96 to 97	22	69	27	37	15
A010	Tsoi Yuen Tsuen House 74	97 to 98	22 to 23	69	27	37	15
A011	Fuk Hang Tsuen House 152	100 to 101	23 to 24	69	27	37	15
A012	Tsoi Yuen Tsuen Village House	100 to 102	23 to 24	69	27	37	15
A013	Tsoi Yuen Tsuen House 159	99 to 101	22 to 23	69	27	37	15
A014	Tsoi Yuen Tsuen Village House	99	22 to 23	69	27	37	15
A015	Tsoi Yuen Tsuen House 166	105	25	71	28	38	16
A016	Tsoi Yuen Tsuen House 189	104 to 105	24 to 25	71	28	38	16
A017	Tsoi Yuen Tsuen Village House	103 to 104	25	71	28	38	16
A020	Nai Wai House 332	101	23 to 24	71	27	37	16
A021	Nai Wai Village House	101	24	71	27	37	16
A022	Nai Wai House 248	100 to 101	24	71	27	37	16
A023	Nai Wai Village House	102 to 106	24 to 26	71	27 to 28	37	16
A024	Yorks Field Garden	94 to 97	20 to 22	71	27	38	15
A025	Tsoi Yuen Tsuen House 211A	97 to 98	22	71	27	37	16
A026	Nai Wai Temple	96	21	73	27	38	16
A027	Nai Wai House 158	97	22	71	27	37	16
A028	Belrose Place Block A	100 to 109	22 to 24	73	27 to 28	38	16
A029	Tsing Yick Road Village House	97 to 100	23 to 24	73	27 to 28	38	16
A030	Tsing Yick Road Village House	99 to 100	23 to 24	73	28	38	16
A031	Lam Tei Pet Garden	111	NA	72	NA	38	NA
A032	Fuk Hang Playground Basketball Court	107	NA	72	NA	38	NA
A033	Fuk Hang Tsuen Road House 2	103 to 108	25 to 27	72	28	38	16
A034	Fuk Hang Tsuen Road House 11	105 to 113	26 to 32	72	28	38	16
A035	Fuk Hang Tsuen Road Garden	121	NA	72	NA	38	NA
A036	Fuk Hang Tsuen Road House 18	105 to 121	27 to 33	72	28	38	16
A037	Fortress Garden Block 8	100 to 101	23 to 24	71	27	38	16
A038	Tuen Tsz Wai Village House	101 to 102	23 to 24	71 to 72	27	38	16
A039	Tuen Tsz Wai House 565	102 to 104	23 to 24	71 to 72	27	38	16
A040	Farmer Restaurant	102 to 108	22 to 25	71 to 72	27 to 28	37 to 38	16
A041	Miu Fat Buddhist Monastery Ksitigarbha Hall	102	24	71	27	38	16
A042	Miu Fat Buddhist Monastery	93 to 101	21 to 24	71	27	37 to 38	16
A043	Madam Lau Kam Lung Secondary School of Miu Fat Buddhist Monastery	98 to 102	22 to 24	71	27	38	16
A044	Miu Fat Buddhist Monastery Elderly Home	99 to 101	22 to 23	71	27	38	16
A045	Temple at Lam Tei	101	23	71	27	38	16
A046	Lam Tei House 20	101	23	71	27	38	16
A047	The Sherwood Block 1	94 to 107	21 to 27	71 to 72	27 to 28	37 to 38	16
A048	The Sherwood Block 2	93 to 107	21 to 27	71 to 72	27 to 28	37 to 38	16
A049	The Sherwood Block 3	94 to 111	21 to 26	71 to 72	27 to 28	37 to 38	16
A050	The Sherwood Block 4	95 to 106	21 to 25	71 to 72	27 to 28	37 to 38	16
A051	The Sherwood Block 5	95 to 103	21 to 25	71 to 72	27 to 28	37 to 38	16
A052	The Sherwood Podium	108 to 111	28 to 30	72	28	38	16
A053	The Sherwood Block 13	94 to 110	21 to 28	71 to 72	27 to 28	37 to 38	16
A054	The Sherwood Block 12	95 to 109	21 to 27	71 to 72	27 to 28	37 to 38	16
A055	The Sherwood Block 11	95 to 109	21 to 27	71 to 72	27 to 28	37 to 38	16
A056	The Sherwood Block 10	95 to 107	21 to 26	71 to 72	27 to 28	37 to 38	16

ASR ID	Location	Range of Pollutant Concentration (μg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
A057	The Sherwood Block 9	95 to 106	21 to 26	71 to 72	27 to 28	37 to 38	16
A058	Lam Tei Main Street House 88	101	23	71	27	37 to 38	16
A059	Tuen Mun San Tsuen House 110	100 to 101	23	71	27	37	16
A060	Store at Lam Tei Main Street House 128	101 to 108	23 to 27	71 to 72	27 to 28	38	16
A061	Botania Villa Block 1	95 to 106	21 to 25	71	27	37 to 38	16
A062	Botania Villa Podium	104 to 105	25 to 26	72	27	38	16
A063	Botania Villa Block 10	95 to 104	21 to 25	71 to 72	27	37 to 38	16
A064	GreenView Podium	104 to 110	24 to 27	71 to 72	27 to 28	38	16
A065	GreenView	94 to 108	21 to 26	71 to 72	27 to 28	37 to 38	16
A066	Botania Villa Block 9	94 to 105	21 to 25	71	27	37 to 38	16
A067	Fuk Hang Tsuen House 12	105	25	72	28	38	16
A068	The Church of Christian Faith Lam Tei Gospel Church	103	24	72	27	38	16
A069	Property Agency at Fuk Hang Tsuen Road	103	27	72	28	38	16
A070	Fuk Hang Tsuen House 25	107 to 108	25	72	28	38	16
A071	Fuk Hang Tsuen House 458	107 to 108	26	72	28	38	16
A072	Fuk Hang Tsuen Village House	103 to 104	22 to 23	69	27	37	15
A073	Fuk Hang Tsuen Village House	103 to 105	23	69	27	37	15
A074	Fuk Hang Tsuen Village House	110 to 111	27	72	28	38	16
A075	Fuk Hang Tsuen Village House	108 to 111	27 to 28	72	28	38	16
A076	Fuk Hang Tsuen Houses 59-61	108	26 to 27	72	28	38	16
A077	Church of Christian Faith Lam Tei Gospel Church	107	25 to 26	72	28	38	16
A078	Fuk Hang Tsuen Village House	105	25 to 26	72	28	38	16
A079	Tin Hau Temple at Fuk Hang Tsuen Road	108	26	72	28	38	16
A080	Tuen Mun Heung Fuk Hang Tsuen Village Office	105 to 109	25 to 26	72	28	38	16
A081	Lam Tei Fa Pao Association	107	25	72	28	38	16
A082	Fuk Hang Tsuen House 130	105 to 106	25 to 26	72	28	38	16
A083	Fuk Hang Tsuen Village House	105	25	72	28	38	16
A084	Fuk Hang Tsuen Village House	104	24	72	27 to 28	38	16
A085	To Yuen Wai House 160	103 to 104	24 to 25	72	28	38	16
A087	Tan Kwai Tsuen Village House	94	18	69	27	37	15
A088	Tung Fuk Road Village House	97 to 98	18 to 19	69	27	37	15
A089	Tung Fuk Road Village House	94 to 97	18	69	27	37	15
A090	Tung Fuk Road Village House	99	19	69	27	37	15
A091	Tung Fuk Road Village House	101	20	69	27	37	15
A092	Tung Fuk Road Village House	102 to 104	20	69	27	37	15
A093	Tung Fuk Road Village House	103 to 107	20	69	27	37	15
A094	Fuk Hang Tsuen House 178	99 to 100	19	69	27	37	15
A095	Fuk Hang Tsuen Village House	101 to 102	19 to 20	69	27	37	15
A096	Fuk Hang Tsuen Village House	96 to 98	18	69	27	37	15
A097	Tin Hau Temple at Fuk Hang Tsuen Path	97	18	69	27	37	15
A098	Fuk Hang Tsuen Village House	96	18	69	27	37	15
A099	Fuk Hang Tsuen Village House	101 to 103	20	69	27	37	15
A100	Chui Fuk Road Village House	104 to 105	21 to 22	69	27	37	15
A101	Chui Fuk Road Village House	104	21 to 22	69	27	37	15

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
A102	Chui Fuk Road Village House	104 to 105	22	69	27	37	15
A103	Fu Fuk Road Village House	102 to 103	21	69	27	37	15
A104	Fu Tei Ha Tsuen Village House	110 to 111	24	71 to 72	28	38	16
A105	Fu Tei Ha Tsuen Village House	109 to 111	24 to 25	71 to 72	28	38	16
A106	Fu Tei Ha Tsuen Village House	110	24	71	27	37	16
A107	Fu Tei Ha Tsuen Village House	105	23	71	27	37	16
A108	Fu Tei Ha Tsuen Village House	104 to 105	23 to 24	71	27	37	16
A110	Fu Tei Ha Tsuen Village House	103	21	69	27	37	15
A111	Sin Fat Hang Yuen Temple	103	20	69	27	37	15
A112	Nam On Buddhist Monastery	103	20	69	27	37	15
A113	Fu Tei Ha Tsuen Village House	100	20	69	27	36	15
A114	Fu Tei Ha Tsuen Village House	101	20	69	27	36	15
A115	Fu Tei Ha Tsuen Village House	100	20	69	27	36	15
A116	Fu Tai Estate - Ning Tai House	91 to 100	18 to 20	69	27	36	15
A117	Fu Tai Estate - Yat Tai House	91 to 100	18 to 20	69	27	36	15
Planned ASRs							
P001	Proposed Public Housing at Ping Shan South and Podium with Kindergarten, Welfare and Retail Facilities	89 to 95	17 to 20	71	27	37 to 38	15
P002a	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 100	17 to 22	69	27	37	15
P002b	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 97	17 to 22	69	27	37	15
P002c	Podium with Welfare and Retail Facilities for Proposed Public Housing at Lam Tei North	97 to 100	21 to 22	69	27	37	15
P003a	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 95	17 to 20	69	27	37	15
P003b	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 95	17 to 20	69	27	37	15
P003c	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 94	17 to 20	69	27	37	15
P004a	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 95	17 to 21	69	27	37	15
P004b	Proposed Public Housing at Lam Tei North and Podium with Welfare and Retail Facilities	90 to 95	17 to 21	69	27	37	15
P005a	Proposed Public Housing at Lam Tei North	90 to 101	17 to 23	69	27	37	15
P005b	Proposed Public Housing at Lam Tei North	90 to 100	17 to 23	69	27	37	15
P006	Proposed Temporary Place of Recreation, Sports or Culture (Indoor Recreation Centre)	97	22	69	27	37	15

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
P007a	Proposed Public Housing at Nai Wai and Podium with Welfare Facilities	91 to 105	19 to 24	71	27	37 to 38	15 to 16
P007b	Proposed Public Housing at Nai Wai and Podium with Welfare Facilities	91 to 124	19 to 30	71	27 to 28	37 to 38	15 to 16
P008a	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 105	19 to 26	71	27 to 28	37 to 38	15 to 16
P008b	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 115	19 to 29	71	27 to 28	37 to 38	15 to 16
P008c	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 104	19 to 25	71	27	37 to 38	15 to 16
P008d	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 105	19 to 26	71	27 to 28	37 to 38	15 to 16
P009a	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 106	19 to 26	71	27 to 28	37 to 38	15 to 16
P009b	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 102	19 to 24	71	27	37 to 38	15 to 16
P010	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 101	19 to 24	71	27	37 to 38	15 to 16
P011	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 103	19 to 25	71	27 to 28	37 to 38	15 to 16
P012a	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 107	19 to 26	71	27 to 28	37 to 38	15 to 16
P012b	Proposed Public Housing at Nai Wai and Podium with Welfare and Retail Facilities	91 to 105	19 to 26	71	27 to 28	37	15 to 16
P013a	Planned Public Housing in Hung Shui Kiu/Ha Tsuen New Development Area and Podium with Retail Use	93 to 100	18 to 25	73	27 to 28	38	16
P014	Proposed Development of Elderly Home by Pok Oi Hospital	92 to 106	20 to 28	71 to 72	27 to 28	37 to 38	15 to 16
P015	Proposed Development of Elderly Home by Pok Oi Hospital	92 to 105	20 to 26	71 to 72	27 to 28	37 to 38	15 to 16
P016	Proposed Development of Elderly Home by Pok Oi Hospital	92 to 104	20 to 25	71 to 72	27 to 28	37 to 38	15 to 16
P017	Proposed Comprehensive Development Area in Lot 2883 in D.D. 130	102 to 105	23 to 24	71	27	38	16
P018	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	95 to 109	21 to 27	71 to 72	27 to 28	37 to 38	16

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
P019	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	97 to 111	21 to 27	71 to 72	27 to 28	37 to 38	16
P020	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	98 to 107	21 to 26	71 to 72	27 to 28	37 to 38	16
P021	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	97 to 114	21 to 29	71 to 72	27 to 28	37 to 38	16
P022	Proposed Comprehensive Development in D.D. 130 and Adjoining Government Land	97 to 113	21 to 30	71 to 72	27 to 28	37 to 38	16
P025	Temporary Place of Recreation, Sports or Culture (Sports Training Ground)	104 to 111	20 to 21	69	27	37	15

Note:
[1] NA indicates the AQO is not applicable for those ASRs (e.g. park, garden, outdoor play/recreational area, sitting areas, etc.) since people inside these premises would not stay for long duration and subject to long-term impacts.

Table 3.23 Cumulative NO_2, RSP and FSP Concentrations in Pillar Point Area

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among assessment heights[1]					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
Existing ASRs							
A401	TMCLK Main Control Building FAI	119	35	70	28	40	16
A402	TMCLK Main Control Building Windows	111 to 117	33 to 35	70	28	40	16
A403	Butterfly Beach Laundry	116 to 147	32 to 38	70	28 to 29	40	16
A404	Butterfly Beach Laundry	118 to 133	32 to 35	70 to 71	29	40	16
A405	Metal Recycle or Vehicle Repairing Workshop	128 to 137	34 to 36	71 to 72	29	40	16
A406	Metal Recycle or Vehicle Repairing Workshop	126 to 131	34 to 35	71 to 73	29 to 30	40	16
A407	Metal Recycle or Vehicle Repairing Workshop	128 to 135	34 to 35	71 to 73	29 to 32	40	16 to 17
A408	Metal Recycle or Vehicle Repairing Workshop	130 to 143	35 to 36	70 to 72	29 to 31	40	16
A409	Metal Recycle or Vehicle Repairing Workshop	139 to 145	36 to 37	71 to 73	30 to 32	39 to 40	17
A410	Sawmill at 25-33 Ho Yeung Street	139 to 142	36 to 37	71 to 72	30 to 31	39	17
A411	Sawmill at 25-33 Ho Yeung Street	139 to 140	36 to 38	72 to 73	30	39	17
A412	Sawmill at 25-33 Ho Yeung Street	141 to 146	37	71	30	39	16
A413	Sawmill at 25-33 Ho Yeung Street	140	37 to 40 [2]	72	30	39	16 to 17
A414	Sawmill at 25-33 Ho Yeung Street	138 to 141	36 to 39	72	30	39	16 to 17

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among assessment heights[1]					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
A415	Sawmill at 61-69 Ho Yeung Street	139 to 141	37 to 39	72	29 to 30	39	16 to 17
A416	Sawmill at 61-69 Ho Yeung Street	143 to 147	37	71	29	39	16
A417	Sawmill at 81-85 Ho Yeung Street	145 to 147	37	71	29	39	16
A418	Sawmill at 81-85 Ho Yeung Street	141 to 144	37	71	29	39	16
A419	Sawmill at 81-85 Ho Yeung Street	136 to 139	37 to 39	71	29 to 30	39	16 to 17
A420	Sunhing Hungkai Tuen Mun	131 to 157	36 to 39	70 to 71	29 to 30	38 to 39	16 to 17
A421	Pillar Point Fire Station	143 to 155	37 to 39	71	29	39	16
A422	Sunhing Hungkai Tuen Mun	136 to 165	37 to 39	70 to 71	29 to 30	38 to 39	16
A423	Pillar Point Fire Station	141 to 146	37 to 38	71	29	39	16
A424	Sunhing Hungkai Tuen Mun	135 to 150	36 to 39	70 to 71	29 to 30	38 to 39	16
A425	Chu Kong Warehouse Block 2	135 to 162	36 to 40 [2]	70 to 71	29	38 to 39	16
A426	Chu Kong Warehouse Block 1	127 to 140	36 to 38	70 to 71	29	38 to 39	16
A427	TMCLK Kiosk N2 FAI	131	35	71	29	39	16
A428	TMCLK Maintenance Depot Office Windows	125	35	71	29	39	16
A429	TMCLK Administration Building	122 to 125	36 to 40 [2]	71	29	39	16
A430	Customs and Excise Department Harbour and River Trade Division FAI	128	37	70	29	39	16
A431	EMSD Tuen Mun Vehicle Servicing Station	131 to 138	37 to 39	71	29	39	16
A432	Administration Building of Pillar Point Sewage Treatment Works	139 to 141	36 to 37	71	29	39	16
A433	Goodman Westlink	120 to 135	34 to 38	69 to 70	28	39	16

Notes:

[1] For ASRs in Pillar Point Area with assessment height larger than 17mAG, PATH Level 2 is adopted for cumulative impacts.

[2] The annual NO_2 concentrations for A413 (10mAG), A425 (1.5mAG) and A429 (5mAG) are 39.9µg/m^3, 39.6 µg/m^3 and 39.6 µg/m^3 respectively which comply with the AQO criterion.

Table 3.24 Cumulative NO_2, RSP and FSP Concentrations in Sam Shing Area

ASR ID	Location	Range of Pollutant Concentration (μg/m³) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
	Criteria	**200**	**40**	**100**	**50**	**50**	**25**
Existing ASRs							
A301	Handsome Court Block 4	88	18	68	27	37	15
A302	Handsome Court Block 7	88 to 91	18 to 20	68	27	37	15
A303	Alpine Garden Block 2	89 to 94	21 to 23	69	27	38	15
A304	Alpine Garden Block 5	89 to 94	21 to 23	69	27	38 to 39	15
A305	Hoi Tak Garden Block 3	90 to 95	22 to 24	69	27	39	15
A306	Harvest Garden Block 3	90 to 95	21 to 24	69	27	38 to 39	15
A307	Harvest Garden Block 2	90 to 98	21 to 24	69	27	38 to 39	15
A308	Harvest Garden Block 1	90 to 100	21 to 24	69	27	38 to 39	15
A309	Kam Fai Garden Block 1	89 to 99	21 to 24	69	27	38 to 39	15
A310	Podium for Kam Fai Garden	98 to 99	23	69	27	39	15
A311	Kam Fai Garden Block 4	90 to 99	21 to 24	69	27	38 to 39	15
A312	Kam Fai Garden Block 3	89 to 97	21 to 24	69	27	38 to 39	15
A313	Caritas Li Ka Shing Care And Attention Home	95 to 97	23 to 24	69	27	39	15
A314	Chi Lok Fa Yuen Stores	95	21	68	27	37	15
A315	Chi Lok Fa Yuen Block 8	88 to 96	18 to 22	68	27	37	15
A316	Taoist Association Yuen Yuen Primary School	89 to 95	18 to 21	68	27	37	15
A317	Rainbow Garden Block B	90 to 100	21 to 25	69	27	38 to 39	15
A318	JC Place Tower 3	90 to 101	22 to 25	69	27	39	15
A319	JC Place Tower 1	91 to 100	22 to 25	69	27	39	15
A320	Tsing Sin Playground	103	NA	69	NA	39	NA
A321	Tai Tung Pui Care & Attention Home	90 to 100	22 to 25	69	27	39	15
A322	Hong King Garden Block B	99 to 106	24 to 28	69 to 70	27	39	15
A323	Tuen Mun Siu Lun Government Complex	101 to 115	25 to 31	69 to 70	27 to 28	39	15 to 16
A324	CSBS Mrs. Aw Boon Haw Secondary School	102 to 112	26 to 31	70	27 to 28	39	15 to 16
A325	Semple Memorial Secondary School	102 to 107	26 to 29	70	27	39	15
A326	Sam Shing Temple	102 to 103	26	70	27	39	15
A327	Ki Lun Kong Public Park	107	NA	70	NA	39	NA

ASR ID	Location	Range of Pollutant Concentration (μg/m^3) among assessment heights					
		NO_2 (Year 2048)		RSP (Year 2048)		FSP (Year 2048)	
		1-hour (19th highest)	Annual	24-hour (10th highest)	Annual	24-hour (19th highest)	Annual
Criteria		**200**	**40**	**100**	**50**	**50**	**25**
A328	The Salvation Army Sam Shing Nursery School	115	30	70	28	39	15
A329	Palm Cove Tower 5	99 to 103	24 to 26	69 to 70	27	39	15
A330	Palm Cove Tower 3	99 to 104	24 to 26	69 to 70	27	39	15
A331	Palm Cove Tower 1	89 to 97	21 to 23	69	27	38	15
A332	Tsing Ha Lane Village House	97 to 98	22	69	27	38	15
A333	Dragon Villa	91 to 96	21 to 22	69	27	38	15
A334	Dragon Inn Court Block 4	89 to 99	21 to 22	69	27	38 to 39	15
A335	Dragon Inn Seafood Restaurant	98 to 100	22 to 23	69	27	39	15
A336	Tsing Yung Terrace Tower 1	89 to 94	21 to 22	69	27	38	15
A337	Tsing Yung Terrace Club House	95	22	69	27	38	15
A338	Podium for Faraday House	95	22	69	27	38	15
A339	Faraday House Block 1	89 to 95	21 to 22	69	27	38	15
A340	Wah Fat Playground	95	NA	69	NA	39	NA

Table 3.25 Contribution Breakdown of ASRs with Highest Annual NO_2 Concentration in Respective Areas

Annual NO_2 concentration (ug/m^3)	Lam Tei	Pillar Point	Pillar Point	Pillar Point	Sam Shing
	A036	A413	A425	A429	A323
	Fuk Hang Tsuen Road House 18	Sawmill at 25-33 Ho Yeung Street	Chu Kong Warehouse Block 2	TMCLK Admin Building	Tuen Mun Siu Lun Government Complex
Chimney	3	<1	<1	1	-[1]
Marine	-[1]	4	3	1	-[1]
Open road [2]	10	<1	2	2	6
Portal	<1	<1	<1	1	<1
VB	<1	<1	<1	<1	<1
PTI	<1	<1	<1	<1	<1
PATH Background	19	34	34	34	24
Cumulative impact	33	40 [3]	40 [3]	40 [3]	31

Notes:

[1] No marine emission at Lam Tei and Sam Shing Area. No chimney emission at Sam Shing Area.

[2] The contribution breakdown is presented for the ASRs with highest cumulative concentration from all sources including the background. The presented contribution from open roads (including Project roads) to the selected ASRs may not be the highest amongst all ASRs in the respective area.

[3] The annual NO_2 concentrations for A413 (10mAG), A425 (1.5mAG) and A429 (5mAG) are 39.9µg/m^3, 39.6 µg/m^3 and 39.6 µg/m^3 respectively which comply with the AQO criterion.

3.5.6 Recommended Mitigation Measures

3.5.6.1 According to the operational air quality assessment results, adverse cumulative air quality impact during operational phase of the Project is not anticipated. However, the TMB's entire satellite control building and tiny portion of operation area in Lam Tei, as well as southern portion of the proposed maintenance compound and tiny portion of training ground and supporting area in Pillar Point would fall within the potential exceedance zone.

3.5.6.2 It is recommended that if there are any planned air sensitive uses within the operation area in Lam Tei, and maintenance compound and training ground and supporting area in Pillar Point, they will be properly designed such that any openings, openable windows, and/or FAIs will be located and avoided from the predicted exceedance zone at 1.5mAG (e.g. by provision of fixed glazed window or blank facades, and FAIs to be located away or proposed air sensitive uses outside the exceedance zone). Further review of the layout and design of these TMB highway / tunnel operation and maintenance facilities will be conducted in Detailed Design Stage to re-affirm compliance of the AQOs.

3.5.6.3 For the proposed satellite control building where the entire building falls within the exceedance zone, it is recommended to install air filtering system with at least 40% NO_2 removal efficiency in order to achieve AQO compliance. In case FAIs for maintenance compound are unavoidably to be planned within the exceedance zone at 1.5mAG, air filtering system with at least 30% NO_2 removal efficiency shall be installed. The air filtering system and NO_2 removal efficiency shall be further reviewed in Detailed Design

Stage to re-affirm that the air quality impacts at all sensitive uses at the TMB highway / tunnel operation and maintenance facilities could comply within the AQOs.

3.5.6.4 It should be noted that the ventilation schemes as presented in **Table 3.17** and **Table 3.18** are the best available information provided by the Project Engineer at the time of preparing this EIA. During the subsequent design stage and the operational stage, the ventilation engineer should conduct reviews on the ventilation scheme covering different periods of a day, taking into account the contemporary circumstance such as latest traffic forecast, traffic composition, update on the ambient air quality, etc., and then review and update the air quality assessment as necessary to re-affirm full compliance of the AQO. These reviews would allow the designer and operator to optimize the operation of the ventilation system without compromising the compliance of AQO.

3.5.7 Residual Impacts

3.5.7.1 According to the operational air quality impact assessment results, with proper design and mitigation measures at TMB's highway / tunnel operation and maintenance facilities, no adverse residual air quality impact during operational phase of the Project is anticipated.