

**Appendix 12.1 Key Assessment Assumptions, Limitation of Assessment Methodologies and related Agreement(s) with the Director**

Assessment Methodology	Key Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities		Proposed Alternative Assessment Tools / Assumptions (if applicable)
			EIA Study Brief Clause Reference	Relevant Documentation	
<b>Air Quality Impact</b>					
<b>Interim Phase and Operation Phase</b>					
<p>The air quality impact assessment follows: Annex 4 and Annex 12 of the TM-EIAO, Air Pollution Control Ordinance (APCO) (Cap. 311) and the Air Quality Objectives (AQOs), Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, Air Pollution Control (Fuel Restriction) Regulation, DEVB TC(W) No. 13/2020 and DEVB TC(W) No. 1/2015. Vehicular emission will be the dominant source of air pollution within 500m assessment area. The assessment of interim phase and operation phase air quality impact followed the technical requirements set in Appendix B of the EIA Study Brief. Operation phase air quality impact assessment will focus on NO<sub>2</sub>, RSP, and FSP concentrations on the representative air sensitive receivers.</p>	<p><u>Background Contributions</u></p> <ul style="list-style-type: none"> <li>Based on current tentative construction programme shown in Appendix 3.1, the works for removal and reprovision of noise barrier will commence in Year 2030. For operational phase assessment, based on the latest information, the Project commission year will be Year 2033. Therefore, the best available data from PATH v2.1 was the projected background scenario in Year 2030.</li> </ul> <p><u>Vehicular Emissions from Open Road Traffic</u></p> <ul style="list-style-type: none"> <li>The traffic data adopted for the assessment is presented in Appendix 3.2. The traffic data has been endorsed by the Transport Department and the endorsement letter is enclosed in Appendix 3.2. The detailed input parameters and model assumptions made in EMFAC-HK model are summarized in Appendix 3.3. The emission factors for NO were derived by assuming NO<sub>x</sub> consists of NO and NO<sub>2</sub> only. Temperature and relative humidity data from the nearest weather station with both temperature and relative humidity measurement, i.e., Hong Kong Wetland Park, in Year 2022 was obtained from the Hong Kong Observatory (HKO) for EMFAC modelling.</li> <li>According to Appendix 3.1, the works for removal and reprovision of noise barrier will tentatively commence in Year 2030. Therefore, adopting Year 2030 vehicular emission factors and the road network in Year 2033 would be the worst-case scenario representing the whole interim phase.</li> <li>The results for the sensitivity test are presented in Appendix 3.3. Based on the results of the sensitivity test, the adoption of Year 2033 vehicular emission factors and road network in Year 2041 yielded the highest vehicular emission burden. Therefore, this combination was adopted as the worst-case scenario.</li> <li>Open sections of existing road networks within the study area will be considered in the model. Surface roughness coefficients of 100cm for each grid will be taken in CALINE4 model.</li> <li>Under the current EPD guideline, the hourly meteorological data including wind speed, wind direction, and air temperature from the relevant grids in the WRF Meteorological data (same basis for PATH v2.1 model), was employed for the model run. Pasquill-Gifford stability class from the relevant grids provided in the WRF meteorological data was adopted as the meteorological input to CALINE4 model.</li> <li>The secondary air quality impacts arising from underpass and roadside noise mitigation measures, namely vertical noise barriers, vertical noise barriers with canopies, and semi-enclosures were incorporated into the air quality model. The locations of all existing and proposed noise barriers, semi-enclosures, and full enclosures within 500m study area are depicted in Figure 3.5, Figure 3.5a, Figure 3.5b, and Figure 3.5c.</li> <li>It is assumed that, with the installation of vertical noise barriers, all traffic pollutants generated from the mitigated road section are emitted from the top of the noise barriers. In the CALINE4 model, elevation of the mitigated road section was set to the elevation of the barrier top.</li> <li>Vehicular emissions from open road was based on modeling results of EMFAC and the air quality impact is predicted using CALINE4 model.</li> <li>For cantilever barriers and semi-enclosures, it is assumed that dispersion of traffic pollutants is in effect similar to physically shifting the mitigated road section towards the central divider. The traffic pollutants are assumed to emit from the top of the canopies. In the CALINE4 model, the alignment of the mitigated road section was shifted by a distance equal to the covered extent, elevation of the mitigated road section was set to the elevation of the barrier top.</li> <li>The NO, NO<sub>2</sub>, RSP, and FSP running exhaust and start emission factors of 18 vehicle classes predicted by EMFAC-HK are presented in Appendix 3.4. The 24-hour traffic flows and composite emission factors for each road link adopted in air dispersion modelling for vehicular emissions from open roads are presented in Appendix 3.5.</li> </ul> <p><u>Vehicular Emission from Portals</u></p> <ul style="list-style-type: none"> <li>The portal emissions (NO, NO<sub>2</sub>, RSP, and FSP) were calculated based on the 24-hour vehicle emission factors</li> </ul>	<p><u>Height limitation for line sources in CALINE4</u></p> <ul style="list-style-type: none"> <li>There is a height limitation for line sources in CALINE4, i.e., road height higher than 10 metres above ground is considered as 10 metres high above ground for assessment purpose. As a rule of thumb, the vertical height difference between road source and receptor in the model should not be larger than their actual vertical difference to avoid underestimation of air quality impact. For the YLH section between Tin Shui Wai West Interchange and Lam Tei Quarry, the YLH is higher than the general area of Tai Tao Tsuen and Tan Kwai Tsuen. Thus, this section of YLH was considered as filled road with the height being set to the elevation of the barrier top plus height difference between the receivers and the road. However, for some receivers situating on terrain and higher than YLH (e.g., A1, A5, A7, A10, A18, A21, A26, PA8, and PA9), the receiver height was adjusted according to the height of the nearest section of YLH in model by the following equation:</li> </ul> <p>Actual height of ASR, mPD – (Actual road elevation, mPD – road elevation set in CALINE4 model, m)</p> <p><u>No Response for the remaining 2 chimneys</u></p> <ul style="list-style-type: none"> <li>Letters were issued on 31st January 2023 to the respective chimney operator to obtain the latest emission information and parameters of each chimney and the latest specified process license of the concrete batching plant was obtained. Of the 4 chimney operators, 2 of them responded and the information has been used for compiling the emission inventory for industrial emissions. The emission inventory for the remaining 2 chimneys without response was referenced to the approved EIA Report for "Housing Sites in Yuen Long South".</li> </ul>	-	<p>The methodology adopted for the traffic forecast used in the EMFAC-HK modeling has been agreed by TD (Letters dated 1 August 2023, Ref.: TD MP/146-180/9). A methodology paper (dated 2 February 2023) was submitted to EPD for agreement on the air quality requirements under the EIA Study Brief. The meeting with EPD was carried out on 8 March 2023.</p>	N/A

	<p>predicted by EMFAC-HK v4.3 model and vehicle flows were provided by the traffic consultant. Yearly lowest temperature and relative humidity from the nearest weather station with both temperature and relative humidity measurement, i.e., Hong Kong Wetland Park, in Year 2022 was obtained from the Hong Kong Observatory (HKO) for EMFAC modelling.</p> <ul style="list-style-type: none"> <li>• Pollutants are assumed to eject from the portal as a portal jet such that 2/3 of the total emissions were dispersed within the first 50 m of the portal and 1/3 of the total emissions within the second 50 m.</li> <li>• The mixing height was capped between 131 m and 1941 m according to the observation in Year 2015 by HKO. The height of the input data was assumed to be 9 m above ground for the first layer of the WRF data as input. In order to avoid any missing hours misidentified by AERMOD and its associated components, the WRF met data was handled manually to set wind direction between 0° – 0.1° to be 360°. The meteorological data was inputted as on-site data into AERMET.</li> <li>• Surface characteristic parameters such as albedo, Bowen ratio and surface roughness are required in the AERMET (the meteorological pre-processor of AERMOD). The land use characteristics of the surrounding were classified, and these parameters of each land use were determined by AERMET by default according to its land use characteristics. The determination of the surface characteristics parameters is presented in Appendix 3.6. Flat terrain in AERMOD was adopted for this assessment as a conservative approach.</li> <li>• The locations and detailed calculations of portal emissions are presented in Figure 3.6, Figure 3.6a, Figure 3.6b and Appendix 3.7.</li> </ul> <p><u>Industrial Emissions and 4km Major Point Source</u></p> <ul style="list-style-type: none"> <li>• Based on desktop survey and site survey dated on 25 November 2022 and 1 December 2022, the following industrial emissions sources consisted of 4 chimneys and 3 concrete batching plant were identified. The asphalt plant identified within 4km near Lam Tei Quarry (AP-2) was obstructed by terrain and had no direct line-of-sight to the air sensitive receivers. Therefore, the contribution from this major emission point to the cumulative air quality impact was considered insignificant and excluded from this assessment. According to the information provided by CEDD in March 2023, the area occupied by the concrete batching plants at Golik Concrete Ltd. and Redland Concrete Ltd. would be resumed in Year 2025. Therefore, these two concrete batching plants were excluded from operation phase air quality impact assessment. The locations of industrial emission sources are shown in Figure 3.6.</li> <li>• Letters were issued on 31 January 2023 to the respective chimney operator to obtain the latest emission information and parameters of each chimney and the latest specified process license of the concrete batching plant was obtained. Of the 4 chimney operators, 2 of them responded and the information has been used for compiling the emission inventory for industrial emissions. Site survey was conducted on 25 November 2022 and 1 December 2022 on the chimneys and were found to be valid. The emission inventory for industrial emissions is presented in Appendix 3.8.</li> </ul> <p><u>Emissions associated with the existing bus and minibus termini, heavy goods vehicle and coach parking sites</u></p> <ul style="list-style-type: none"> <li>• Error! Reference source not found. shows road sections within the assessment area which were classified as district distributor, expressway, or trunk road according to the Annual Traffic Census 2022 published by Transport Department.</li> <li>• For the purpose of this assessment, start emissions generated from private cars, taxi, light goods vehicles, private light buses, heavy goods vehicles, non-franchised bus (NFB) (&lt;6.4t), and motorcycles were assumed on all local roads irrelevant to the actual location of engine start. (i.e., using broad-brush approach, allocating the start emissions on open local roads, using CALINE4). Based on site survey on 22 March 2023 and 24 March 2023, on-street parking of public light bus (PLB), non-franchised bus (NFB) (6.4t – 15t), NFB (15t – 24t), NFB (&gt;24t), franchised bus single deck (FBSD), and franchised bus double deck (FBDD) was not observed on all local roads within 500m study area. Therefore, start emissions generated by PLB, NFB (6.4t – 15t), NFB (15t – 24t), NFB (&gt;24t), FBSD, and FBDD were excluded from start emission modelled by broad-brush approach. Nevertheless, start emissions induced by bus and minibus termini, heavy goods vehicle and coach parking sites were modelled to avoid underestimation of air quality impact. The start emissions, running exhaust emissions, and idling emissions associated with franchised buses, public light buses, heavy goods vehicles, and non-franchised buses (&gt;6.4t) at the existing termini and parking sites within the study area (NO<sub>2</sub>, RSP, and FSP) were calculated based on the start emission and running exhaust emission factors predicted by EMFAC-HK v4.3 model, cold idling emission factors from the Calculation of Start Emissions in Air Quality Impact Assessment published by EPD, warm idling emission factors from Road Tunnels: Vehicle Emissions and Air Demand for Ventilation published by World Road Association, and traffic data obtained by site survey.</li> <li>• Calculations of emissions associated with the bus and minibus termini, heavy goods vehicle and coach parking sites were referenced to the Calculation of Start Emissions in Air Quality Impact Assessment published by EPD. Start emissions for diesel vehicles fitted with selective catalytic reduction (SCR) devices vehicles and LPG</li> </ul>				
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	<p>vehicles were adjusted based on the idling emission and were released over a total spread distance of 700 m and 150m respectively from where the start takes place, while running exhaust and idling emissions were released on the spot. According to the latest The area occupied by the bus depot at 71 Shan Ha Road and the HGV carpark near 95 Tong Yan San Tsuen Road will be resumed by Yuen Long South Second Phase Development, which the site formation and engineering infrastructure works will tentatively commence in Year 2025. Therefore, this bus depot and HGV carpark were excluded from interim phase and operation phase air quality impact assessment. The HGV carpark at Tai Tao Tsuen was found to be abandoned during site survey on 17 March 2023. Hence, this HGV carpark was not considered in interim phase and operation phase air quality impact assessment. The HGV carpark at Shan Ha Road will be resumed under "Potential Housing Sites for Yuen Long Area 13 &amp; 14" Project, which the site formation and engineering infrastructure works will tentatively begin in Year 2029. Start emissions from this HGV carpark were excluded from interim phase and operation phase air quality impact assessment. The locations of these bus and minibus termini, heavy goods vehicle and coach parking sites with consideration of start emissions by precise approach are listed below and shown in <b>Figure 3.8</b>.</p> <ul style="list-style-type: none"> <li>The number of starts per hour of the concerned vehicle class were derived from on-site observation and operator's published schedule, if applicable, on a normal day for 24 hours and the sitting time and idling time were obtained based on on-site observation at the PTIs, parking sites, and bus depots. The emission inventory is presented in <b>Appendix 3.9</b>.</li> </ul> <p><u>Ozone Limiting Method for Short-term Cumulative NO<sub>2</sub> Assessment</u></p> <ul style="list-style-type: none"> <li>For industrial emissions, the initial NO<sub>2</sub>/NO<sub>x</sub> ratios were assumed as 10% according to the <i>Heathrow Airport EIA Report</i>. The predicted initial NO concentrations from open roads (from CALINE4), portals, bus and minibus termini, heavy goods vehicle and coach parking sites, and 90% of the predicted NO<sub>x</sub> concentrations from industrial emissions (from AERMOD) was firstly added together on an hour-to-hour basis and OLM was applied subsequently.</li> </ul> <p><u>Jenkin Method for Long-term Cumulative NO<sub>2</sub> Assessment</u></p> <ul style="list-style-type: none"> <li>For the long-term cumulative NO<sub>2</sub> assessment (i.e., predictions of annual average NO<sub>2</sub> concentration), Jenkin method was adopted for the conversion of cumulative NO<sub>x</sub> to NO<sub>2</sub> by using the functional form of annual mean of NO<sub>2</sub>-to-NO<sub>x</sub> with reference to the Review of Methods for NO to NO<sub>2</sub> Conversion in plumes at short ranges. The mentioned functional form is referenced from (Jenkin, 2004). The above functional form was used to analyse the annual mean data obtained from EPD's air quality monitoring stations including Yuen Long general station, Tap Mun general station, and three roadside stations (i.e., Causeway Bay, Central and Mong Kok roadside stations).</li> <li>The Yuen Long general station is the nearest station and therefore chosen as the representative station. Tap Mun general station and three roadside stations were also included in order to cover a wider range of NO<sub>x</sub> concentration.</li> <li>A scatter plot for latest 5 years annual means of NO<sub>2</sub> versus NO<sub>x</sub> obtained from relevant air quality monitoring stations was created to obtain a best-fit function form curve. The functional form curve would fit the annual mean data when [OX] = 102 µg/m<sup>3</sup> and J/k = 22 µg/m<sup>3</sup>. The value of [OX] and J/k are considered reasonable as they are within typical value range for Hong Kong. The range of annual average [OX] from the selected air quality monitoring stations is 75 – 116 µg/m<sup>3</sup>. The empirical functional form curve was adopted for the cumulative annual average NO<sub>x</sub> to NO<sub>2</sub> conversion. The data analysis and derivation of cumulative annual average NO<sub>x</sub> to NO<sub>2</sub> conversion equation using Jenkin Method for this assessment are shown in <b>Appendix 3.10</b>.</li> </ul> <p><u>Cumulative Air Quality Impact</u></p> <p>With reference to the EPD's Guidelines on Choice of Models and Model Parameters, PATH v2.1 output of RSP and FSP concentrations require the following adjustment:</p> <ul style="list-style-type: none"> <li>10<sup>th</sup> highest daily RSP concentration: add 11.0 µg/m<sup>3</sup></li> <li>Annual RSP concentration: add 10.3 µg/m<sup>3</sup></li> <li>19<sup>th</sup> highest daily FSP concentration: Nil</li> <li>Annual FSP concentration: add 3.5 µg/m<sup>3</sup></li> </ul>				
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<b>Noise Impact</b>					
<p>The noise impact assessment for the project follows Annex 5 and Annex 13 of the EIAO-TM, Noise Control Ordinance (NCO), TM on Environmental Impact Assessment Process (EIAO-TM), TM on Noise from Construction Work other than Percussive Piling (GW-TM), TM on Noise from Construction Work in Designated Areas (DA-TM) and TM on Noise from Percussive Piling (PP-TM).</p>	<p>Road traffic noise was presented in terms of noise levels exceeded for 10% of the one-hour period having the peak traffic flow (i.e., L10, 1-hour, dB(A)). A 2.5 dB(A) façade reflection and correction factors for effects due to gradient, distance, view angle, road surface, and barriers were included in the assessment.</p> <p>Based on the latest Project programme, the Project is expected to be in operation in Year 2033. The assessment year for road traffic noise was taken as Year 2048 which is the maximum traffic projection within 15 years after full operation of the proposed roadwork. The peak traffic flow for “with Project” scenario in Year 2048 and prevailing scenario in Year 2028 are presented in <b>Appendix 4.3</b>. The traffic forecast for this Study was prepared by Traffic Consultants, strictly following the methodology endorsed by the Transport Department. The endorsement letter is presented in <b>Appendix 4.3</b>.</p> <p>Road traffic noise in the following four scenarios was evaluated:</p> <ul style="list-style-type: none"> <li>• Unmitigated scenario in Year 2048;</li> <li>• Mitigated scenario in Year 2048; and</li> <li>• Prevailing scenario in Year 2028 for indirect mitigated measures eligibility assessment;</li> </ul> <p>Under the scope of this Project, road sections were classified as the following categories for the purpose of the road traffic noise assessment:</p> <ul style="list-style-type: none"> <li>• “Project” roads which in the context of this report describe all roads that are completely new or are substantially altered by the proposed project. In this Project, the sections of the Yuen Long Highway to be widened and the slip road from Hung Tin Road (south bound) to Yuen Long Highway (east bound) were identified as new roads. All road sections defined in the scope of designated project stipulated in the EIAO are considered as “Project Roads”.</li> <li>• “Existing” Roads which are unchanged or without significant traffic noise impact (i.e., the traffic noise level with the road project would be less than that without the road project at the design year by 1.0 dB(A).</li> </ul> <p>Road sections included in the assessment and the extent of Project roads are presented in Figure 4.5. Agreement on the road sections has been obtained from EPD in accordance with Appendix C, Clause 3.2.2(a) of the EIA Study Brief. The characteristics of the road network such as road width, surface type and traffic flow and the use of LNRS, the existing and committed noise mitigation measures was considered in the assessment. Noise mitigation measures proposed from the environmental assessments of the potential concurrent projects was considered during the assessment for this Project. The locations of existing and committed noise mitigation measures (including noise barriers and enclosures) are presented in <b>Figure 4.6</b>.</p> <p>In accordance with HyD Guidance Notes on Road Surface Requirements for Expressways and High Speed Road (RD/GN/032A), highly modified friction course (HMFC) is proposed as the standard surfacing material on the road sections with design speed of 80km/h or above without traffic lights and classified as trunk road/high speed road. HMFC would therefore be provided on the Project Road with the design speed of 80km/h or above. The extent of road section with HMFC is presented in <b>Figure 4.7</b>.</p> <p>Direct mitigation measures would be proposed for Project roads if adverse environmental impact is predicted. If the NSRs are affected by noise from existing roads, direct mitigation measures are required to reduce the noise from the Project roads to a level that it:</p> <ul style="list-style-type: none"> <li>• is not higher than the noise standard; and</li> <li>• has no significant contribution (less than 1.0 dB(A)) to the cumulative noise level, if the overall noise level (i.e., noise from the new roads together with other existing roads) exceeds the noise standard.</li> </ul> <p>If any façades of NSRs were still exposed to predicted noise levels exceeding the relevant noise criteria after the implementation of all direct mitigation measures, provision of indirect technical remedies in the form of window</p>	<p>There would be some limitations of methodology such as the accuracy of the predictive base data for future (e.g. traffic flow forecast). Besides, traffic noise levels are predicted based on free flow condition. Traffic congestion and hence reduced traffic speed are not taken into account in the noise model. Quantitative uncertainties in the assessment of impacts should be considered when drawing conclusions from the assessment.</p>	-	<p>The working paper (dated 27 February 2023) was submitted to EPD for agreement on noise impact assessment under the EIA Study Brief. Final working paper was issued on 5 May 2023.</p>	N/A

	<p>insulation and air conditioning should be considered under the EIAO-TM. The eligibility for indirect technical remedies would be tested against the following three criteria:</p> <ul style="list-style-type: none"> <li>• the predicted overall noise level, L10 (1-hour), from the Project Roads, together with other traffic noise in the vicinity must be above a respective noise level (for example, 70 dB(A) for domestic premises and 65 dB(A) for educational institutions.);</li> <li>• the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level; and</li> <li>• the contribution to the increase in the predicted overall noise level from the Project Roads must be at least 1.0 dB(A).</li> </ul> <p>Referring to the environmental permit (EP) of Deep Bay Link (EP-163/2003/H) and the EP of Widening of Yuen Long Highway between Tan Kwai Tsuen and Shap Pat Heung Interchange (EP-141/2002/A), the existing noise mitigation measures covered in the two EPs will need to be removed for the purpose of this Project. In general, the future Contractor of this Project is not allowed to remove any existing noise barriers until either permanent noise barriers or temporary noise barriers with the same geometry as the one to be demolished are erected and connected to the other existing noise barriers seamlessly.</p>				
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<b>Water Quality Impact</b>					
<p>The water quality impact assessment followed: Annexes 6 and 14 of the EIAO-TM. The assessment of construction phase and operation phase water quality impact from the Project has followed the criteria for evaluating water quality impacts include Annexes 6 and 14 of the "Technical Memorandum on Environmental Impact Assessment Process" (EIAO -TM), ETWB Technical Circular (Works) No. 5/2005 Protection of Natural Streams/Rivers from Adverse Impacts Arising from Construction Works, Hong Kong Planning Standards and Guidelines (HKPSG), Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS), Water Pollution Control Ordinance (WPCO) (Cap.358), Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 1/94); and Practice Note for Professional Persons on Drainage Plans (ProPECC PN5/93).</p> <p>Water quality impact assessment was carried out for Deep Bay WCZ and North Western WCZ. and all areas within 500m from the Widening of Yuen Long Highway (section between Lam Tei and Tong Yan San Tsuen) boundary.</p> <p>Key water sensitive receivers that may potentially be affected by the Widening of Yuen Long Highway (section between Lam Tei and Tong Yan San Tsuen) were identified. These included reservoirs, inactive and abandoned fishponds and watercourses etc.</p>	-	The study has based largely on the current preliminary design and construction method for the Widening of Yuen Long Highway (section between Lam Tei and Tong Yan San Tsuen).	-	The working paper (dated 1 February 2023) was submitted to EPD for agreement on water quality impact assessment under the EIA Study Brief. Final working paper was issued on 3 April 2023.	N/A
<b>Construction Phase</b>					
<p>All identified sources of potential water quality impacts in were then evaluated and their impact significance was determined. The need for mitigation measures to reduce any identified adverse impacts in water quality to acceptable levels was determined.</p>	<p>There are wide variety of water sensitive receivers (WSRs) including fishponds, watercourse and reservoirs which may run close/ pass the work areas. Construction works around these areas may cause water quality impact as a result of site runoff and uncontrolled discharge of wastewater from construction works. The watercourse which closes to the project site shall be temporarily isolated, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props, to prevent adverse impacts on the stream water qualities. Other proper control measures specified under ETWB TC(Works) No. 5/2005 shall be implemented to control potential impact to nearby water sensitive receivers. Detailed measures are provided in Section 5.8 to control potential impact to natural streams or rivers nearby.</p> <p>All vehicles and plants should be cleaned before they leave a construction site to ensure no earth, mud, debris and the like is deposited by them and carrying them on the roads. A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains. Other proper control measures specified under ProPECC PN1/94 shall be implemented to control potential impact occurred.</p>	-	-	-	N/A

	Detailed measures are provided in Section 5.8 to control the disposal of construction site discharges.				
<b>Operation Phase</b>					
Sources of potential water quality impacts in operation phase were identified and their impact significance was determined. The need for mitigation measures to reduce any identified adverse impacts in water quality to acceptable levels was determined.	Potential water quality impact may also arise from surface runoff discharge during operational phase. The surface runoff may contain small amount of suspended solids that may cause water quality impacts to the nearby receiving waters. However, surface runoff from the Yuen Long Highway including the at-grade section and viaduct sections would be collected by the integrated road drainage system with gully pots to collect silt and discharged to the nearby proper drainage system to receive surface runoff to the drainage system, It is anticipated that with proper implementation of best management practices as recommended in Section 5 of ProPECC PN 5/93, no adverse water quality impact from non-point source surface runoff is expected.	-	-	-	N/A

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<b>Waste Management Implication</b>					
<p>The waste management assessment followed Annex 7 and Annex 15 of the EIAO-TM. The methodology for assessing the potential waste management impacts during construction and operation of the Project will include the Estimation of types, quantity, quality and timing of the wastes generated, which will be the estimates in the Preliminary Design stage and will be subject to further review during the Reference Design and Construction stages, Assessment of potential impacts from the management of the waste with respect to potential hazards, air and odour emissions, noise, wastewater discharge and public transport, Evaluation of the opportunities for reducing waste generation, Identification of disposal options for each type of waste; and Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.</p>	<p>The site clearance and demolition works of existing temporary structures, site formation and excavation Works, and superstructure works are expected the generation of waste from the project. The types of waste generated in the Yuen Long Highway Widening project and their respective sources during the construction phase are anticipated to include C&amp;D materials, chemical waste and general waste.</p> <p><u>C&amp;D Materials</u> Vegetation waste will be generated from site clearance. Excavated materials and materials from site preparation and demolition works of existing temporary structures and noise barriers along Yuen Long Highway, including inert C&amp;D materials and non-inert C&amp;D materials will be generated.</p> <p><u>Chemical Waste</u> Chemical waste will be generated from construction plant operation and maintenance, and maintenance of mechanical equipment, including oil and grease, scrap batteries, used paint and cleaners etc.</p> <p>It is difficult to quantify the amount of chemical waste as it will be highly dependent on the Contractor's on-site maintenance practice and the quantities of plant and vehicles utilized. Nevertheless, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance will be small and in the order of few hundred litres per month.</p> <p>Chemical waste should be collected by a licensed collector and to be disposed of at a licensed chemical waste treatment and disposal facility (CWTC). Wherever possible, opportunities for the reuse and recycling of materials will be taken. Mitigation measures for chemical wastes are detailed in <b>Section 6.10</b>. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.</p> <p><u>General Refuse</u> The number of work force (clerical and workers) to be employed for the Project is not available at this stage but is anticipated not to be over 200 staff. Based on the generation rate of 0.65kg/person/day, the total refuse generated per day would be less than 130kg/day.</p> <p>A summary of estimated amount of C&amp;D materials to be generated by different construction activities and their estimated yearly amount are summarised in <b>Table 6.1</b> and <b>6.2</b>.</p>	-		<p>The working paper (dated 8 February 2023) was submitted to EPD for agreement on waste management implications assessment under the EIA Study Brief. Final working paper was issued on 3 March 2023.</p>	N/A



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			EIA Study Brief Clause Reference	Relevant Documentation	
<b>Land Contamination</b>					
<p>The assessment methodology comprised of undertaking a desktop study to review current and historical land uses (from aerial photos, site records and previous studies), acquisition of information related to potential land contamination from relevant Government Departments and conducting site surveys to identify existing land uses.</p>	<p>The desktop study has identified the potential contaminated areas (refer Figure 4.1, 4.1a and 4.1b of CAP) within the Project area. As the majority of the sites within the Assessment Area are still in operation, site access for appraisal is limited. Sampling should be carried out in these sites once access is available. As detailed in the CAP in Appendix D, 10 potentially contaminated sites were identified. Based on the latest information, site C1 to C7 are currently under work area of CEDD contract no. YL/2022/01. The environmental sampling of these sites will be conducted by relevant contractors under YL/2022/01. Sites C8 and C9 are currently under Yuen Long South Stage 2B works areas. Similar to C1 to C7, the environmental sampling of these areas will be conducted by the relevant contractors under Yuen Long South Stage 2B. Hence, a total of 8 boreholes have been recommended at Site C10 for SI under this Project. It should be noted, however, that the CAP has determined the approach for SI based on the best available current information and thus the actual sampling and testing strategies could be subject to change after a detailed site walkover is undertaken.</p> <p>Further site appraisal will be carried out by Project Proponent (PP)'s appointed consultants once site access is available (e.g. after land resumption), in order to identify the presence of "potential contaminant" for intrusive site investigation and confirm the evaluation of the contaminated site in initial land contamination assessment.</p> <p>The PP's consultants should prepare a supplementary CAP to summarise the relevant findings of the further site appraisal at Site C10. The supplementary CAP for Site C1 to C7 and C8 to C9 will be prepared by the relevant contractors under YL/2022/01 and Yuen Long South Stage 2B respectively. After approval of the supplementary CAP and upon completion of the SI works, if any, the PP should prepare a CAR to present findings of the SI works. If contamination has been identified, a RAP should be prepared to formulate appropriate remedial measures to deal with the contamination identified. Following completion of any necessary remediation works, a RR should be prepared to demonstrate adequate clean-up and submit to EPD for approval prior to the commencement of any development works at the contaminated sites.</p> <p>Other than above area, the land contamination potential of the Project area is considered as low because the area has no previous indication of industrial activities and site inspection has identified no major land contaminative uses within the area.</p>	<p>The assessment is based on desktop studies, which is limited by the presence and availability of records/reports, while the site survey is limited by the visibility of potentially contaminative land uses.</p> <p>The Contamination Assessment Plan (CAP) is based on EPD's Guidance Note for Contaminated Land Assessment and Remediation, and the Practice Guide for Investigation and Remediation of Contaminated Land.</p>	-	<p>In accordance with Section 3.1 of Annex 19 of the EIAO-TM, the CAP (letter dated 13 February 2023, Ref.: EP1/K20/WKR-OT/185 Pt.2) and subsequently the Land Contamination section of the EIA report was submitted to EPD (letter dated 20 March 2023, Ref.: EP1/K20/WKR-OT/185 Pt.2), and has no adverse comment on the CAP.</p>	N/A

Assessment Methodology	Key Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities		Proposed Alternative Assessment Tools / Assumptions (if applicable)
			EIA Study Brief Clause Reference	Relevant Documentation	
<b>Ecological Impact</b>					
<p>The ecological surveys shall be carried out in accordance with the requirements set out in the EIA study brief (No.: ESB-356/2022), in particular, Appendix G, issued to the Highways Department on 14 July 2022.</p> <p>The ecological surveys also address the requirements in establishing the ecological baseline profile and follow the requirements of the pertinent of Annexes 8 and 16 of the Technical Memorandum as well as Environmental Impact Assessment Ordinance Guidance Note No. 7/2010 "Ecological Baseline Survey for Ecological Assessment" and No. 10/2010 "Methodologies for Terrestrial and Freshwater Ecological Baseline Survey."</p> <p>The Ecological Impact Assessment Methodology comprised the Literature Review, Ecological Surveys, Habitat and Vegetation Survey, Mammal Survey, Avifauna Survey, Egret Survey, Herpetofauna Survey, Butterfly and Odonate Survey and Aquatic Assemblages Survey.</p> <p>The Study Area for impact assessment of ecology covers all the areas within 500m from the Project site boundary and the areas likely to be affected by the Project. The study was firstly conducted by a literature review and supplemented by on site ecological baseline surveys where it is found necessary. A literature review was performed to investigate the existing condition within the Study Area and identify habitats or species with conservation concern. However, previous literature for this area is limited, therefore ecological Baseline Surveys (Habitat, vegetation and fauna surveys) were carried out within the ecological Study area.</p>	<p><u>Potential bird collision during Operation Phase</u> There will be re-provision of noise barriers along the road that may cause bird collision if not mitigated. However, it is anticipated that the number of birds passing through is low due to the highly disturbed nature, as recorded in the current study. The potential impact is anticipated to be minor. Mitigation such as adopting bird friendly design, such as using falcon sticker, tinted materials should be considered to further reduce the potential impact.</p>	-	-	<p>The working paper (dated 13 January 2023) was submitted to EPD and AFCD for agreement on ecological survey under the EIA Study Brief. AFCD has no further comments on the working paper on 16 February 2023.</p>	N/A

Assessment Methodology	Key Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities		Proposed Alternative Assessment Tools / Assumptions (if applicable)
			EIA Study Brief Clause Reference	Relevant Documentation	
<b>Landscape and Visual Impact</b>					
<p>The landscape and visual impact assessment (LVIA) shall be carried out in accordance with the requirements set out in the EIA study brief (No.: ESB-356/2022), in particular Appendix H, issued to the Highways Department on 14 July 2022.</p> <p>The Landscape Impact Assessment Methodology comprised the Review of Planning and Development Control Framework, Identification and Examination of Landscape Resources and Landscape Character Areas (LCAs), Broad-brush Tree Survey, Assessment of Sensitivity of LRs/ LCAs, Identification of Sources and Magnitude of Potential Landscape Impacts, Recommendation of Landscape Mitigation Measures, and Significance of Residual Landscape Impacts.</p> <p>The Visual Impact Assessment Methodology comprised the Identification and Examination of Visual Envelope (VE) and Visually Sensitive Receivers (VSRs), Assessment of Sensitivity of VSRs, Identification of Sources and Magnitude of Potential Visual Impacts, Identification of Potential Visual Mitigation and Enhancement Measures, Significance of Residual Visual Impact and Overall Result of Landscape and Visual Impact Assessment.</p>	<p><u>Magnitude of Change of Landscape Quality without Mitigation</u></p> <p>Except for the two TPIs at LR6 mentioned above, all the remaining TPIs and OVT identified within the 500m Assessment Area are away from the Project site and will not be affected.</p> <p>The mostly impacted LCAs are LCA1 Yuen Long Miscellaneous Rural Fringe (~4.54ha) and LCA2 Yuen Long Miscellaneous Urban Fringe (~16.34ha). However, the extent of impacts are considered to result in small changes in these LCAs in the overall the Assessment Area. Very minor fringe areas of LCA3 Kung Um Shan Settled Valley Landscape (~0.23ha) and LCA4 Kung Um Shan Upland Hillside Landscape (~0.04ha) will be impacted by the Project.</p> <p>During the construction phase, the Project is anticipated to result in a Medium level of landscape change in LR4, LR6 and LCA2.</p> <p>Upon completion of the Project, potential landscape changes to most of the affected LRs and LCAs will become smaller, except for LR6 Roadside Vegetation which is expected to suffer a Medium level of landscape changes from removal of trees/ vegetation if no mitigation measures are to be implemented.</p> <p><u>Magnitude of Change of Visual Quality without Mitigation</u></p> <p>The Project is considered to result in a Medium level of visual changes to R05, R06, L01 and F01.</p> <p><u>Significance of Landscape Impacts without Mitigation</u></p> <p>The Project will result in loss of approximately 1013 nos. of trees under unmitigated scenario (the exact number of trees requiring tree transplantation or removal will be determined upon completion of the detailed tree survey and will be presented in the Tree Survey Report and Tree Preservation and Removal Proposal to be prepared at a later stage of the Project).</p> <p>During the construction phase without mitigation, the Project is considered to result in Moderately Adverse impacts to LR6 Roadside Vegetation and LCA2 Yuen Long Miscellaneous Urban Fringe, mainly due to loss of vegetation/ trees. LR1 Village Settlement, LR3 Brownfield Operation, LR4 Vehicular Road and LCA1 Yuen Long Miscellaneous Rural Fringe are expected to experience Slightly Adverse impacts during the construction phase without mitigation.</p>	-	-	<p>The working paper (dated 2 March 2023) was submitted to EPD, PlanD and HyD/Landscape Division for agreement on Landscape and visual impact assessment under the EIA Study Brief. The viewpoints for generating photomontages were verbally agreed with Planning Department prior to commencement of the LVIA.</p>	N/A

	<p>During project operation, only LR6 Roadside Vegetation will be Moderately Adversely impacted from loss of trees/ vegetation without mitigation.</p> <p><u>Significance of Visual Impacts without Mitigation</u></p> <p>During the construction phase and operation phase without mitigation, the Project is considered to result in Moderately Adverse impacts to R05, R06, L01 and F01 who are located within or very close to the Project site.</p>				
<b>Cultural Heritage Impact</b>					
<p>The Cultural Heritage Impact Assessment (CHIA) is in accordance with Appendix I of the EIA Study Brief No. ESB-356/2022 and presents the results of an assessment of potential impacts on cultural heritage resources such as terrestrial archaeological resources and historic buildings in the proposed Project as a result of construction and operational activities.</p> <p>The relevant legislations, standards and guidelines applicable to present study for the assessment of cultural heritage impact include Antiquities and Monuments Ordinance (A&amp;MO) (Cap.53), Environmental Impact Assessment Ordinance (EIAO) (Cap.499), Annex 10 of the EIAO-TM, Criteria for Evaluating Visual and Landscape Impact, and Impact on Sites of Cultural Heritage, Annex 19 of the EIAO-TM, Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts, Guidance Notes on Assessment of Impact on Sites of Cultural Heritage in Environmental Impact Assessment Studies (GN-CH); and Hong Kong Planning Standards and Guidelines (HKPSG), Proposed Grading and Graded Historic Building Classification and Guidelines for Cultural Heritage Impact Assessment issued by the Antiquities and Monuments Office (GCHIA).</p> <p>The key stages for CHIA include the Baseline study (including a desk-top study and, subject to the result of the desk-top study, a field survey), Evaluate impact; and Recommend mitigation measures.</p>	<p><u>Built Heritage</u></p> <p>There are 4 non-graded historic buildings located within 300m assessment area but outside the Project boundary. Wo Yuen, Tai Tao Tsuen is located at 15m from Project boundary, potential direct impacts due to damages through contacting with heavy construction machineries would be anticipated. Indirect impacts including ground-borne vibration would be anticipated during construction of insignificance.</p> <p>A total of 185 graves were recorded during the built heritage survey. The distribution of clan and individual graves is shown in <b>Figure 10.2 - 10.5</b>.</p>	-	-	The working paper (dated 28 April 2023) was submitted to EPD and AMO for agreement on cultural heritage impact assessment under the EIA Study Brief.	N/A