MTR Corporation Ltd

Environmental Consultancy No. C1202 Environmental Impact Assessment Study for Tung Chung Line Extension

Environmental Impact Assessment Report - Air Quality Impact Assessment

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3 Air Quality

3.1 Legislation, Standards and Criteria

3.1.1 General

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

- 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); and
- Criteria and guidelines for evaluating and assessing air quality impact as specified in Section 1 of Annexes 4 and 12 of the EIAO-TM.

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

3.1.2.1 During the construction phase of the Project, the key air pollution sources that may bear upon the air quality are dust emissions associated with the construction activities of the Project. The representative pollutants for construction phase assessments are particulate matters, including Total Suspended Particulate (TSP), Respirable suspended particulates (RSP) and Fine Suspended Particulates (FSP).

3.1.2.2 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), RSP, 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 2014 are listed in **Table 3.1.1.**

Table 3.1.1 Current Hong Kong Air Quality Objectives (HKAQO)

Pollutant	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)			125 (3)	
RSP (PM_{10}) [2]				100 (9)	50

Pollutant	Limits on Concentration, µg/m³ [1] (The Number of Exceedance per calendar year allowed is shown in brackets)				
	10-min	1-hr	8-hr	24-hr	Annual
FSP ($PM_{2.5}$) [3]				75 (9)	35
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 293Kelvin 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. $PM_{2.5}$).

3.1.2.3 It shall be noted that the Air Pollution Control (Amendment) Ordinance 2021 (Amendment Ordinance) for tightening three AQOs (namely the 24-hour AQO for SO_2 and the annual and 24-hour AQOs for FSP) have been published in the gazette on 7 May 2021. The new AQOs will be effective on 1 Jan 2022. The new AQOs is summarised in **Table 3.1.2** below. Considering the programme of this study, the new AQOs will be used for the air quality impact assessment.

Table 3.1.2 New AQOs

Pollutant	Limits on Concentration, µg/m³ [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)	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 293Kelvin 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. $PM_{2.5}$).

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

3.1.3.1 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.

3.1.4 Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation

3.1.4.1 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.

3.1.5 Air Pollution Control (Fuel Restriction) Regulation

3.1.5.1 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.

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

3.1.6.1 There is no criterion on TSP under the AQOs. In accordance with Annex 4 of EIAO-TM, a limit of 500μg/m^3 for 1-hour TSP concentration at any sensitive receivers should be adopted for evaluating air quality impacts.

3.2 Description of the Environment

3.2.1 Existing Ambient Air Quality

3.2.1.1 The nearest Air Quality Monitoring Station (AQMS) operated by EPD within the project area is Tung Chung AQMS. The latest 5-years monitoring data for RSP and FSP are summarised in **Table 3.2.1**.

Table 3.2.1 Air quality monitoring data (Tung Chung Station, 2016 – 2020)

Pollutant	Parameter	Concentrations (µg/m^3)						AQOs (µg/m^3)
		2016	2017	2018	2019	2020	5-year mean	
RSP	10th highest 24-hour	92	81	73	75	66	77 [77%]	100 (9)
	Annual	33	34	31	30	25	31 [61%]	50
FSP	36th highest 24-hour	39	42	33	35	27	35 [70%]	50 (35)
	Annual	21	21	18	19	14	19 [76%]	25

Note:
[1] Number of exceedance allowed under the AQO is shown in ( ), % of the AQO is shown in [ ].
[2] Monitoring results exceeding the AQO are bolded and underlined.
[3] The historical monitoring data was compared to the proposed new AQOs.

3.2.1.1 It can be seen from **Table 3.2.1** that there was a decreasing trend of 10th highest 24-hour RSP from 92µg/m^3 in 2016 to 66µg/m^3 in 2020 and they all complied with the AQO of 100µg/m^3. A decreasing trend of annual RSP was also observed, ranging from 33µg/m^3 in 2016 to 25µg/m^3 in 2020, which could all comply with the AQO of 50µg/m^3.

3.2.1.2 Similar to RSP, there was a decreasing trend of 36th highest 24-hour FSP from 39µg/m^3 in 2016 to 27µg/m^3 in 2020. The annual FSP concentrations were found to decrease from 21µg/m^3 in 2016 to 14µg/m^3 in 2020. Both 24-hour and annual FSP concentrations could comply with the proposed new AQOs of 50µg/m^3 and 25µg/m^3, respectively.

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 only. The future ambient 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 A new version of the PATH model (PATH v2.1) has been available in July 2021. As the assessment years are 2023 to 2027 (all major heavy and dusty construction activities of the Project will be conducted between 2023 to 2027, see details in **Section 3.4.2.1**), Year 2023 and 2024 PATH model results are used for the assessment of construction dust impacts in 2023 and 2024 respectively, while Year

2025 PATH model results are used for the assessment of construction dust impacts in 2025, 2026 and 2027.

3.2.2.3 The assessment area of the Project involves 8 grids in PATH v2.1. The hourly concentrations of particulate matters predicted by the PATH v2.1 for year 2023, 2024 and 2025 are summarised in the following tables. **Figure 3.2.1** illustrates the locations of concerned PATH grids.

Table 3.2.2a Future ambient air quality for concerned PATH grids (Year 2023)

Pollutant	Parameter	Concentrations (μg/m³)				
		16_29	16_30	17_30	17_31	AQO
RSP	10th highest 24-hour	67	66	67	68	100 (9)
	Annual	27	26	27	28	50
FSP	36th highest 24-hour	25	24	25	24	50 (35)
	Annual	15	15	15	15	25
Pollutant	**Parameter**	**Concentrations (μg/m³)**				
		18_30	**18_31**	**19_31**	**20_31**	**AQO**
RSP	10th highest 24-hour	68	68	68	68	100 (9)
	Annual	27	28	28	28	50
FSP	36th highest 24-hour	25	25	25	25	50 (35)
	Annual	15	15	15	15	25

Table 3.2.2b Future ambient air quality for concerned PATH grids (Year 2024)

Pollutant	Parameter	Concentrations (μg/m³)				
		16_29	16_30	17_30	17_31	AQO
RSP	10th highest 24-hour	66	66	67	68	100 (9)
	Annual	26	26	27	28	50
FSP	36th highest 24-hour	24	24	24	24	50 (35)
	Annual	14	14	15	15	25
Pollutant	**Parameter**	**Concentrations (μg/m³)**				
		18_30	**18_31**	**19_31**	**20_31**	**AQO**
RSP	10th highest 24-hour	68	68	68	68	100 (9)
	Annual	27	28	28	28	50
FSP	36th highest 24-hour	25	25	24	24	50 (35)
	Annual	15	15	15	15	25

Table 3.2.2c Future ambient air quality for concerned PATH grids (Year 2025)

Pollutant	Parameter	Concentrations (μg/m³)				
		16_29	16_30	17_30	17_31	AQO
RSP	10th highest 24-hour	66	66	67	67	100 (9)
	Annual	26	26	27	28	50
FSP	36th highest 24-hour	24	24	24	24	50 (35)
	Annual	15	15	15	15	25

Pollutant	Parameter	Concentrations (µg/m^3)				
		16_29	16_30	17_30	17_31	AQO
Pollutant	**Parameter**	**Concentrations (µg/m^3)**				
		18_30	**18_31**	**19_31**	**20_31**	**AQO**
RSP	10th highest 24-hour	68	68	68	67	100 (9)
	Annual	27	28	28	28	50
FSP	36th highest 24-hour	24	24	24	24	50 (35)
	Annual	15	15	15	15	25

3.2.2.4 With the updated emission inventory and implementation of the emission reduction measures by both the Hong Kong and Guangdong Governments, future background RSP and FSP concentrations predicted by PATH v2.1 is lower than the new AQOs.

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 Representative ASRs within the boundary of the Assessment Area (i.e. 500m from the Project boundary) have been identified. These ASRs include both the existing and planned developments. Existing ASRs are identified by means of reviewing topographic maps, aerial photos and building plans, and verified by site visits. Representative ASRs are described in clusters as follows:

ASRs near Tai Ho Wan	• Pak Mong Village
ASRs to North of North Lantau Highway	• Residential developments (e.g. Ying Tung Estate, The Visionary, Coastal Skyline, Caribbean Coast), recreational facilities (e.g. Bermuda Park, Tung Chung Waterfront Park, Tung Chung North Park), schools (e.g. Ho Yu College and Primary School) as well as Sheraton Hong Kong Tung Chung Hotel
ASRs to South of North Lantau Highway to Shun Tung Road	• Residential developments (e.g. Tung Chung Crescent, Fu Tung Estate), recreational facilities (e.g. Tung Chung Swimming Pool) and schools (e.g. Sunshine House International Pre-School)
ASRs to South of Shun Tung Road to Yat Tung Estate	• Residential developments (e.g. Yat Tung Estate, Ma Wan Chung), North Lantau Hospital, Lantau North Police Station and Tung Chung Fire Station

ASRs to South of Yu Tung Road	• Residential developments (e.g. Mun Tung Estate, Wong Ka Wai Village, Sheung Ling Pei), Hong Chi Shiu Pong Morninghope School, Ma Wan San Tsuen Auxiliary Medical Service Tung Chung Office and Chung Wai Street Children's Playground

3.3.1.3 Planned/committed ASRs are identified by making reference to relevant Outline Zoning Plans (OZP) (S/I-TH/1, S/I-TCE/2, S/I-TC TC/23 and S/I-TCV/2), Layout Plans and other published plans in relation to the development on North Lantau, etc. The Tung Chung New Town Extension (TCNTE) comprising the TCNTE (East) and TCNTE (West) is the largest planned development in Lantau which provides about 49,600 flats for an additional population of 145,500 and about 877,000m^2 gross floor area (GFA) for commercial uses according to Tung Chung New Town Extension Official Website (https://www.tung-chung.hk/about.php?locale=en). Recently, Civil Engineering and Development Department (CEDD) is undertaking a study to explore the feasibility of increasing the development intensity of the TCNTE to meet the increasing demand of the public housing supply under separate Consultancy Services for the Design and Construction Supervision of TCNTE (East) and TCNTE (West). The latest Recommended Outline Development Plan (RODP), updated population intensity and planning parameter, updated population intake years of TCNTE (East) and TCNTE (West) etc have been collated from CEDD and Planning Department (PlanD). Representative planned ASRs in TCNTE which have population intake in or before Year 2027 (i.e. the year with completion of all major heavy and dusty construction activities of the Project) have been identified.

3.3.1.4 The locations of representative ASRs for air quality impact assessment are summarized in **Table 3.3.1** and are shown in **Figure 3.3.1.** In addition to discrete ASRs, contour plots are also prepared at the worst affected level and worst scenario years to ensure no exceedance at all air sensitive areas.

Table 3.3.1 Representative ASRs for air quality impact assessment

ASR ID	Location	No. of Storeys [1]	Land Use [2]	Lowest Assessment Height (m)	Intake Year [3]	Approx. distance from the nearest emission sources (m)
Existing ASRs						
A01	Pak Mong Village	3	Res	1.5	--	~550
A02	Pak Mong Village	3	Res	1.5	--	~400
A03	Ying Tung Estate - Ying Chui House (Block 3)	40	Res	10	--	~130
A04	Ying Tung Estate - Ying Yuet House (Block 4)	42	Res	10	--	~80
A05	Rosita Yuen Kindergarten	1	Edu	1.5	--	~70
A06	Ying Tung Estate - Ying Hei House (Block 1)	40	Res	1.5	--	~80
A07	The Visionary Resident Recreational Facilities	3	Rec	10	--	~170
A08	The Visionary Tower 3	36	Res	1.5	--	~190
A09	Century Link Tower 6A	30	Res	10	--	~410

ASR ID	Location	No. of Storeys [1]	Land Use [2]	Lowest Assessment Height (m)	Intake Year [3]	Approx. distance from the nearest emission sources (m)
A11a	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	NA	Com	2.4	--	~80
A11b	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	NA	Com	3.4	--	~90
A11c	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	NA	Com	3.5	--	~130
A12	Caribbean Coast Monterey Cove Tower 1	47	Res	10	--	~160
A13	Caribbean Coast Monterey Cove Tower 3	47	Res	10	--	~240
A16	Tung Chung North Park Soccer Pitch	NA	Rec	1.5	--	~280
A17	Ho Yu College	7	Edu	1.5	--	~410
A18	Bermuda Park	NA	Rec	1.5	--	~260
A19	La Mer House 1	4	Res	5	--	~310
A20a	Tung Chung Waterfront Park	NA	Rec	1.5	--	~180
A20b	Tung Chung Waterfront Park	NA	Rec	1.5	--	~120
A21	Le Bleu House 99	2	Res	1.5	--	~240
A22	Le Bleu House 33	2	Res	1.5	--	~200
A23	Le Bleu Deux Block 7	16	Res	10	--	~140
A24	Le Bleu Deux Block 3	16	Res	10	--	~160
A25a	Seaview Crescent Alfresco Dining Area	1	Rec	1.5	--	~240
A25b	Seaview Crescent Park	NA	Rec	1.5	--	~300
A25c	Seaview Crescent Club House and Swimming Pool	3	Rec	1.5	--	~290
A25d	Seaview Crescent Block 1	52	Res	10	--	~380
A30b	Tung Chung Crescent - Block 1	31	Res	15	--	~80
A31	Tung Chung Crescent - Block 2	33	Res	15	--	~60
A32	Tung Chung Crescent - Block 3	33	Com (Shops) at 1.5m; Res start from 15m	1.5	--	~50
A33	Tung Chung Crescent - Block 5	36	Com (Shops) at 1.5m; Res start from 15m	1.5	--	~50
A34	Tung Chung Crescent - Block 7	42	Res	15	--	~80
A35b	Tung Chung Crescent - Block 9	45	Res	15	--	~50
A36a	Tung Chung Crescent Clubhouse - Tennis Court	NA	Rec	10	--	~10

ASR ID	Location	No. of Storeys [1]	Land Use [2]	Lowest Assessment Height (m)	Intake Year [3]	Approx. distance from the nearest emission sources (m)
A36b	Tung Chung Crescent Clubhouse - Tennis Court	NA	Rec	10	--	~10
A37	Shops at Tung Chung Crescent	1	Com	1.5	--	~10
A38	Shops at Tung Chung Crescent	1	Com	1.5	--	~10
A39a	Tung Chung Crescent Clubhouse - Swimming Pool	1	Rec	15	--	~20
A39b	Tung Chung Crescent Clubhouse - Swimming Pool	1	Rec	15	--	~10
A57	Sheung Ling Pei House 1	2	Res	1.5	--	~300
A58	Auxiliary Medical Service Tung Chung Office	3	Com	1.5	--	~150
A59	Ha Ling Pei	3	Res	1.5	--	~140
A60	Ha Ling Pei House 9	3	Res	1.5	--	~160
A61	Ha Ling Pei House 7	2	Res	1.5	--	~170
A62	JoysMark	5	Com	1.5	--	~170
A63	Children's Playground of JoysMark	NA	Rec	5	--	~180
A64a	Mun Tung Estate - Mun Wo House	41	Res	5	--	~130
A64b	Mun Tung Estate - Mun Wo House	41	Res	5	--	~130
A64c	Mun Tung Estate - Mun Wo House	41	Res	5	--	~180
A77	Yat Tung Estate - Yung Yat House	41	GIC at 1.5m; Res start from 5m	1.5	--	~260
A78	Yat Tung Estate - Ping Yat House	41	Res	5	--	~210
A79	Yat Tung Estate - Tai Yat House	41	Res	5	--	~160
A80	Yat Tung Estate - Chau Yat House	41	Res	5	--	~120
A81a	Yat Tung Estate - Fuk Yat House	41	Res	5	--	~20
A81b	Yat Tung Estate - Fuk Yat House	41	Res	5	--	~10
A82	Yat Tung Estate - Luk Yat House	41	GIC at 1.5m; Res start from 5m	1.5	--	~10
A83	Yat Tung Estate - Ying Yat House	41	Res	5	--	~10
A84	Yat Tung Estate - Yu Yat House	41	Res	5	--	~10
A85	Yat Tung Shopping Centre	3	Com	1.5	--	~10
A86	Yat Tung Estate - Chui Yat House	41	Res	5	--	~10
A87	Yat Tung Estate - Yuet Yat House	41	GIC at 1.5m; Res start from 5m	1.5	--	~10
A88	Yat Tung Estate - Sui Yat House	41	GIC at 1.5m;	1.5	--	~10

ASR ID	Location	No. of Storeys [1]	Land Use [2]	Lowest Assessment Height (m)	Intake Year [3]	Approx. distance from the nearest emission sources (m)
			Res start from 5m			
A89	Ma Wan Chung	1 to 3	Res	1.5	--	~110
A91	Ma Wan Chung	1 to 3	Res	1.5	--	~100
A93	Islands Community Green Station	1	GIC	1.5	--	~150
A94	Tung Chung Road Soccer Pitch	NA	Rec	1.5	--	~110
A95	Ma Wan Chung	1	Res	1.5	--	<10
A96	Wong Ka Wai Village	3	Res	1.5	--	~220
Planned ASRs						
P12	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	46	Res/Com	10 [5]	2027	~100
P13	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	46	Res/Com	1.5	2027	~40
P14	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	46	Res/Com	1.5	2027	~80
P15	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	46	Res/Com	1.5	2027	~10
P16	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	46	Res/Com	1.5	2027	~100
P17	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	46	Res/Com	1.5	2027	~20
P19	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	46	Res/Com	1.5	2027	~100
P20	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	46	Res/Com	1.5	2027	~40
P21a	TCNTE East - Planned Commercial Development (COM-1/Area 57)	54	Com	1.5	2024[4]	~40
P21b	TCNTE East - Planned Commercial Development (COM-1/Area 57)	54	Com	1.5	2024[4]	~50
P22	TCNTE East - Planned Residential Development (B1-2/Area 100)	42	Res	1.5	2024	~180
P23	TCNTE East - Planned Clinic & GIC Complex (B0-3/Area 59)	5	GIC	1.5	2024	~100
P25	TCNTE East - Planned Residential Development (B1-2/Area 100)	42	Res	1.5	2024	~200
P26	TCNTE East - Planned Residential Development (Area 54)	40	Res	1.5	2023	~210

ASR ID	Location	No. of Storeys [1]	Land Use [2]	Lowest Assessment Height (m)	Intake Year [3]	Approx. distance from the nearest emission sources (m)
P27	TCNTE East - Planned Residential Development (Area 54)	40	Res	1.5	2023	~230
P34	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	5	Com	1.5	2025	~60
P35a	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	5	Com	1.5	2025	~130
P35b	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	5	Com	1.5	2025	~150
P38	TCNTE West - Planned Residential Development (TCV-1/Area 60)	3	Res	1.5	2025	~240
P39	TCNTE West - Planned Residential Development (TCV-1/Area 60)	3	Res	1.5	2025	~240
P40	TCNTE West - Planned Residential Development (TCV-1/Area 60)	3	Res	1.5	2025	~270
P42	TCNTE West - General Clinic /Health Centre (TCV-i/Area 36A)	4	GIC	1.5	2025	~160
P43	TCNTE West - Planned Residential Development (TCW-3/Area 48)	20	Res	1.5	2025	~270

Notes:

[1] ASR locations, number of storeys, the lowest floor with air sensitive use (i.e. first assessment height) are determined based on site survey, building plan (existing ASR) and latest layout plan (planned ASR) where available and applicable. For all planned ASRs, 1st assessment level is assumed to be 1.5m except P12 (see note 5).

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

[3] Population intake years are only presented for planned ASRs. Only representative planned ASRs which have population intake in or before Year 2027 (i.e. the year with completion of all major heavy and dusty construction activities of the Project) are included.

[4] The population intake of Area 57 is assumed to be 2024 for the conservative side in air quality impact assessment.

[5] As the ASR is located above the planned PTI, the first assessment level is 10mAG.

3.4 Identification of Pollution Sources and Emission Inventory

3.4.1 General

3.4.1.1 Trains to be operated in the Project are electrified, there is no air emission during the normal operation. Hence, adverse impacts during the operational phase are not anticipated. The construction phase air quality impacts arising from the Project have been assessed according to the EIA Study brief (ESB - 329/2020).

3.4.1.2 According to Clause 3.4.4.2 of the EIA Study brief (ESB - 329/2020), the assessment area for air quality impact assessment shall be defined by a distance of 500 metres from the boundary of the Project Area and the works of the Project 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. **Figure 3.2.1** illustrates the 500m study area from the boundary of the Project site.

3.4.1.3 The assessment shall also take into account the impacts of emission sources from road vehicles, nearby concurrent projects and major point sources which are located within 4 km from the assessment area, if any, which should be modelled by dispersion model to account for the spatial variations in background concentrations induced by them.

3.4.2 Project-induced Emission Sources

3.4.2.1 The major project-induced emission source that may potentially affect air quality during construction phase is dust emission associated with the construction activities. According to the latest programme, the tentative entire construction period of the Project is from Year 2023 to Year 2029 and all major heavy and dusty construction activities involving ground excavation, earthwork and backfilling activities for the Project realignment will be completed in Year 2027. The remaining works in Year 2028 and 2029 are only removal of existing Tung Chung Line (TCL) track, removal of temporary site office and construction equipment, landscaping work and signal testing and hence significant dust emission is not expected.

3.4.2.2 Based on the latest design information, the major dust emission will be generated from the following construction activities:

- Site excavation, construction and backfilling for realignment of the existing at grade TCL section from Tuen Mun Chek Lap Kok Link interchange to south of Ying Tung Estate;
- Site excavation, cut-and-cover and backfilling for the tunnel launching and retrieving shaft for the underground tunnel section for TCW extension alignment;
- Site excavation, open cut/cut-and cover and backfilling for above ground Tung Chung East (TCE) Station, underground Tung Chung West (TCW) Station and the overrun tunnel section at south of TCW Station;
- Site excavation and construction of Emergency Access Point (EAP) and Emergency Egress Point (EEP);
- Material handling at barging facility and stockpile areas;
- Wind erosion from the deck of the barges; and

- Wind erosion from all exposed works sites with heavy construction activities.

3.4.2.3 The site excavation, construction and backfilling activities will involve large quantities of earthworks. In order to reduce the dust emission from the Project, regular watering on all exposed construction areas with dust emission (see **Appendix 3.1)** as a good site practice will be implemented. Vehicle washing facilities will 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 entirely by clean impervious sheeting before leaving the construction site, dust nuisance from construction vehicle movement outside the exposed construction areas with dust emission is unlikely to be significant.

3.4.2.4 The TCW Station is an underground station. As mentioned in **Section 2**, once excavation reaches a certain level that allows manoeuvring of construction plant, the station roof structure would be constructed. There will be small openings at location in the station roof structure for mucking out during the construction period and these small openings will be covered when not in use. After installation of the station roof structure, subsequent construction activities would be carried out underneath and dust impact could also be largely alleviated.

3.4.2.5 Tunnel Boring Machine (TBM) method will be used for construction of the underground tunnel section for the TCW extension alignment with the launching shaft and retrieving shaft near Tung Chung Crescent. According to the information provided by Design Consultant, bentonite will be used throughout the tunnel boring process. Bentonite is a naturally occurring clay mineral used extensively in the construction industry. The mineral is mixed with water to form a slurry, which is supplied to the TBM by a delivery pipeline. The slurry is contained in a chamber in the cutter head of the TBM. The slurry will be used and mixed with the excavated material by the cutter head within the chamber. The mixed slurry coming out from the process is in wet condition and it will then be transported out of the tunnel via a closed piped network. Dust emission is therefore not anticipated. The mucking out locations at both the launching and retrieving shafts will also be installed with the noise enclosures / screening structures which could also alleviate the dust impact.

3.4.2.6 As described in **Section 2**, there may require small scale drill-&-blast at possible granite layer at a level close to the bottom of the TCW Station (i.e. about -7mPD) and the bottom of the shaft between the proposed EAP / EEP and the tunnel (i.e. about -7mPD). The number of blasting would be limited to once per day. The concrete slabs for station concourses and platforms would have been completed when the excavation reaches the bottom of the TCW Station, and any drill-&-blast would be conducted underneath these slabs for concourses and platforms. For the shaft between the proposed EAP / EEP and the tunnel, a roof cover will also be provided and drill-&-blast will be carried out underneath. For safety reasons, all neighbouring construction activities will be suspended during blasting.

Impermeable blast covers at the mucking out locations will be shut. The blasting will only be carried out in an enclosed environment with no air exhaust during blasting. The spoil materials produced from blasting are mostly rocks. The rock will be transported off-site and no on-site crushing plant is planned. 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, potential dust impact due to blasting is not anticipated.

3.4.2.7 The spoil generated from the construction of stations, tunnel, EAP/EEP, etc will be transported either to the barging facility via construction vehicles for subsequent transfer to Tuen Mun Area 38 Fill Bank via marine transportation or directly to the fill bank via Tuen Mun Chek Lap Kok Connection Road via land transport, depending on actual site circumstances and weather conditions. The means of transportation and their routing involved with a view to addressing potential environmental nuisance were collectively discussed in Chapter 2.

3.4.2.8 A barging facility with two berths is proposed to the east of Tung Chung Pier. There will be 1 barge per day and 33 trucks per hour at each berth. In general, the spoil will be unloaded to the barges directly from the trucks. A stockpile area is proposed near the barging facility for contingency use if necessary and there will be 10 trucks per hour at the stockpile area. The unloading activities at the barging facility and material handling at the stockpile area will generate dust. 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.

3.4.2.9 As mentioned above, 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. 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. Dust emission from construction truck movement is therefore considered insignificant.

3.4.2.10 Wind erosion arising from the spoils on the deck of the barges is also anticipated. The barges will operate from 7am to 7pm and will generally not stay overnight.

Yet, when necessary, if the barge will need to stay overnight at the barging point, the spoils on the deck will be covered by tarpaulin to avoid dust emission.

3.4.2.11 Tugboat is used to haul the barge. It is expected that there will be one tugboat for each barge (i.e. a total of 2 tugboat only for a total of 2 berths). The tugboats will either leave or idle with engine off after hauling the barge. Hence, marine emission from tugboat is expected to be insignificant.

3.4.3 Dust Emissions from Concurrent Construction Projects

3.4.3.1 All potential concurrent projects have been identified and the construction programme are described in **Section 2**. Amongst them, there are two major concurrent construction projects within 500m from the Project boundary including the TCNTE (i.e. TCNTE (East) and TCNTE (West)) and modification of the footbridge near Yu Tung Road which will have potential cumulative construction dust impacts.

Tung Chung New Town Extension (TCNTE)

3.4.3.2 The reclamation for ~130ha of land for TCNTE (East) was currently being undertaken by phases by CEDD. As advised by CEDD, the programme and construction works schedule of land reclamation shall be made reference to Environmental Permit of "Construction Works Schedule and Location Plans for Tung Chung New Town Extension (EP No. EP-519/2016)". Accordingly, all reclamation works will be completed in Q2 of 2023. During the overlapping period with the Project construction in Year 2023, the only remaining works is surcharge filling in Phase 4. Its potential cumulative dust impacts have therefore been included in the assessment.

3.4.3.3 The detailed design for both TCNTE (East) and TCNTE (West) was still being underway. CEDD has been consulted to collate the latest construction phasing and programme etc for TCNTE (East) and TCNTE (West). Where there is no updated available information, reference shall be made to the approved EIA for TCNTE (AEIAR-196/2016). According to the latest information, the site formation and infrastructure works will be taken by phases and are tentatively scheduled from Year 2021 to Year 2030. It is anticipated that the construction activities will overlap with the heavy construction period of the Project from Year 2023 to Year 2027. The construction work of TCNTE involving excavation and earthwork etc, as well as wind erosion of open sites will generate dust emission. Its potential cumulative dust impacts have therefore been included in the assessment.

Modification of the footbridge near Yu Tung Road

3.4.3.4 There is a planned modification of an existing footbridge to the south of TCW Station and north of Yu Tung Road. This is a Reprovisioning, Remedial and Improvement Work (RRIW) project.

3.4.3.5 This RRIW includes demolition of the existing ramp along the side of Yu Tung Road eastbound and re-provision of a new ramp on its eastern side with landing point to the south of Tai Yat House of Yat Tung Estate. There is no modification work on the section of the footbridge across Yu Tung Road and the ramp along the side of Yu Tung Road westbound. (see **Figure 2.2** for its location)

3.4.3.6 According to the latest information, the tentative construction period of footbridge modification is from Year 2023 to Year 2025 which will overlap with the heavy construction of the Project. Cumulative dust impact induced from both demolition and construction of the footbridge has been included in the assessment.

3.4.4 Other Major Pollution Emissions in the Immediate Neighbourhood

3.4.4.1 Apart from the concurrent construction projects, cumulative impacts from the following major emission sources within 500m from the Project boundary has also been considered:

- Vehicular emission from open roads;
- Emission from public transport interchanges (PTIs);
- Chimney at North Lantau Hospital; and
- Marine emission from ferries travelling between Tuen Mun, Tung Chung and Tai O

Vehicular Emission from Open Roads

3.4.4.2 Particulate emissions, including TSP, RSP and/or FSP, are generated from road traffic although the contribution is expected to be small. Cumulative impacts due to vehicular emissions from the existing road networks and the induced traffic from the planned projects, such as the TCNTE and its associated road infrastructure, Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot, Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works, 3RS system of Hong Kong International Airport (HKIA), SKYCITY, etc. on the nearby ASRs has been considered. The road network should cover a distance of at least 500m from the Project boundary and its works sites (**Figure 3.4.1**).

Emission from Public Transport Interchange (PTI) and Bus Termini

3.4.4.3 There are a total of 3 existing PTIs/bus termini and 4 planned PTIs/bus termini within a distance of 500m from the Project boundary (**Figure 3.4.2**). They include:

Existing PTIs/bus termini	• Tung Chung Temporary Bus Terminus • Tung Chung Town / Station Bus Terminus • Yat Tung Estate PTI
Planned PTIs/bus termini at TCNTE	• Planned PTI at Area 38 of TCNTE (West) • Planned PTI at Area 99 of TCNTE (East)

- Planned PTI at Area 113 of TCNTE (East)
- Planned PTI at Area 133 of TCNTE (East)

3.4.4.4 The planned PTI at Area 133 of TCNTE (East) will be commissioned after Year 2027 (the last year of heavy construction of the Project) and therefore cumulative impact during the construction stage of the Project is not anticipated.

3.4.4.5 There is no start particulate emission from all diesel and LPG vehicles. According to ProPECC Note PN1/98 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. However, based on site observation, buses were found idling with engines turned on while waiting for passengers to get on before leaving the PTI. Although the contribution of particulate matter is expected to be small, the emissions from the buses inside PTIs have been considered in the assessment.

Chimney at North Lantau Hospital

3.4.4.6 Two chimneys are identified at North Lantau Hospital (**Figure 3.4.3**). Information on the chimney at North Lantau Hospital, including fuel consumption rate, stack height, gas exhaust velocity, exhaust temperature and the internal diameter of the stack etc. have been collected from Hospital Authority (HA). As advised by HA, town gas is used for these two existing chimneys. HA also advised that there is no information on any planned chimney at North Lantau Hospital Phase 2 development.

Marine vessels

3.4.4.7 According to the approved EIA for TCNTE (AEIAR-196/2016), the construction of the proposed marina will be carried out by others during the construction of TCNTE (East) Phase 4 which is beyond Year 2029. Hence, the potential cumulative impact due to marine emission from the planned marina is not anticipated and therefore has not been included in the construction dust assessment.

3.4.4.8 There are local vessels travelling between Tuen Mun, Tung Chung, Sha Lo Wan and Tai O (**Figure 3.4.3**). Marine emission from these local vessels within 500m from the Project boundary has been included in the assessment. Timetable for the local vessels has been made reference to the latest timetable available in the public domain (https: // www.fortuneferry. com. hk/ upload/ timetable/ original/766932971073.pdf).

3.4.5 Major Emission Point Source within 4km

3.4.5.1 The Organic Resources Recovery Centre (ORRC) Phase 1 is located at some 3.2km from the Project (**Figure 3.4.3**). The ORRC Phase 1 will convert source-separated organic waste from the commercial and industrial sectors (mostly food waste) into compost and biogas through proven biological treatment technologies.

Biological treatment facility of the ORRC Phase 1 have a capacity of about 200 tonnes per day.

3.4.5.2 There are a total of 6 chimneys at the biological treatment facility, including 1 for centralized air pollution control unit, 3 for cogen units, 1 for flaring gas unit and 1 for ammonia stripping plant. They are considered as major point sources. Their operation would contribute to the cumulative air quality impacts during the construction stage of the Project and thus has been included in the assessment.

3.4.5.3 There is no other major point source that would generate particulate matter emission within 4km of the Project Boundary.

3.4.6 Far-field Source Contribution

3.4.6.1 Other far-field emission sources would also have a certain influence on the background air quality level. These sources include HKIA, territory wide vehicular emission, power plants, other marine emissions, as well as regional emission from Pearl River Delta (PRD).

3.5 Key Representative Pollutants

3.5.1.1 According to Section 13.2.4.3 of USEPA AP-42, among all aerodynamic particle sizes (i.e. TSP), there are 47.3% and 7.2% of particles with an aerodynamic diameter of <10 μm (i.e. RSP) and <2.5 μm (i.e. FSP) respectively. Hence, TSP, RSP and FSP are the most representative pollutants for construction phase assessment. The 1-hour TSP, 24-hour RSP/ FSP, and annual RSP/ FSP concentrations at each identified ASR have been assessed and compared with the respective proposed new AQOs or the requirements of EIAO-TM to determine their compliance.

3.5.1.2 Fuel combustion from the use of Powered Mechanical Equipment (PME) during construction works could be a source of NO_2, SO_2 and CO. Emissions from machines and non-road vehicles are controlled by the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation. Starting from 1st December 2015, only approved or exempted non-road mobile machinery is allowed to be used in construction sites. 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^oC will be used as much as practicable to minimise SO_2 emissions. The introduction of ultra-low sulphur diesel for vehicle fleet and implementation of the Air Pollution Control (Fuel Restriction) Regulations have also reduced the SO_2 emission from road transport and fuel combustion in Hong Kong. Besides, good site practices have also been recommended and implemented to control and reduce the emission from the use of non-road mobile machinery from the Project (see **Section 3.8.2**). Hence, the emissions from non-road mobile machinery are considered relatively small. In addition, there is no source of Pb and O_3 emission during the construction

phase. Hence, NO_2, SO_2, CO, Pb and O_3 are not considered as the key pollutants for quantitative air quality assessment for the construction phase of the Project.

3.6 Assessment Methodology

3.6.1.1 The construction phase air quality impact assessment has been conducted in accordance with the criteria and guidelines as stated in section 1 of Annex 4 and Annex 12 of the EIAO-TM.

3.6.1.2 According to Guidelines on Assessing the 'TOTAL' Air Quality Impacts, the air quality assessment shall include the following three tiers of emission source contribution:

Tier 1	Primary contribution from the project-induced emission sources
Tier 2	Secondary contribution due to the concurrent construction projects and other pollution emission sources in the immediate neighbourhood as identified in **Sections 3.4.3** and **3.4.4** respectively
Tier 3	Background due to far-field source contribution

3.6.1.3 Tier 1 and Tier 2 emissions are modelled in near-field dispersion models; while the Tier 3 emissions are simulated in far-field dispersion model.

3.6.2 Project-induced Emission Sources

3.6.2.1 Fugitive dust impact assessments have been carried out based on conservative assumptions of general construction activities which include the following:

- Heavy construction activities including site clearance, ground excavation, construction of the associated facilities, etc. to be concurrently undertaken at all works sites (for locations of works sites with heavy construction activities, please refer to **Appendix 2.3**);
- Wind erosion at all active open sites, entire stockpile area and spoils on the deck of the barges;
- Material handling at the barging facility (maximum 33 trucks/berth/hour) and stockpile area (maximum 10 trucks/berth/hour); and
- Construction working periods of 26 days a month and 12 hours a day from 7:00am to 7:00pm, except Sundays and public holidays.

3.6.2.2 As mentioned in **Section 3.4.2** above, the TBM launching shaft and TCW station will be constructed using cut-and-cover method. After the roof or screening structures are constructed/installed, the subsequent construction activities will be undertaken underneath and dust impact could be reduced. For conservative assessment, it is assumed that they are exposed to heavy construction for the entire period.

3.6.2.3 The prediction of dust emissions is based on typical values and emission factors from United States Environmental Protection Agency (USEPA) Compilation of

Air Pollution Emission Factors (AP-42), 5th Edition. References of the dust emission factors for different dust generating activities are listed in **Table 3.6.1** below.

Table 3.6.1 Dust emission factors for different dust generating activities

Construction Sites	Activities	Equations and Assumptions	Reference
All construction sites except storage area and site office	Heavy construction activities including land clearance, ground excavation, cut and fill operations, construction of the facilities, haul road, etc. (during working hours)	$E_{(TSP)}$ = 1.2 tons/acre/month of activity or = 2.69 Mg/hectare/month of activity $E_{(RSP)} = E_{(TSP)}$ x 0.473 = 1.27 Mg/hectare/month of activity $E_{(FSP)} = E_{(TSP)}$ x 0.072 = 0.19 Mg/hectare/month of activity	USEPA AP-42, S.13.2.3.3
	Wind erosion (during non-working hours)	$E_{(TSP)}$ = 0.85 Mg/hectare/year $E_{(RSP)} = E_{(TSP)}$ x 0.473 = 0.40 Mg/hectare/year $E_{(FSP)} = E_{(TSP)}$ x 0.072 = 0.06 Mg/hectare/year	USEPA AP-42, S.11.9, Table 11.9.4
Barging facility and/or any stockpiles	Material handling at barging facility and stockpile area (during working hours)	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$ (kg/megagram) k = Particle size multiplier, k = 0.74 as defined according to Table 2 of USEPA AP42 S13.2.4 U = Average wind speed M = Material moisture content $E_{(RSP)} = E_{(TSP)}$ x 0.473 kg/megagram $E_{(FSP)} = E_{(TSP)}$ x 0.072 kg/megagram	USEPA AP42, S13.2.4
	Wind erosion at entire stockpile area (during working and non-working hours) and spoils on the deck of the barges (during working hours)[2]	$E_{(TSP)}$ = 0.85 Mg/hectare/year $E_{(RSP)} = E_{(TSP)}$ x 0.473 = 0.40 Mg/hectare/year $E_{(FSP)} = E_{(TSP)}$ x 0.072 = 0.06 Mg/hectare/year	USEPA AP-42, S.11.9, Table 11.9.4

Note:
[1] RSP:TSP and FSP:TSP ratios are referenced from Section 13.2.4.3 of USEPA AP-42.
[2] Barges will operate from 7am to 7pm and will generally not stay overnight. If the barge will need to stay overnight at the barging point, the spoils on the deck will be covered by tarpaulin to avoid dust emission. Therefore, wind erosion from the deck of the barges during non-working hours is not expected.

3.6.2.4 During daytime working hours (7am to 7pm), it is assumed that dust emissions would be generated from all dust generating activities. During night-time non-working hours (7pm to 7am of the next day), dust emission source would include wind erosion only as construction activities during these hours are ceased.

3.6.2.5 Construction activities might not be taken place on the entire works sites with heavy construction at the same time, but will be undertaken at moving multiple work fronts spreading across the works sites. For conservative assessment, it is assumed that 100% construction areas with dust emission are exposed and active in construction concurrently.

3.6.2.6 **Appendix 3.1** presents the calculation of dust emission factors and locations of dust sources.

3.6.2.7 As mentioned in **Section 3.4.2** above, regular watering on all exposed construction areas with dust emission as a good site practice will be implemented to suppress the dust emission. In accordance with the *"Control of Open Fugitive Dust Sources*" (USEPA AP-42), watering once per hour on exposed construction areas with dust emission is proposed to achieve a dust removal efficiency of 91.7%. The required watering intensity and dust suppression efficiency are provided in **Appendix 3.1**.

3.6.2.8 At the barging facility, all unloading activities at the berths will be carried out inside an enclosed system with a 3-side screen with top cover and provision of a 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. A dust removal efficiency of 50% has been assumed.

3.6.2.9 Regular watering once per hour will also be implemented on all exposed stockpiles as a good site practice to achieve dust removal efficiency of 50%. The required watering intensity is provided in **Appendix 3.1**.

3.6.2.10 Detailed good site practice and recommended mitigation measures are given in **Section 3.8** below.

3.6.2.11 Dust impact assessment has been conducted using the EPD approved AMS/EPA Regulatory Model (AERMOD). AERMOD is a well-known model designed for computing air dispersion. Modelling parameters including dust emission factors, particles size distributions, surface roughness, etc. have been be referred to EPD's "Guidelines on Choice of Models and Model Parameters" and USEPA AP-42. The density of dust is assumed to be 2.5g/cm^3, with reference to the "Coal Mining Emission Factor Development and Modelling Study" (USEPA AP-42). Particle size distribution is estimated based on S13.2.4.3 of USEPA AP-42. **Table 3.6.2** presents the particle size distribution of TSP, RSP and FSP adopted in the assessment.

Table 3.6.2 Particle size distribution to be assumed in AERMOD

Particle Size (μm)	Average Particle Size (μm)	Particle Size Distribution		
		TSP	RSP	FSP
0 – 2.5	1.25	7%	15%	100%
2.5 – 5	3.75	20%	42%	-
5 - 10	7.5	20%	43%	-
10 – 15	12.5	18%	-	-
15 - 30	22.5	35%	-	-

Particle Size (μm)	Average Particle Size (μm)	Particle Size Distribution		
		TSP	RSP	FSP
Total		100%	100%	100%

3.6.2.12 Hourly meteorological data (including wind direction, wind speed, temperature and mixing height) for Year 2015 extracted from the PATH v2.1 provided by EPD has been adopted. With respect to the actual monitoring data from the Hong Kong Observatory in Year 2015, mixing height retrieved from the PATH v2.1 for modelling is capped between 133m and 1941m. For the treatment of calm hours, the wind speeds are capped at 1m/s for those from the PATH v2.1 below 1m/s.

3.6.2.13 Fugitive dust impacts have been modelled for ASR at the first ASR assessment height (referred to **Table 3.3.1**) and then every 5m up to 20m (i.e. 5m, 10m, 15m and 20m where applicable). Since all the dust generating sources associated with the Project are located on ground level, these assessment levels would therefore cover the worst-case scenario.

3.6.2.14 A summary of AERMOD modelling parameters that has been adopted in the construction dust assessment is given in **Table 3.6.3** below.

Table 3.6.3 Modelling parameters adopted in AERMOD

Parameters	Input
Modelling Mode	Urban with flat option
Meteorological Data	2015 hourly meteorological data adopted in the PATH v2.1 with the mixing height capped between 133m and 1941m. The wind speeds are capped at 1m/s for those from PATH v2.1 below 1m/s
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 (**Appendix 3.2**)
Bowen Ratio	Determined within 10km x 10km region from the Project (**Appendix 3.2**)
Land Use and Surface Roughness	Surface characteristic determined within 1km for each PATH grid (**Appendix 3.2**)
Assessment Heights	1st assessment height (refer to **Table 3.3.1**) and then every 5m up to 20m (i.e. 5m, 10m, 15m and 20m where applicable)

3.6.3 Dust Emissions from Concurrent Construction Projects

Tung Chung New Town Extension (TCNTE)

3.6.3.1 The cumulative dust impact from TCNTE has been assessed based on the following same conservative assumptions for all assessment years in accordance with its approved EIA (AEIAR-196/2016):

- Heavy construction activities including surcharge filling, site clearance, ground excavation, construction of the associated facilities, etc. from all active works sites;

- Wind erosion at all active works sites;
- Wind erosion from all inactive open sites, i.e. those land parcel formed but construction works not commenced yet;
- Construction working periods of 26 days a month and 12 hours a day from 7:00am to 7:00pm, except Sundays and public holidays (for active construction sites).

3.6.3.2 The same dust emission factors for heavy construction activities and wind erosion has been presented in **Table 3.6.1**. The approved EIA (AEIAR-196/2016) has mentioned that any active construction at any one time in each phase would not be more than 100m x 100m. For assessment on critical areas in close proximity to construction sites of TCNTE (i.e. ASRs P13 in Year 2027 and P21a in Year 2024 for TSP), a more practicable assumption that any active construction site at any one time in each phase would not be more than 100m x 100m (or 10,000m^2) in size while all other construction sites located relatively further away from the ASRs remain 100% active has been adopted as a very conservative assumption. Besides, the EIA has also recommended watering once per hour on all exposed construction areas with dust emission and haul road to achieve a dust removal efficiency of 91.7%. The same assumptions have been followed in the current assessment. **Appendix 3.3** presents the calculation of dust emission factors and locations of dust sources for TCNTE.

3.6.3.3 The cumulative dust impact due to TCNTE has been assessed for the overlapping period of heavy construction activities of the Project between Year 2023 and 2027.

Modification of the footbridge near Yu Tung Road

3.6.3.4 The cumulative dust impact has been assessed based on the following conservative assumptions:

- Heavy construction activities including site clearance, ground excavation, construction of the associated facilities, etc on the entire work boundary of the existing ramp and new ramp along the side of Yu Tung Road eastbound;
- Wind erosion from the entire work boundary of the existing ramp and new ramp along the side of Yu Tung Road eastbound;
- Construction working periods of 26 days a month and 12 hours a day from 7:00am to 7:00pm, except Sundays and public holidays.

3.6.3.5 The same dust emission factors for heavy construction activities and wind erosion has been presented in **Table 3.6.1**. As a good and typical standard practice, regular watering once per hour will be implemented to achieve a dust removal efficiency of 91.7%. **Appendix 3.3** presents the calculation of dust emission factors and locations of dust sources for the modification.

3.6.3.6 The cumulative dust impact due to the modification of the footbridge has been included for the heavy construction period of the Project between Year 2023 and 2025.

3.6.4 Other Major Pollution Emissions in the Immediate Neighbourhood

Vehicular Emission from Open Roads

3.6.4.1 **Figure 3.4.1** illustrates the extent of road network which has been included in the near-field dispersion model in the construction phase assessment. For conservative assessment, particulate emissions from road traffic have been determined based on the traffic data for Year 2029 (i.e. tentative last construction year of the Project with the highest traffic flow between 2023 and 2029) coupled with emission factors for Year 2023 (i.e. tentative first construction year of the Project with maximum emission factors between 2023 and 2029). The traffic forecast data provided by the Project Traffic Engineer, which has been endorsed by the Transport Department, are given in **Appendix 3.4a**. Traffic forecast of Year 2029 has been presented in **Appendix 3.4b**.

3.6.4.2 The traffic forecast has taken into account the total updated population for TCNTE (East) and TCNTE (West) and also the induced traffic from other planned and concurrent projects including but not limited to Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot, Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works, 3RS system of Hong Kong International Airport (HKIA), SKYCITY, etc.

3.6.4.3 The latest EmFAC-HK v4.3 model has been adopted. "Emfac" mode has been adopted to derive the running and start exhaust emission factors. The population and accrual are kept default in the input. The PM_{30} emission factors are available from the current EmFAC-HK v4.3 and have been adopted for assessment of TSP. The running and start emission rates for particulate matters including PM_{30}, PM_{10} and $PM_{2.5}$ are independent of the temperature and humidity condition. There is also no start particulate emission from all diesel and LPG vehicles. Therefore, for both short-term (i.e. hourly and 24-hour concentrations) and long-term impact assessments (i.e. annual concentrations), the running emission rates for each vehicle class travelling at different speeds have been determined using the annual minimum temperature and humidity. **Appendix 3.5** shows the 24-hour profile of the temperatures and relative humidity considered for the minimum temperature and humidity. The start emission rates for the petrol vehicles have also been determined using the annual minimum temperature, and for conservative assessment, the maximum amongst different sitting times (from 5min to 720min) has been used for estimation of the cold start emission for petrol vehicles for both short term and long term impact assessments.

3.6.4.4 The start emission from petrol vehicles has been modelled on roads. It is assumed that there is no start emission on expressways, trunk roads, primary distributors and district distributors. The local distributors or rural roads have been assumed with cold starts. In EmFAC-HK, the number of trips is dependent on vehicle population. Since there are no project-specific vehicle population data, the number

of trips from the local roads within the study area has been estimated based on its Vehicle Kilometre Travelled (VKT) and the ratio of the default trip to default VKT in the EMFAC-HK model, given the assumption that the VKT is related to vehicle population. **Appendix 3.6** presents the extent of local and rural roads as well as the estimated trips for local and rural roads.

3.6.4.5 The near field air dispersion model CALINE4 developed by the California Department of Transport has been used to assess vehicular emissions impact from all existing and planned open road network. **Appendix 3.7** presents the hourly composite TSP, RSP and FSP emission factors for each road link.

3.6.4.6 Grid-specific meteorological data extracted from the PATH v2.1 has been adopted in CALINE4 model, including relevant temperature, wind speed, wind direction and mixing height. The stability classes have been estimated from PCRAMMET model. The mixing height is capped between 133m and 1941m as per the real meteorological data. For the treatment of calm hours, the wind speeds are capped at 1m/s for those from the PATH v2.1 are lower than 1m/s.

3.6.4.7 Surface roughness of 50cm is assumed for Grids 17_31, 18_30 and 20_31 to represent the relatively rural characteristic and low-rise developments in the Lantau areas, while 100cm is assumed for Grids 16_29, 16_30, 17_30 and 18_31 and 19_31 to represent the urbanized and high-rise developments in Tung Chung Town. The wind standard deviation is estimated in accordance with the "Guideline on Air Quality Models (Revised), 1986", as summarized in **Table 3.6.4**.

Table 3.6.4 Summary of wind standard deviation for surface roughness

Period / Location/ Parameters		Assumptions
Grid 16_29, 16_30, 17_30 and 18_31 and 19_31	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.
Grid 17_31, 18_30 and 20_31	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.

3.6.4.8 Owing to the limitation of CALINE4 model, road elevation is limited to 10m above ground (mAG). Within the road network covered in the CALINE4, only a section of Tuen Mun Chek Lap Kok (TMCLK) Link has a road height higher than 10mAG. However, this road link is located at more than 500m from all ASRs except A01 and A02. The contribution from the TMCLK link to these ASRs would not be

expected to be significant. For A01 and A02, both ASRs are village house with heights less than 10m, the height of TMCLK link has therefore capped to be 10mAG for conservative assessment. For roads with planned noise barriers, 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.

3.6.4.9 The contribution due to vehicular emission from open roads has been added for the entire heavy construction period of the Project from Year 2023 to 2027.

Emission from PTIs

3.6.4.10 The cumulative impacts due to emission from buses inside the 3 existing PTIs (Tung Chung Temporary Bus Terminus, Tung Chung Town / Station Bus Terminus and Yat Tung Estate PTI) and 3 planned PTIs (Area 38 PTI, Area 99 PTI and Area 113 PTI) have been assessed.

3.6.4.11 The emission at PTI is determined based on the number of bus movement within each PTI and estimated idling time. The traffic of the PTIs has been prepared and a "Technical Note on Traffic Forecast" has been submitted to Transport Department and no adverse technical comments were received. The traffic forecast data provided by the Project Traffic Engineer, which has been endorsed by the Transport Department, are given in **Appendix 3.4a**.

3.6.4.12 The cold idling emission factors for particulate matters are not available in the EPD's Note on "Calculation of Start Emissions in Air Quality Impact Assessment". Hence, the warm idling emission has been estimated based on the emission factors for different Euro engine types in accordance with the latest report on "Road Tunnels: Vehicle Emissions and Air Demand for Ventilation" published by the Permanent International Association of Road Congresses (PIARC, 2019), taking into account the mass factor for heavy vehicles and air-conditioning loading factor. Detailed calculation of the emissions and location of the sources are summarised in **Appendix 3.8**.

3.6.4.13 The emissions within the PTIs are modelled, where appropriate, as point sources (for Tung Chung Town / Station Bus Terminus with the provision of mechanical ventilation system) or area sources (for Yat Tung PTI with use of natural ventilation through side openings, as well as Tung Chung Temporary PTI, planned Area 38 PTI, planned Area 99 PTI and planned Area 113 PTI which are in open form) in AERMOD. The modelling parameters adopted shall be referred to **Table 3.6.3** above.

Chimney at North Lantau Hospital

3.6.4.14 Information on the chimney at North Lantau Hospital, including fuel consumption rate, stack height, gas exhaust velocity, exhaust temperature and the internal diameter of the stack etc. have been collected from Hospital Authority (HA).

Detailed calculation of the emissions is given in **Appendix 3.9**. Modelling parameters adopted shall be referred to **Table 3.6.3** above.

Marine vessels

3.6.4.15 The emission factors have been made reference to "Study on Marine Vessels Emissions Inventory". The marine emission for different time-in-mode including hotelling, manoeuvring, slow cruise and fairway cruise has been calculated. Detailed calculation of the marine emission is given in **Appendix 3.10**.

3.6.4.16 The emission of TSP has been assumed to be the same as that of RSP. Emissions from the local vessels have been modelled as "Point" sources along the marine route in AERMOD. Modelling parameters adopted shall be referred to **Table 3.6.3** above.

3.6.5 Major Emission Point Source within 4km

3.6.5.1 Stack and chimney emissions from the ORRC Phase 1 has been referenced to the variation of Environmental Permit approved in Dec 2015 (Application No. VEP488/2015). The emission inventory is given in **Appendix 3.9**. Emissions from the chimneys have been modelled as "Point" source in AERMOD. Modelling parameters adopted shall be referred to **Table 3.6.3** above.

3.6.6 Far-field Source Contribution

3.6.6.1 Other far-field emission sources are covered in the PATH v2.1. The PATH model includes the emissions from all major emission sources in Hong Kong, PRD Region, Guangdong Province, as well as the majority parts of China and Southeast Asia.

3.6.6.2 The hourly pollutant concentrations predicted by the PATH v2.1 model have been directly adopted as the background concentrations for this construction dust impact assessments. The PATH v2.1 covers the assessment years from 2021 to 2025. The scenario for Year 2025 has already included the emission from HKIA's third runway system; while scenarios for other years (i.e. 2021 to 2024) have assumed the second runway system. Therefore, for assessment Year 2025 to 2027, the hourly pollutant concentration data predicted by the PATH v2.1 for Year 2025 are adopted directly as the background concentrations. For assessment Year 2023 and 2024, the hourly pollutant concentration data predicted by the PATH v2.1 for the corresponding years shall be adopted instead.

3.6.6.3 The RSP and FSP concentrations are available from the PATH v2.1. For hourly background TSP concentrations, it is considered reasonable to assume the hourly RSP concentrations from PATH v2.1 as the ambient TSP background concentrations, since the particulates of sizes larger than 10μm generated from far-field dust sources would have been largely settled before reaching the ASRs, and

hence most of the particulates contributed from far-field sources affecting the ASRs will likely be of less than or equal to 10μm in size (i.e. RSP).

3.6.7 Cumulative Impacts

3.6.7.1 The cumulative air quality impact is a combination of the emission impacts contributed from the near-field (Tier 1 and 2) and far-field sources (Tier 3) on hourly basis.

3.6.7.2 In consideration of the number of exceedance allowance of the 24-hour AQOs for RSP and FSP, the pollutant concentrations beyond the AQOs allowance limits (i.e. the 10th highest 24-hour RSP and 36th highest 24-hour FSP concentrations for new AQOs) have been determined at each ASR. The annual predicted concentrations have also been assessed and all predicted levels are then compared with the respective proposed new AQOs (for RSP and FSP) and EIAO-TM (for TSP).

3.7 Assessment Results

With implementation of the good practice and mitigation measures, the predicted maximum 1-hour TSP concentrations, 10th highest 24-hour RSP, 36th highest 24-hour FSP and annual RSP / FSP concentrations at all representative ASRs for Years 2023 to 2027 could comply with the respective criteria. A summary of the results for the worst affected year is presented in **Table 3.7.1** below and detailed results in **Appendix 3.11**.

Table 3.7.1 Cumulative TSP, RSP and FSP concentrations among all years and assessment heights

ASR ID	Location	Range of Pollutant Concentration (μg/m^3) among All Years and Assessment Heights				
		TSP	RSP		FSP	
		Max. 1-hour	24-hour (10th highest)	Annual	24-hour (36th highest)	Annual
Criteria		**500**	**100**	**50**	**50**	**25**
Existing ASRs						
A01	Pak Mong Village	143 to 235	68 to 69	28 to 29	25 to 26	15
A02	Pak Mong Village	144 to 226	68 to 69	28 to 29	25	15
A03	Ying Tung Estate - Ying Chui House (Block 3)	151 to 273	69 to 70	30 to 31	25 to 26	16
A04	Ying Tung Estate - Ying Yuet House (Block 4)	151 to 292	69 to 70	30 to 32	25 to 26	16
A05	Rosita Yuen Kindergarten	151 to 272	69 to 71	30 to 32	25 to 26	16
A06	Ying Tung Estate - Ying Hei House (Block 1)	150 to 233	69 to 70	29 to 31	25 to 26	16
A07	The Visionary Resident Recreational Facilities	145 to 180	68 to 69	29 to 30	25 to 26	16

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among All Years and Assessment Heights				
		TSP	RSP		FSP	
		Max. 1-hour	24-hour (10th highest)	Annual	24-hour (36th highest)	Annual
	Criteria	**500**	**100**	**50**	**50**	**25**
A08	The Visionary Tower 3	145 to 188	68 to 70	29 to 31	25 to 26	16
A09	Century Link Tower 6A	147 to 211	68 to 69	29 to 30	24 to 25	15 to 16
A11a	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	227 to 228	68 to 69	29 to 30	24 to 25	15 to 16
A11b	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	213 to 214	69 to 71	29 to 30	24 to 25	15 to 16
A11c	Sheraton Hong Kong Tung Chung Hotel – Shopping Mall (Fresh Air Intake)	221 to 222	68 to 69	29 to 30	24 to 25	15 to 16
A12	Caribbean Coast Monterey Cove Tower 1	147 to 154	68 to 69	28 to 29	25 to 26	15 to 16
A13	Caribbean Coast Monterey Cove Tower 3	147 to 155	68 to 69	28 to 29	25 to 26	15
A16	Tung Chung North Park Soccer Pitch	148	68 to 69	28 to 29	25 to 26	16
A17	Ho Yu College	149 to 188	67 to 69	28 to 29	25 to 26	15 to 16
A18	Bermuda Park	149 to 179	67 to 68	28 to 29	25 to 26	15 to 16
A19	La Mer House 1	149 to 180	67 to 68	28	25 to 26	15
A20a	Tung Chung Waterfront Park	149 to 176	68	28 to 29	25 to 26	15 to 16
A20b	Tung Chung Waterfront Park	157 to 169	67 to 68	28 to 29	25 to 26	15
A21	Le Bleu House 99	149 to 179	67 to 68	28	25 to 26	15 to 16
A22	Le Bleu House 33	149 to 178	67 to 68	28	25 to 26	15
A23	Le Bleu Deux Block 7	149 to 186	67 to 68	28	25 to 26	15
A24	Le Bleu Deux Block 3	149 to 187	67 to 68	28	25 to 26	15
A25a	Seaview Crescent Alfresco Dining Area	149 to 170	67 to 68	28 to 29	26	16
A25b	Seaview Crescent Park	149 to 167	67 to 68	28	25 to 26	15 to 16
A25c	Seaview Crescent Club House and Swimming Pool	149 to 183	67 to 68	28	25 to 26	15 to 16
A25d	Seaview Crescent Block 1	149 to 180	67 to 68	28	25 to 26	15
A30b	Tung Chung Crescent - Block 1	149 to 200	66 to 67	28 to 29	25 to 26	15
A31	Tung Chung Crescent - Block 2	150 to 157	67 to 68	28	25	15
A32	Tung Chung Crescent - Block 3	149 to 235	66 to 67	28 to 29	25 to 26	15 to 16
A33	Tung Chung Crescent - Block 5	149 to 331	66 to 68	28 to 30	25 to 26	15 to 16
A34	Tung Chung Crescent - Block 7	149 to 213	66 to 67	28 to 29	25 to 26	15
A35b	Tung Chung Crescent - Block 9	149 to 214	66 to 68	28 to 29	25 to 26	15
A36a	Tung Chung Crescent Clubhouse - Tennis Court	149 to 246	67 to 68	29 to 30	25 to 26	15 to 16

ASR ID	Location	Range of Pollutant Concentration (µg/m³) among All Years and Assessment Heights				
		TSP	RSP		FSP	
		Max. 1-hour	24-hour (10th highest)	Annual	24-hour (36th highest)	Annual
	Criteria	**500**	**100**	**50**	**50**	**25**
A36b	Tung Chung Crescent Clubhouse - Tennis Court	149 to 241	66 to 67	28 to 29	25 to 26	15 to 16
A37	Shops at Tung Chung Crescent	149 to 428	66 to 69	28 to 32	25 to 26	15 to 16
A38	Shops at Tung Chung Crescent	149 to 318	66 to 68	28 to 30	25 to 26	15 to 16
A39a	Tung Chung Crescent Clubhouse - Swimming Pool	149 to 196	66 to 67	28 to 29	25 to 26	15
A39b	Tung Chung Crescent Clubhouse - Swimming Pool	149 to 200	66 to 67	28 to 29	25 to 26	15
A57	Sheung Ling Pei House 1	156 to 166	67 to 69	27 to 29	25 to 26	15
A58	Auxiliary Medical Service Tung Chung Office	154 to 183	67 to 69	27 to 30	25 to 27	15 to 16
A59	Ha Ling Pei	170 to 197	67 to 69	27 to 30	25 to 26	15
A60	Ha Ling Pei House 9	201 to 221	67 to 69	27 to 30	25 to 26	15
A61	Ha Ling Pei House 7	217 to 235	67 to 69	27 to 30	25 to 26	15
A62	JoysMark	159 to 189	67 to 69	28 to 30	25 to 26	15 to 16
A63	Children's Playground of JoysMark	151 to 194	67 to 69	27 to 30	25 to 26	15
A64a	Mun Tung Estate - Mun Wo House	149 to 210	67 to 72	27 to 31	25 to 26	15 to 16
A64b	Mun Tung Estate - Mun Wo House	148 to 248	67 to 74	27 to 31	25 to 26	15 to 16
A64c	Mun Tung Estate - Mun Wo House	148 to 261	67 to 75	27 to 32	25 to 26	15 to 16
A77	Yat Tung Estate - Yung Yat House	151 to 216	67 to 68	27 to 29	25 to 26	15
A78	Yat Tung Estate - Ping Yat House	150 to 239	67 to 69	27 to 29	25 to 26	15
A79	Yat Tung Estate - Tai Yat House	150 to 259	67 to 71	27 to 31	25 to 26	15 to 16
A80	Yat Tung Estate - Chau Yat House	149 to 275	67 to 73	27 to 32	25 to 26	15 to 16
A81a	Yat Tung Estate - Fuk Yat House	148 to 369	67 to 78	27 to 34	25 to 27	15 to 16
A81b	Yat Tung Estate - Fuk Yat House	148 to 378	67 to 78	27 to 34	25 to 27	15 to 16
A82	Yat Tung Estate - Luk Yat House	148 to 390	67 to 83	28 to 37	25 to 27	15 to 16
A83	Yat Tung Estate - Ying Yat House	148 to 375	68 to 79	28 to 34	25 to 27	15 to 16
A84	Yat Tung Estate - Yu Yat House	148 to 372	68 to 78	28 to 34	25 to 27	15 to 16
A85	Yat Tung Shopping Centre	148 to 369	68 to 83	28 to 36	25 to 27	15 to 16
A86	Yat Tung Estate - Chui Yat House	148 to 344	68 to 78	28 to 34	25 to 26	15 to 16
A87	Yat Tung Estate - Yuet Yat House	148 to 345	68 to 82	28 to 35	25 to 27	15 to 16
A88	Yat Tung Estate - Sui Yat House	148 to 352	67 to 77	28 to 34	24 to 26	15 to 16
A89	Ma Wan Chung	189 to 279	67 to 70	28 to 29	25 to 26	15

ASR ID	Location	Range of Pollutant Concentration (μg/m³) among All Years and Assessment Heights				
		TSP	RSP		FSP	
		Max. 1-hour	24-hour (10th highest)	Annual	24-hour (36th highest)	Annual
	Criteria	**500**	**100**	**50**	**50**	**25**
A91	Ma Wan Chung	159 to 244	67 to 72	28 to 29	25 to 26	15
A93	Islands Community Green Station	153 to 459	67 to 88	28 to 37	25 to 28	15 to 17
A94	Tung Chung Road Soccer Pitch	247 to 274	67 to 71	28 to 31	25 to 26	15 to 16
A95	Ma Wan Chung	222 to 448	71 to 88	31 to 43	26 to 29	16 to 18
A96	Wong Ka Wai Village	190 to 214	67 to 69	27 to 30	25 to 26	15
Planned ASRs						
P12	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	232 to 440	72 to 76	33 to 36	26 to 28	16 to 17
P13	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	220 to 425	71 to 87	32 to 39	26 to 29	16 to 18
P14	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	240 to 386	72 to 82	32 to 36	26 to 28	16 to 17
P15	TCNTE East - Comprehensive Development Area (A1-2/ Area 113)	243 to 315	71 to 80	32 to 39	26 to 28	16 to 18
P16	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	237 to 421	71 to 82	32 to 35	26 to 28	16 to 17
P17	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	228 to 352	70 to 78	31 to 37	25 to 28	16 to 17
P19	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	260 to 387	70 to 76	31 to 33	25 to 27	16 to 17
P20	TCNTE East - Comprehensive Development Area (A1-1/ Area 113)	244 to 363	70 to 75	31 to 35	25 to 27	16 to 17
P21a	TCNTE East - Planned Commercial Development (COM-1/Area 57)	152 to 447	69 to 81	30 to 38	25 to 29	16 to 17
P21b	TCNTE East - Planned Commercial Development (COM-1/Area 57)	160 to 379	69 to 76	30 to 34	25 to 27	16 to 17
P22	TCNTE East - Planned Residential Development (B1-2/Area 100)	168 to 453	69 to 79	30 to 35	25 to 27	16 to 17
P23	TCNTE East - Planned Clinic & GIC Complex (B0-3/Area 59)	151 to 368	69 to 76	30 to 32	25 to 26	16
P25	TCNTE East - Planned Residential Development (B1-2/Area 100)	168 to 328	69 to 74	30 to 32	25 to 26	16
P26	TCNTE East - Planned Residential Development (Area 54)	147 to 215	68 to 69	29 to 30	24 to 25	15 to 16
P27	TCNTE East - Planned Residential Development (Area 54)	147 to 304	68 to 69	29 to 30	24 to 26	15 to 16
P31	TCNTE West - Planned Residential Development (TCW-2/Area 23)	148 to 203	67 to 68	27 to 29	25	15
P34	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	148 to 175	67 to 72	27 to 30	25 to 26	15 to 16
P35a	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	148 to 226	67 to 70	27 to 29	25 to 26	15

ASR ID	Location	Range of Pollutant Concentration (µg/m^3) among All Years and Assessment Heights				
		TSP	RSP		FSP	
		Max. 1-hour	24-hour (10th highest)	Annual	24-hour (36th highest)	Annual
	Criteria	**500**	**100**	**50**	**50**	**25**
P35b	TCNTE West - Planned Commercial Development (COM-2/Area 38B)	148 to 256	67 to 71	27 to 31	25 to 26	15 to 16
P38	TCNTE West - Planned Residential Development (TCV-1/Area 60)	148 to 186	67 to 69	27 to 28	25	15
P39	TCNTE West - Planned Residential Development (TCV-1/Area 60)	148 to 191	67 to 70	27 to 29	25 to 26	15
P40	TCNTE West - Planned Residential Development (TCV-1/Area 60)	148 to 176	67 to 71	27 to 29	25 to 26	15
P42	TCNTE West - General Clinic /Health Centre (TCV-i/Area 36A)	148 to 204	67 to 70	27 to 29	25 to 26	15
P43	TCNTE West - Planned Residential Development (TCW-3/Area 48)	148 to 181	67 to 71	27 to 30	25 to 26	15

3.7.1.1 **Table 3.7.2** to **Table 3.7.6** further illustrate the breakdown of the maximum 1-hour TSP concentrations, 10th highest 24-hour RSP, 36th highest 24-hour FSP and annual RSP / FSP concentrations for the critical ASRs at each region showing the contribution from the Project and other major sources.

3.7.1.2 It can be seen from **Table 3.7.2** that the maximum 1-hour TSP concentrations at most of these critical ASRs are mainly contributed by the TCNTE construction. Except A37 Shops at Tung Chung Crescent, the Project only contributes <1ug/m^3 to the maximum 1-hour TSP concentrations. In particular for A93 Islands Community Green Station (the worst predicted ASR) where the predicted cumulative maximum 1-hour TSP concentration is 459 ug/m^3, over 90% (i.e. 430 ug/m^3) is contributed by TCNTE construction under NNE wind direction. Although the Project will induce a relatively significant contribution (i.e. 206 ug/m^3) to the maximum 1-hour TSP concentration (i.e. 428 ug/m^3) at ASR A37, the background concentration is found high (i.e. 138 ug/m^3) and the predicted cumulative 1-hour TSP concentration is still well within the criterion of 500 ug/m^3.

3.7.1.3 As shown from **Table 3.7.3 to 3.7.6,** the RSP and FSP concentrations are mainly dominated by the background. The contribution from the Project is generally found very small, except ASR 95 Ma Wan Chung where the Project-induced emission contributes 28 ug/m^3 to the 10th highest cumulative 24-hour RSP concentration of 88 ug/m^3 and 14 ug/m^3 to the cumulative annual RSP concentration of 43 ug/m^3, respectively. Nonetheless, the predicted cumulative RSP concentrations are still well within the respective criteria at A95. For FSP, the Project contribution to the 36th highest cumulative 24-hour and cumulative annual concentrations is even smaller.

Table 3.7.2 Breakdown of maximum 1-hour TSP

Location Clusters	ASRs	Worst Year	Max 1-hour TSP concentration (ug/m^3) [2]				
			Project induced	TCNTE	Others [1]	Background	Cumulative
Tai Ho Wan	A01	2027	<1	197	<1	37	235
North of North Lantau Highway	P27	2025	<1	256	<1	47	304
South of North Lantau Highway to Shun Tung Road	A37	2023	206	77	7	138	428
South of Shun Tung Road to Yat Tung Estate	A93	2023	<1	430	3	27	459
TCNTE TCE	P22	2026	<1	354	1	98	453
TCNTE TCW	P35b	2026	<1	167	<1	89	256

Note:
[1] Others include emissions from modification of the footbridge near Yu Tung Road, vehicular emission, chimney at North Lantau Hospital, marine vessels and major emission point source within 4km, i.e. ORRC Phase 1.
[2] All figures are rounded to integer.

Table 3.7.3 Breakdown of 10th highest 24-hour RSP

Location Clusters	ASRs	Worst Year	10th highest 24-hour RSP concentration (ug/m^3) [2]				
			Project induced	TCNTE	Others [1]	Background	Cumulative
Tai Ho Wan	A01	2023	<1	<1	<1	68	69
North of North Lantau Highway	A05	2024	3	1	<1	66	71
South of North Lantau Highway to Shun Tung Road	A37	2023	2	<1	<1	66	69
South of Shun Tung Road to Yat Tung Estate and South of Yu Tung Road	A95	2023	28	<1	<1	58	88
TCNTE TCE	P13	2027	<1	16	<1	70	87
TCNTE TCW	P34	2025	2	<1	3	66	72

Note:
[1] Others include emissions from modification of the footbridge near Yu Tung Road, vehicular emission, chimney at North Lantau Hospital, marine vessels and major emission point source within 4km, i.e. ORRC Phase 1.
[2] All figures are rounded to integer.

Table 3.7.4 Breakdown of annual RSP

Location Clusters	ASRs	Worst Year	Annual RSP concentration (ug/m^3) [2]				
			Project induced	TCNTE	Others [1]	Background	Cumulative
Tai Ho Wan	A01	2027	<1	<1	<1	28	29
North of North Lantau Highway	A05	2024	2	2	<1	28	30
South of North Lantau Highway to Shun Tung Road	A37	2023	3	2	<1	26	32
South of Shun Tung Road to Yat Tung Estate and South of Yu Tung Road	A95	2023	14	1	<1	27	43
TCNTE TCE	P13	2027	3	7	<1	28	39
TCNTE TCW	P34	2025	<1	<1	1	26	30

Note:
[1] Others include emissions from modification of the footbridge near Yu Tung Road, vehicular emission, chimney at North Lantau Hospital, marine vessels and major emission point source within 4km, i.e. ORRC Phase 1.
[2] All figures are rounded to integer.

Table 3.7.5 Breakdown of 36th highest 24-hour FSP

Location Clusters	ASRs	Worst Year	36th highest 24-hour FSP concentration (ug/m3) [2]				
			Project induced	TCNTE	Others [1]	Background	Cumulative
Tai Ho Wan	A01	2027	<1	2	<1	24	26
North of North Lantau Highway	A05	2024	<1	<1	<1	24	26
South of North Lantau Highway to Shun Tung Road	A37	2023	<1	<1	1	24	26
South of Shun Tung Road to Yat Tung Estate and South of Yu Tung Road	A95	2027	3	<1	<1	26	29
TCNTE TCE	P13	2027	<1	5	<1	23	29
TCNTE TCW	P34	2025	<1	<1	<1	25	26

Note:
[1] Others include emissions from modification of the footbridge near Yu Tung Road, vehicular emission, chimney at North Lantau Hospital, marine vessels and major emission point source within 4km, i.e. ORRC Phase 1.
[2] All figures are rounded to integer.

Table 3.7.6 Breakdown of annual FSP

Location Clusters	ASRs	Worst Year	Annual FSP concentration (ug/m3) [2]				
			Project induced	TCNTE	Others [1]	Background	Cumulative
Tai Ho Wan	A01	2027	<1	<1	<1	15	15
North of North Lantau Highway	A05	2024	<1	<1	<1	15	16
South of North Lantau Highway to Shun Tung Road	A37	2023	<1	<1	<1	15	16
South of Shun Tung Road to Yat Tung Estate and South of Yu Tung Road	A95	2023	2	<1	<1	15	18
TCNTE TCE	P13	2027	<1	1	<1	15	18
TCNTE TCW	P34	2025	<1	<1	<1	15	16

Note:
[1] Others include emissions from modification of the footbridge near Yu Tung Road, vehicular emission, chimney at North Lantau Hospital, marine vessels and major emission point source within 4km, i.e. ORRC Phase 1.
[2] All figures are rounded to integer.

3.7.1.4 According to the results as presented in **Appendix 3.11**, the worst hit level on the most critical ASRs generally occurs at ground level (i.e. 1.5m above ground). For ASRs in TCE, the dust concentrations at the existing ASRs (i.e. ASR A01 – A25d) are all well below the criteria; while those at the planned ASRs (i.e. ASR P12 – P27) are more critical with much higher predicted dust concentrations (in particular TSP and RSP) and the worst impacts for the majority of the planned ASRs generally occur in Year 2027.

3.7.1.5 In TCW, the dust concentrations of the existing ASRs (i.e. ASR A57 – A80, A89, A91. A94 and A96) and all planned receivers (i.e. ASR P31 – P43) are found well below the criteria. However, the existing ASRs near TCW station (i.e. ASR A81a to A88, A93 and A95) are more critical with much higher predicted dust concentrations (in particular TSP and RSP). The worst impacts for the majority of these critical ASRs generally occur in Year 2023.

3.7.1.6 The remaining ASRs located at Tung Chung Crescent (i.e. ASR A30b – A39b) are close to EAP and EEP, and their maximum dust concentrations are also predicted in Year 2023.

3.7.1.7 In view of the above, contours of the maximum 1-hour TSP concentrations, 10th highest 24-hour and annual RSP concentrations, and 36th highest 24-hour and annual FSP concentrations at 1.5m above ground for Year 2023 and 2027 are plotted. They are illustrated in **Figure 3.7.1a-e** and **Figure 3.7.2a-e**. The contour plots indicate that there are no exceedances at any locations with sensitive uses. Adverse construction dust impacts are therefore not anticipated.

3.8 Good Site Practice and Recommended Mitigation Measures

3.8.1 Construction Dust Control

3.8.1.1 In order to reduce the dust emission from the Project and achieve compliances with relevant criteria at ASRs due to the Project, regular watering under a good site practice should be adopted. In accordance with the *"Control of Open Fugitive Dust Sources*" (USEPA AP-42), watering once per hour on exposed construction areas with dust emission and haul road is proposed to achieve a dust removal efficiency of 91.7%.

3.8.1.2 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%. 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.

3.8.1.3 Any potential dust impact and watering mitigation would be subject to the actual site conditions. For example, for a construction activity that produces inherently wet conditions or in cases under rainy weather, the above watering frequency may not be unreservedly applied. While the above watering frequencies are to be followed, the extent of watering may vary depending on actual site conditions. The dust levels would be monitored and managed under an Environmental Monitoring and Audit (EM&A) programme as specified in the EM&A Manual.

3.8.1.4 Any drill-&-blast activities should be conducted underneath the concrete slabs for concourses and platforms at the bottom of the TCW Station and underneath a roof cover at the bottom of the shaft between the proposed EAP / EEP and the tunnel. Impermeable blast covers at the mucking out locations will be shut. The blasting should only be carried out in a fully enclosed environment. All neighbouring construction activities will be suspended during blasting. 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.

3.8.1.5 In addition, 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 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;
- Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- A stockpile of dusty material should not be extended beyond the pedestrian barriers, fencing or traffic cones;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
- Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also

be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;

- The portion of any road leading only to the construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;
- Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;
- Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;
- Where scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;
- 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.

3.8.2 Emission control on Non-Road Mobile Machinery (NRMMs)

3.8.2.1 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. 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.

3.8.2.2 In addition, the following good site practices that can control and reduce the emission from the use of non-road mobile machinery from the Project are recommended:

- Regulated machines shall be used and exempted NRMMs should be avoided where practicable.
- Use cleaner fuel such as ULSD in diesel-operated construction plant to reduce sulphur dioxide emission.
- Use of electric PMEs where practicable.
- Use power supplied from power utilities when practicable (e.g. to replace generators).
- Switch off the engine of PMEs when idling.
- Implement regular and proper maintenance for plant and equipment.
- Employ plant and equipment of adequate size and power output and avoid overloading of the plant.
- Locate the PMEs away from sensitive receivers as far as possible.
- Erect screen to shield the emission source from sensitive receivers where necessary and practicable.

3.9 Conclusion

3.9.1.1 This section presents the assessment results for construction phase air quality impacts arising from the Project.

3.9.1.2 Potential construction dust impact would be generated from site clearance, soil excavation, backfilling, etc. during the construction phase of the Project. Quantitative construction dust impact assessment has been conducted which has taken into account the cumulative impacts from the concurrent construction projects (i.e. TCNTE and modification of the footbridge near Yu Tung Road) and contribution from other major emission sources including local vehicular emission, ORRC Phase 1, chimney at North Lantau Hospital, as well as marine emission from vessels travelling between Tuen Mun, Tung Chung, Sha Lo Wan and Tai O.

3.9.1.3 With the implementation of the mitigation measures as stipulated in the Air Pollution Control (Construction Dust) Regulation, dust control measures, including watering once per hour on exposed construction areas with dust emission and stockpile, provision of 3-side screen with top cover and water spraying system

at the unloading points of barging facility and good site practices, the predicted 1-hour TSP, 24-hour and annual RSP/FSP concentrations at all representative ASRs would comply with the respective criteria. Hence, no adverse residual air quality impact during the construction phase is anticipated.