5. AIR QUALITY IMPACT

Introduction

5.1 Assessment on the potential air quality impacts associated with the construction phase of the Project is presented in this section. Representative Air Sensitive Receivers (ASRs) in the vicinity of the study area are identified. The potential air quality impacts on these ASRs arising from dust emission from construction work sites, stockpiles and barging facilities have been assessed and appropriate mitigation measures are proposed to alleviate the potential air quality impacts.

5.2 The trains to be employed for the SCL will be electrically operated. Air quality impact associated with train emission is therefore not anticipated during operation phase. Exhausts for general ventilation and smoke extraction facilities will be carefully positioned to avoid nuisance to the surrounding environment.

Environmental Legislation, Standards and Guidelines

5.3 The criteria and guidelines for air quality assessment are laid down in Annex 4 and Annex 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). In addition, specific requirements on air quality assessment for this Project are stipulated in Clause 3.4.2 of the EIA Study Brief (No. ESB-192/2008).

Air Quality Objective & EIAO-TM

5.4 The Air Pollution Control Ordinance (APCO) provides the statutory authority for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which stipulate the maximum allowable concentrations over specific periods for typical pollutants should be met. The AQOs are listed in **Table 5.1**.

Table 5.1 Hong Kong Air Quality Objectives

Pollutant	Maximum Concentration (µg/m^3) [1] Averaging Time				
	1 hour[2]	1 hour[2]	1 hour[2]	1 hour[2]	1 hour[2]
Total Suspended Particulates (TSP)	-	-	260	-	80
Respirable Suspended Particulates (RSP) [5]	-	-	180	-	55
Sulphur Dioxide (SO_2)	800	-	350	-	80
Nitrogen Dioxide (NO_2)	300	-	150	-	80
Carbon Monoxide (CO)	30,000	10,000	-	-	-
Photochemical Oxidants (as Ozone, O_3) [6]	240	-	-	-	-
Lead	-	-	-	1.5	

Note:

(1) Measured at 25°C and one atmosphere.

(2) Not to be exceeded more than three times per year.

(3) Not to be exceeded more than once per year.

(4) Arithmetic mean.

(5) Suspended particulates in air with a nominal aerodynamic diameter of 10 μm or smaller.

(6) Photochemical oxidants are determined by measurement of ozone only.

5.5 The EIAO-TM stipulates that the hourly TSP level should not exceed 500 μgm^{-3} (measured at 25^{o}C and one atmosphere) for construction dust impact assessment.

Air Pollution Control (Construction Dust) Regulation

5.6 Notifiable and regulatory works are under the control of Air Pollution Control (Construction Dust) Regulation. Notifiable works are site formation, reclamation, demolition, foundation and superstructure construction for buildings and road construction. Regulatory works are building renovation, road opening and resurfacing, slope stabilisation, and other activities including stockpiling, dusty material handling, excavation, etc. This Project is expected to include notifiable works (foundation, superstructure construction and demolition) and regulatory works (temporary stockpile, dusty material handling and excavation). Contractors and site agents are required to inform EPD and adopt dust reduction measures to minimize dust emission, while carrying out construction works, to the acceptable level.

Description of the Environment

Environs

5.7 The Project alignment branches out from the existing East Rail tracks south of Mong Kok East Station (MKK) to the new Hung Hom Station (HUH) east of the current station. The locality of the Project area is a developed urban area with major land uses including residential, commercial and educational institutes.

Background Air Quality

5.8 In accordance with the Guidelines in Assessing the 'TOTAL' Air Quality Impacts, both Mong Kok and Hung Hom areas are categorized as urban area. Since there is no EPD general air quality monitoring station located in these areas, the recent five years (2006 –2010) annual average monitoring data recorded at EPD's general air quality monitoring stations in urban areas are therefore taken to estimate the background concentration for the purpose of this assessment. With reference to EPD's Air Quality Annual Report, the EPD's general air quality monitoring stations in urban areas considered in this assessment include Central/Western, Kwun Tong, Sham Shui Po, Tsuen Wan and Kwai Chung. The annual average air pollutant concentrations recorded at these monitoring stations are presented in **Table 5.2**. The background concentration adopted for this assessment is estimated as the mean of these annual average concentrations as shown in the table.

Table 5.2 Background Air Pollutant Concentrations adopted in this Assessment

Urban Stations	Annual Average TSP Concentration (µg/m^3)					TSP Background Concentration (µg/m^3)
	2006	2007	2008	2009	2010	
Tsuen Wan	**82**	79	67	63	63	70.8
Kwai Chung	**81**	**85**	79	70	71	77.2
Sham Shui Po	79	79	**81**	77	76	78.4
Kwun Tong	75	**82**	72	70	67	73.2
Central/Western	78	77	78	73	76	76.4
					Average	75.2

Note: Monitoring results that exceeded AQO are shown in bold characters.

Air Sensitive Receivers

5.9 In accordance with Annex 12 of the EIAO-TM, any 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 are considered as ASRs. As stated in the EIA Study Brief, the boundary of the assessment area for air quality assessment should be 500m from the Project alignment and boundaries of all associated areas under the Project. A total of 14 representative ASRs, which are considered to be most likely to be affected by the construction of the Project, have been identified for this assessment. The selected representative ASRs are listed in **Table 5.3** and their locations are illustrated in **Figure No. NEX2213/C/361/ENS/M60/501**.

5.10 The proposed alignment would generally be built by cut-and-cover method, and the associated construction works would mostly be at or below existing ground level. The lowest assessment height was therefore taken as either at 1.5m above local ground level (AGL) which is the average height of the human breathing zone or at the lowest height where the air sensitive use of the respective ASR locates. Higher assessment levels as shown in Table 5.3 were also selected for elevated ASRs to show the vertical variation of the pollutant concentrations.

Table 5.3 Representative Air Sensitive Receivers

ASRs	Description	Land Use	Distance from the nearest emission sources (m)	No. of storey	Assessment Height (m AGL)
OMA2	Parc Palais, Block 6	Residential	115	24	1.5, 5, 10, 15 & 20
OMA3	Parc Palais, Block 3	Residential	145	24	1.5, 5, 10, 15 & 20
OMA4	Carmel Secondary School	Education Institution	60	5	1.5, 5, 10, 15 & 20
OMA5	King's Park Sport Ground	Recreational	65	0	1.5
HHA1	Wylie Court, Block C	Residential	140	20	1.5, 5, 10, 15 & 20
HHA2	Wing Fung Building	Residential	40	8	1.5, 5, 10, 15 & 20
HHA3	PolyU Cheung On Tak Lecture Theatre	Education Institution	70	6	1.5, 5, 10, 15 & 20
HHA4	China Travel Cargo Logistic Centre	Commercial	40	10	1.5, 5, 10, 15 & 20
HHA5	The Metropolis Residence	Service Apartment	185	18	1.5, 5, 10, 15 & 20
HHA6	Harbour Plaza Metropolis	Hotel	55	11	1.5, 5, 10, 15 & 20

ASRs	Description	Land Use	Distance from the nearest emission sources (m)	No. of storey	Assessment Height (m AGL)
HHA7	Fire Service Headquarters	GIC	165	13	1.5, 5, 10, 15 & 20
HHA8	Hong Kong Coliseum*	GIC	90	1	10, 15 & 20
HHA9	Harbourfront Horizon#	Service Apartment	25	22	5, 10, 15 & 20
HHA10	Wah Lai Building	Residential	115	17	1.5, 5, 10, 15 & 20

Notes:

* - Hong Kong Coliseum is sitting on the podium of HUH. The tunnel construction works adjacent to this ASR will be carried out underneath the HUH podium. As such, the lowest assessment height for this ASR is taken as 10m above the construction works.

- No air sensitive use was observed at the ground level, assessment height was taken as the first floor level at 5m AGL.

Potential Sources of Impact

Construction Phase

5.11 The Project alignment is an approximately 1.2km extension branches out from the existing East Rail Line (EAL) tracks from the tunnel portal near Oi Man Estate (Portal 1A)to the future Hung Hom North Ventilation Building, Plant Rooms and Emergency Access (NOV) which will be constructed under the Shatin to Central Link – Hung Hom to Admiralty Section [SCL (HUH – ADM)]. In addition to the construction of the railway alignment, the Project includes the construction of ventilation shafts; modification of HUH podium structure, platform and station structure; and some demolition and culvert/drain diversion works. Moreover, a barging point with two loading ramps are proposed which will be share used by Shatin to Central Link – Tai Wai to Hung Hom Section [SCL (TAW – HUH)], SCL(HUH-ADM) and Kwun Tong Line Extension (KTE). The proposed barging point would be located at the existing berth at Hung Hom Freight Pier.

5.12 Major construction works that would contribute to construction dust impacts include cut and cover works for tunnel and surface works; construction of superstructures including the ventilation shafts; modification work to HUH podium structure; loading/unloading at barging point. The tentative working hours will be 07:00 to 19:00 from Monday to Saturday for all works sites including the barging point. Locations of the construction works areas including cut and cover work sites and barging point are illustrated in **Figure No. NEX2213/C/361/ENS/M60/501**. Details of the construction activities and potential emission sources for the selected construction method are described in the following sections.

5.13 Alternative construction methods/phasing programme that have previously been reviewed and examined for the Project are described in Section 2 of this report.

Tunnel

5.14 Tunnel construction for the Project would be carried out by cut-and-cover method. The major potential dust impacts above ground would be dust arising from excavation, material handlings and transportation of spoils on paved haul roads within the site.

5.15 The proposed alignment from portal 1A to HUH would be built by cut-and-cover method in open area. Whereas the section entering the new platforms would be built by underpinning method below the existing HUH podium. The existing HUH podium is about 300m wide, 390m long and the headroom is about 7m. Hoarding of not less than 2.4m high would typically be provided at the works boundary. The hoarding would minimise the wind erosion potential of the works area and hence reduce the potential dust impact on the HUH podium.

5.16 Some existing superstructures located directly above the cut-and-cover tunnel would be demolished before the construction of the tunnel. Dust arising from demolishing reinforced concrete structure would be limited. With the implementation of dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation, adverse dust impact associated with the demolition works would not be expected.

5.17 During excavation and unloading of spoils, water spraying would be provided to alleviate potential dust emissions. All the trucks would be equipped with a cover and the dusty materials would be well covered before leaving the work site area. Therefore, adverse dust impact from the transportation of spoil would not be anticipated. Besides, wheel washing facilities would be provided at every designated vehicle exit point. Since all vehicles would be washed at exit points and all trucks loaded with the dusty materials would be covered entirely before leaving the work site, the dust nuisance from construction vehicle movement outside the work site is unlikely to be significant.

Ventilation Shafts

5.18 Some ventilation shafts would be built at the north and south of HUH podium edge for the operational tunnel and station ventilation. The construction areas for these superstructures would be limited, and all structures are reinforced concrete in nature. Adverse dust impacts arising from construction of ventilation shafts are not anticipated with the implementation of dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation.

Modification Works to Existing HUH Podium Structure

5.19 Modification works to the existing HUH podium structure would be carried out to introduce openings for new escalators, lifts and stairs and also to provide sufficient headroom for the mid-Level walkway, E&M provisions and also works resulting from the re-configuration and removal of existing columns of the Freight Terminal. The modification works would only involve minor excavation work of which most are carried out in an enclosed environment to minimise the disturbance to the public and railway operations. Adverse dust impacts arising from the modification works to the existing HUH podium structure are not anticipated with the implementation of dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation.

Barging Point

5.20 One barging point with two loading ramps at Hung Hom Freight Pier, constructed under KTE project would be used during the construction of the SCL projects. It would be operated for 12 hours a day (07:00 to 19:00) on normal working days except the typhoon No.3 or above hoist. The excavated materials produced during the construction of the proposed SCL Alignment would be transported to the tipping halls of the barging point by trucks and then unloaded to the barges. No stockpile area would be provided for the barging point.

5.21 The haul roads within the barging point would be all paved and provided with water spraying. Vehicles would be required to pass through designated wheel washing facilities before leaving the barging facility. To alleviate the potential dust impacts, the dusty materials on the trucks would be well covered and flexible dust curtain would be provided at the loading points (from the berths of barging point to the barges). The barging facilities would be share used by this Project, SCL (HUH – ADM), SCL (TAW – HUH) and KTE.

Railway Reprovisioning Works of Homantin Siding

5.22 Homantin Siding, the former livestock sidings area located at the south side of Chatham Road Interchange, would be reserved for railway reprovisioning works. Only minor excavation works, e.g. realignment of the existing rail track and relocation of the crossing, would be carried out. No potential dust impact would, therefore, be expected.

Other Construction Works

5.23 Apart from the above construction works, there are some minor supporting works, including demolition works, pile removal, stormwater drain, culvert diversion and other improvement works for Viaducts, for the Project. The potential dust impacts from these activities are localized and the extent of excavated areas would be limited. Adverse dust impacts are, therefore, not anticipated with the implementation of dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation.

Off-site Area at MKK Freight Yards

5.24 Minor modification works for office/store layout would be carried out inside the current freight yard underneath MKK podium. No potential dust impact would be expected.

Cumulative Dust Impact from Other Concurrent Projects

5.25 Based on the current programme, the Project would likely have interactions with some other projects, including SCL (HUH – ADM), SCL (TAW – HUH) and KTE.

SCL (HUH – ADM)

5.26 SCL (HUH – ADM) starts from the north of the proposed NOV across the harbour to new stations at Exhibition and Admiralty. The construction of SCL (HUH – ADM) at Hung Hom would be carried out concurrently with the Project. The construction of tunnels at Hung Hom would be generally carried out by cut-and-cover method near the waterfront. In addition, the existing MTR Freight Operations Building at south of HUH would need to be demolished to facilitate the tunnel construction. The tip of

the existing Hung Hom Freight would also be removed and reprovisioned in situ. The detailed assessment methodology is addressed in the SCL (HUH – ADM) EIA Report and it is also summarized in **Appendix 5.2**.

SCL (TAW – HUH)

5.27 The SCL (TAW – HUH) is an extension of Ma On Shan Line from Tai Wai through the new stations in the east Kowloon, namely Diamond Hill, Kai Tak, To Kwa Wan, Ma Tau Wai, Ho Man Tin Stations and finally connecting the West Rail Line (WRL) at the HUH. The section of the SCL (TAW – HUH) alignment at Hung Hom would be constructed by cut-and-cover method. Potential dust impacts would be expected. The detailed assessment methodology is addressed in the SCL (TAW – HUH) EIA Report and it is also summarized in **Appendix 5.3**.

KTE

5.28 The KTE alignment which branches out from the existing Yau Ma Tei Station to the new Ho Man Tin Station would be constructed by drill-and-blast and mine tunnelling methods. The new Ho Man Tin Station, located next to the Project boundary, would be constructed by open excavation method and potential dust impacts would be expected. Two rock crushing facilities and one barging point with two loading ramps located at Hung Hom Freight Pier are required to be constructed and operated during the construction of KTE. The barging facilities would be share among this Project, SCL (HUH – ADM), SCL (TAW – HUH) and KTE. Thus, potential cumulative dust impacts arising from the operation of the rock crushing facilities and barging point are expected. The detailed assessment methodology is addressed in the KTE EIA Report and it is also summarized in **Appendix 5.4**.

5.29 Any above-ground major construction activity arising from SCL (HUH – ADM), SCL (TAW – HUH) and KTE within 500m from the Project boundary, with consideration to be given to extend the area to include emission sources that may have contribution on cumulative dust concentration, and barging facilities at Hung Hom Freight Pier would be assessed in this assessment.

Operation Phase

5.30 During operation of the Project, no air pollutant emissions would be generated from the electrical trains. The ventilation shafts connecting to the ventilation system of the station would only emit carbon dioxide (CO_2) generated from the breathing of the passengers and staff. The ventilation system is designed for an air exchange rate of 5 litre/person/second in accordance with MTR Design Manual. As a result, all CO_2 would be exhaled by normal air exchange. Similar to other electrical rail projects with substantial underground sections (e.g. Express Rail Link and Kowloon Southern Link), air quality impact from the operations of ventilation shafts would not be considered as a key environmental issue.

5.31 With regards to the future operations, freight train (with diesel locomotive) operation will be winded down, and intercity service would remain the same in fairly low frequency. Thus, there will be less emission generated from diesel locomotives as compared to the current situation. No additional particulate emission associated with diesel combustion is therefore anticipated.

5.32 One of the works items is to realign the Cheong Wan Road Viaduct. The section of Cheong Wan Road Viaduct connecting HUH and Gillies Avenue South would be shifted by about 10m to the west. Based on the latest design information, both the traffic flow and traffic composition would not be altered due to the proposed road realignment. Cheong Wan Road is a local distributor, the traffic flow are much smaller as compared to other nearby primary distributor roads, such as Hong Chong Road. The potential vehicle emission impact arising from the operation of the new Cheong Wan Road Viaduct would be as follows:

- To the east of the road – the nearest ASRs are Metropolis Residence and Royal Peninsula. As the road would be shifted further away, the impact would expect to be less than the existing condition.
- To the west of the road – the nearest ASR is Hong Kong Polytechnics University (HKPU) which has been provided with a central fresh air supply system to minimize any roadside effect. The new Cheong Wan Road Viaduct would be shifted insignificantly towards the HKPU by 10m as compared to the original distance of 110m. The impact will be minimal as compared to the recommended setback distance of 5m from local distributor in accordance with the Hong Kong Planning Standard and Guidelines (HKPSG).
- To the south of the road – the nearest ASR is HUH. There is no change in the setback distance as compared to the existing alignment. As the ASRs are more than 75m away from the road, vehicular impact arising from the realigned Cheong Wan Road Viaduct would expect to be negligible in accordance with the HKPSG Guidelines.
- To the north of the road – the nearest ASR is On Tai Mansion. Similarly, the ASRs are more than 150m away and there is no change to the setback distance as compared to the existing alignment. Therefore, vehicular impact arising from the realigned Cheong Wan Road Viaduct would not be a concern.

Assessment Methodology

Construction Phase

5.33 Referring to the above sections, major potential dust impacts would be expected from the construction of cut-and-cover tunnel and the operation of the barging point at Hung Hom Freight Pier. Quantitative assessment is therefore conducted for these construction works. The potential dust emission sources considered in the assessment are shown in **NEX2213/C/361/ENS/M60/512** under **Appendix 5.1**.

5.34 Regarding the construction of ventilation shafts at HUH and the modification works to existing HUH podium structure, there would only be limited dusty construction activities involved and any excavation works and/or spoil loading/unloading would all be undertaken within enclosed structure. Therefore, with the implementation of dust suppression measures as stipulated in Air Pollution Control (Construction Dust) Regulation, no adverse dust impacts would be expected from these construction activities. The potential dust impacts arising from these works areas are addressed qualitatively in this study.

Emission Inventory

5.35 The impact of fugitive dust sources on air quality depends upon the quantity as well as the drift potential of the dust particles emitted into the atmosphere. Large dust particles (i.e. over 100 μm in diameter) will settle out near the source and particles that are between 30 and 100 μm in diameter are likely to undergo impeded settling. The major dust impacts are likely to arise from particles less than 30 μm in diameter, which have a greater potential to disperse over greater distances.

5.36 According to United States Environmental Protection Agency (USEPA) AP-42[1], construction dust particles may be grouped into five particle size classes. Their size ranges are 1.25 μm, 3.75 μm, 7.5 μm, 12.5 μm, 22.5 μm, and the percentage of particles in each class was estimated to be 7%, 20%, 20%, 18% and 35%, respectively.

5.37 Predicted dust emissions are based on emission factors from AP-42. The major dusty construction activities for the Project that have been considered in the modelling assessment include:

(A) Tunnel Cut & Cover areas

- Excavation and material handling within the construction site were modelled as heavy construction activities
- Wind erosion of open active site

(B) Barging Point (share used facilities, the design has been updated in this study as compared to the approved KTE EIA Report)

- Transportation of the spoils to the enclosed tipping hall of the barging point was modelled as heavy construction activities
- Unloading point to the barge

5.38 According to the preliminary engineering design information, dust control measures have been incorporated into the design of the barging facilities, as presented in **Tables 5.4**. These dust control measures have also been taking into account in the assessment.

Table 5.4 Barging Facilities – Dust Emission Design Control Measures

Process	Description	Dust Emission Design Control Measures
Haul road within barging facilities	Transportation of spoils to the barging point	All road surfaces within the barging facilities would be paved and watering once along the haul road for every working hour would be provided.
Unloading of materials	Unloading of spoil materials	The unloading process would be undertaken within a 3-sided screen with top tipping hall. Water spraying and flexible dust curtains would be provided at the discharge point for dust suppression.
Trucks	Vehicles leaving the barging facility	Vehicles would be required to pass through the wheel washing facilities provided at site exit.

[1] USEPA, AP-42 Compilation of Air Pollution Emission Factors (AP-42), Section 13.2.4.3, 1st Table

5.39 Due to the constrained size of the works sites and the tight construction programme, it will be necessary for active construction activities to be undertaken at multiple work faces spread across each site. Therefore, it is not feasible to identify the exact location of individual dust emission source. As such, for the purpose of predicting annual TSP concentrations, it is assumed that dust emissions would be distributed across the whole area of each site and the dust emission rates are estimated based on the annual average percentage active works area of each works site. Based on the preliminary engineering design, the annual average active area is estimated to be 6% and would be assumed for predicting the annual concentrations. The justification for the percentage of annual average active area is presented in **Appendix 5.5**.

5.40 Whereas for predicting hourly and daily average TSP levels, a more conservative approach is adopted. It is assumed that the whole construction site would be 100% actively operated, notwithstanding such a scenario would unlikely occur.

5.41 The emission rates of identified pollutant sources are summarised in **Tables 5.5** and **5.6**. Detailed calculations of the emission factors are given in **Appendix 5.1**.

Table 5.5 Emission Factors for Dusty Construction Activities

Emission Source	Activity	Emission Rate	Remarks
North Approaching Tunnel Construction (Cut & Cover Areas and Stockpile Areas)	Heavy Construction Activities	E=2.69 Mg/hectare /month of activity	• 100% area actively operating (for hourly and daily concentration prediction) • 6% area actively operating (for annual concentration prediction) • AP-42, Section 13.2.3
	Wind Erosion	E=0.85Mg/hectare /year	• 100% active site (for hourly and daily concentration prediction) • 6% active site (for annual concentration prediction) • AP-42, Section 11.9.4
South Approaching Tunnel Construction (Cut & Cover Areas and Stockpile Areas)	Heavy Construction Activities	E=2.69 Mg/hectare /month of activity	• 100% area actively operating (for hourly and daily concentration prediction) • 10% area actively operating (for annual concentration prediction) • AP-42, Section 13.2.3
	Wind Erosion	E=0.85Mg/hectare /year	• 100% active site (for hourly and daily concentration prediction) • 10% active site (for annual concentration prediction) • AP-42, Section 11.9.4

Table 5.6 Emission Factors for Barging Facilities

Emission Source	Activity	Emission Rate	Remarks
Barging Point at Hung Hom	Unloading of spoils to barge	E=3.42 x 10^{-4} kg/Mg	• AP-42, Section 13.2.4

Emission Source	Activity	Emission Rate	Remarks
Freight Pier	Paved haul road - transport the spoil from the construction sites to the barging point (modelled as heavy construction)	E=2.69 Mg/hectare /month of activity	• 100% area actively operating (for hourly, daily and annual concentration predictions) • AP-42, Section 13.2.3

5.42 Twelve working hours per day on normal working days was assumed for the above-mentioned construction activities during 07:00 to 19:00 in the assessment.

Dispersion Modelling & Concentration Calculation

5.43 Fugitive Dust Model (FDM) (1993 version) was adopted to assess potential dust impact from the construction works. The height of 1.5m (the breathing level of human), 5m, 10m, 15m and 20m above ground were adopted for the construction dust impact assessment.

5.44 Hourly meteorological data including wind speed, wind direction, air temperature and Pasquill stability class from the nearest Hong Kong Observatory weather station, Hong Kong Observatory Station, for the year 2008, were employed for the model run.

5.45 Since no construction activities would occur on Sundays and public holidays, only wind erosion would be assumed for these days as well as for other non-working hours (19:00 to 07:00 of the following day) on normal working days.

5.46 As mentioned in **Section 5.8**, the background TSP level of 75.2 μg/m^3, estimated based on the latest five years average monitoring data recorded at EPD's urban general air quality monitoring stations, was adopted as the future TSP background concentration for this assessment.

Operation Phase

5.47 As there is no significant air quality impact identified during operation of the Project, only qualitative approach is adopted to address the air quality implications.

Prediction and Evaluation of Impacts

Construction Phase

Unmitigated Scenario

5.48 The predicted unmitigated cumulative maximum hourly, daily and annual average TSP concentrations at the representative ASRs are summarized in **Table 5.7**. The contour plots at 1.5m AGL are presented in **Figure Nos. NEX2213/C/361/ENS/M60/514 - NEX2213/C/361/ENS/M60/516**.

Table 5.7 Predicted Cumulative Maximum Hourly, Daily and Annual Average TSP Concentrations at Representative Air Sensitive Receivers (Unmitigated)

ASRs	Assessment Height (mAGL)	Cumulative Maximum TSP Concentrations in μg/m^3		
		Hourly Average	24-hour Average	Annual Average
OMA2	1.5	**1237**	**405**	77.3
	5	**1029**	**355**	77.2
	10	**673**	236	76.8
	15	406	162	76.5
	20	335	125	76.2
OMA3	1.5	**844**	**342**	78.1
	5	**763**	**324**	78.0
	10	**508**	249	77.4
	15	340	184	76.9
	20	286	141	76.5
OMA4	1.5	**1837**	245	77.6
	5	**1464**	203	77.2
	10	**775**	154	76.6

ASRs	Assessment Height (mAGL)	Cumulative Maximum TSP Concentrations in μg/m^3		
		Hourly Average	24-hour Average	Annual Average
	15	**505**	131	76.4
	20	375	118	76.2
OMA5	1.5	**1217**	**523**	**81.5**
HHA1	1.5	**895**	**320**	79.3
	5	**736**	**275**	79.0
	10	425	186	78.0
	15	333	152	77.2
	20	252	135	76.6
HHA2	1.5	**1939**	**424**	79.3
	5	**1580**	249	77.8
HHA2	10	**832**	172	76.7
	15	468	144	76.4
	20	345	138	76.1
HHA3	1.5	**1755**	**754**	**84.8**
	5	**989**	**468**	**82.4**
	10	**524**	207	78.9
	15	345	168	77.3
	20	281	144	76.5
HHA4	1.5	**2515**	**679**	**81.1**
	5	**1381**	**398**	79.1
	10	**790**	246	77.2
	15	439	182	76.5
	20	331	141	76.1
HHA5	1.5	**1366**	**295**	76.8
	5	**1248**	**285**	76.8
	10	**836**	228	76.5
	15	494	178	76.2
	20	373	145	76.0
HHA6	1.5	**810**	242	**83.3**
	5	**802**	242	**81.1**
	10	**653**	213	78.6
	15	488	179	77.4
	20	346	150	76.7
HHA7	1.5	**546**	195	**89.1**
	5	**549**	198	**88.8**
	10	468	180	**86.2**
	15	375	159	**83.5**
	20	288	139	**81.2**
HHA8	10	**705**	200	78.0
	15	**502**	166	77.1
	20	339	138	76.6
HHA9	5	**707**	254	**97.8**
	10	**560**	190	**85.0**
	15	452	159	**80.2**
	20	352	137	78.2
HHA10	1.5	**1044**	223	77.2
	5	**919**	205	77.1
	10	**556**	162	76.6
	15	362	132	76.3
	20	284	121	76.1

Note: (1) The background TSP level of 75.2 μg/m^3 is included in the above results.

(2) The hourly, daily and annual average TSP EIAO-TM/AQO criteria are 500 μg/m^3, 260 μg/m^3 and 80 μg/m^3 respectively.

(3) Boldfaced value presents the predicted TSP concentration exceed the respective criteria.

5.49 Based on the results shown in **Table 5.7** above, the predicted cumulative maximum hourly, daily and annual average TSP concentrations at most of the representative ASRs would exceed the criteria stipulated in EIAO-TM and AQO. Hence, proper dust mitigation measures should be implemented.

Recommended Air Quality Mitigation Measures

5.50 In order to minimise the construction dust impact, the following dust mitigation measures should be implemented:

- Watering once every working hour on the active works areas, exposed areas and paved haul roads to reduce dust emission by 91.7%[2]. This dust suppression efficiency is derived based on the average haul road traffic, average evaporation rate and an assumed application intensity of 1.7 L/m^2 once every working hour. Any potential dust impact and watering mitigation would be subject to the actual site condition. For example, a construction activity that produces inherently wet conditions or in cases under rainy weather, the above water application intensity may not be unreservedly applied. While the above watering frequency is to be followed, the extent of watering may vary depending on actual site conditions but should be sufficient to maintain an equivalent intensity of no less than 1.7L/m^2 to achieve the removal efficiency. The dust levels would be monitored and managed under an EM&A programme as specified in the EM&A Manual.
- Enclosing the unloading process at barging point by a 3-sided screen with top tipping hall, provision of water spraying and flexible dust curtains to reduce dust emission by 50%[3]; and

5.51 In addition to the dust control measures described above, dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices listed below should be carried out to further minimize construction dust impact:

- Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather.
- Use of frequent watering for particularly dusty construction areas and areas close to ASRs.
- Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.

[2] USEPA, AP-42, "Control of Open Fugitive Dust Sources".

[3] USEPA AP-42, "Control Techniques for Particulate Emission for Stationary Sources Volume 2". It states that watering alone would reduce the dust emission by 50%. However, the unloading facilities is enclosed by a 3-side screen with top, addition dust removal efficiency is expected. Thus, it is a very conservative assumption.

- Establishment and use of vehicle wheel and body washing facilities at the exit points of the site.
- Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading area of barging point, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.
- Provision of not less than 2.4m high hoarding from ground level along site boundary where adjoins a road, streets or other accessible to the public except for a site entrance or exit.
- Imposition of speed controls for vehicles on site haul roads.
- Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs.
- 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.
- Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.

Mitigated Scenario

5.52 The predicted mitigated cumulative maximum hourly, daily and annual average TSP concentrations at the representative ASRs during construction are summarized in **Table 5.8**.

Table 5.8 Predicted Cumulative Maximum Hourly, Daily and Annual Average TSP Concentrations at Representative Air Sensitive Receivers (Mitigated)

ASRs	Assessment Height (mAGL)	Cumulative Maximum TSP Concentrations in μg/m^3		
		Hourly Average	24-hour Average	Annual Average
OMA2	1.5	273	148	76.2
	5	250	142	76.2
	10	191	123	76.1
	15	149	109	76.0
	20	141	100	75.9
OMA3	1.5	245	130	76.2
	5	232	127	76.3
	10	190	115	76.1
	15	153	104	76.0
	20	141	96	75.9
OMA4	1.5	291	141	76.4
	5	258	134	76.3
	10	179	121	76.2
	15	170	113	76.1
	20	159	106	76.1
OMA5	1.5	337	161	76.9
HHA1	1.5	314	140	76.5
	5	286	137	76.5
	10	236	122	76.2
	15	202	111	76.0

ASRs	Assessment Height (mAGL)	Cumulative Maximum TSP Concentrations in μg/m^3		
		Hourly Average	24-hour Average	Annual Average
	20	176	105	75.9
HHA2	1.5	439	202	77.0
	5	263	149	76.4
	10	252	139	76.1
	15	282	144	76.0
	20	269	138	75.9
HHA3	1.5	317	161	76.9
	5	291	152	76.6
	10	237	133	76.1
	15	199	119	75.8
	20	174	111	75.7
HHA4	1.5	324	161	76.5
	5	262	138	76.2
	10	177	117	75.9
	15	167	109	75.7
	20	158	103	75.6
HHA5	1.5	220	118	75.8
	5	213	117	75.8
	10	180	110	75.7
	15	154	104	75.6
	20	148	98	75.6
HHA6	1.5	213	113	76.5
	5	242	113	76.4
	10	231	108	76.1
	15	153	102	75.9
	20	143	97	75.7
HHA7	1.5	195	112	78.1
	5	192	111	78.0
	10	178	108	77.5
	15	163	104	77.0
	20	153	101	76.6
HHA8	10	196	104	75.9
HHA8	15	161	100	75.7
	20	145	96	75.6
HHA9	5	201	105	77.9
	10	168	102	76.7
	15	143	98	76.2
	20	137	95	75.9
HHA10	1.5	254	127	76.1
	5	227	122	76.1
	10	205	119	76.0
	15	205	117	75.9
	20	188	112	75.8

Note: (1) The background TSP level of 75.2 μg/m^3 is included in the above results.

(2) The hourly, daily and annual average TSP EIAO-TM/AQO criteria are 500 μg/m^3, 260 μg/m^3 and 80 μg/m^3 respectively.

5.53 Based on the results shown in **Table 5.8**, the cumulative maximum hourly, daily and annual average TSP levels at all ASRs would comply with the criteria stipulated in EIAO-TM and AQO after the implementation of proposed dust mitigation measures. The worst-hit level would be at 1.5m AGL at

most ASRs. The contour plots of cumulative maximum hourly, daily and annual average TSP concentrations at 1.5m AGL are presented in **Figure Nos. NEX2213/C/361/ENS/M60/502 - NEX2213/C/361/ENS/M60/504**. As there is no air sensitive use at the ground level of Harbourfront Horizon (HHA9), the highest cumulative TSP concentration is predicted at 5mAGL. Contour plots of cumulative maximum hourly, daily and annual average TSP concentration at HHA9 (5mAGL) is presented in **Figure Nos. NEX2213/C/361/ENS/M60/505 - Nos. NEX2213/C/361/ENS/M60/507**.

5.54 Some exceedances of hourly, daily and annual average TSP concentrations were predicted at the slope near to Chatham Road North Interchange, the railway track at north of the HUH, the freight pier on the contour plots. However, there is no air sensitive use at these areas and no adverse impact is anticipated. The hourly average TSP concentration at the rest garden and playground near the Chatham Road North Interchange and the annual average TSP concentration at Kowloon Freight Building, MTR Freight Head Office and International Mail Centre are also predicted to exceed the EIAO-TM on the contour plot. These facilities will be closed when the construction works are carried out in the vicinity and those areas are not identified as air sensitive area. Marginal exceedance of hourly TSP concentration is predicted at the south corner of the building of Sai Sing Funeral Parlour at 1.5m AGL on the contour plot, however, that area is reserved for mortuary, the upper levels are blank wall and stair areas which provided with openable windows at 5m AGL or above. Therefore there is no air sensitive use at these areas and no adverse impact is anticipated.

Operation Phase

5.55 There is no adverse air quality impact expected from the operation of the Project as discussed in **Sections 5.30** - **5.32** above.

Evaluation of Residual Impacts

Construction Phase

5.56 With the implementation of the mitigation measures as stipulated in the Air Pollution Control (Construction Dust) Regulation as well as the recommended dust control measures and good site practices, no adverse residual air quality impact would be expected.

Operation Phase

5.57 As the freight train operation would be winded down and the intercity operation mode would remain the same but in fairly low frequency, less emission generated from operation of the existing diesel locomotives would be expected. Thus, insignificant air quality impact from operation of diesel locomotives along the existing East Rail is anticipated.

Environmental Monitoring and Audit Requirements

5.58 Environmental monitoring and audit for dust emission should be conducted during the construction phase of the Project so as to check compliance with legislative requirements. Details of the monitoring and audit programme are contained in a stand-alone EM&A Manual.

Conclusion

Construction Phase

5.59 Potential air quality impacts from the construction works of the Project would mainly be related to construction dust from excavation, materials handling, spoil removal and wind erosion. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation as well as the recommended dust suppression measures and good site practices, no adverse dust impact on the ASRs in the vicinity of the construction sites would be anticipated.

Operation Phase

5.60 As the train will be electrically operated, air quality impact is therefore not anticipated during operational phase. Besides, no adverse air quality impact is expected from the operation of realigned Cheong Wan Road Viaduct and reduction in the number of the existing diesel locomotives (for maintenance trains/intercity) along the existing East Rail. Exhausts for general ventilation and smoke extraction facilities will also be carefully positioned to avoid nuisance to the surrounding environment.