

4. NOISE IMPACT

4.1 Introduction

4.1.1 This section presents the potential noise impact associated with the construction and operation of the Project. Use of powered mechanical equipment (PME) would generate noise during the construction phase. During the operation phase, the new elevated roads of the Project and adjoining road networks would induce traffic noise impacts on the adjacent noise sensitive receivers.

4.2 Environmental Legislation, Standards and Guidelines

Construction Noise during non-Restricted Hours

4.2.1 The Noise Control Ordinance (NCO) (Cap. 400) provides the statutory framework for noise control in Hong Kong. Assessment procedures and standards are set out in the respective Technical Memoranda (TM) promulgated under the NCO. The following TMs are applicable to the assessment and control of construction noise.

- TM on Noise from Construction Work other than Percussive Piling (TM-GW);
- TM on Noise from Percussive Piling (TM-PP); and
- TM on Noise on Construction Work in Designated Areas (TM-DA)

4.2.2 Both the percussive piling and construction work under restricted hours are required a construction noise permit (CNP) in order to carry out such work. Percussive piling would not be required based on the construction method for the Project. The issuance of a CNP by the Noise Control Authority would depend on the compliance of relevant limits set out within the TM-PP and TM-GW/TM-DA.

4.2.3 For daytime construction activities, the “*Technical Memorandum on Environmental Impact Assessment Process*” (TM-EIAO) stipulates noise standards as shown Table 4.1.

Table 4.1 Construction Noise Standards During Non-Restricted Hours

Uses	Noise Standards ^[1] , $L_{eq}(30 \text{ mins})$ dB(A)	
	0700 to 1900 hours on any day not being a Sunday or general holiday	1900 to 0700 hours or any time on Sundays or general holiday
All domestic premises including temporary housing accommodation	75	(See Note 2)
Hotels and hostels	75	
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)	

Notes:

- [1] The above standards apply to uses that rely on opened windows for ventilation.
- [2] The criteria laid down in the relevant technical memoranda under the NCO for designated areas and construction works other than percussive piling may be used for planning purpose. A Construction Noise Permit (CNP) shall be required for the carrying out construction work during the period.

Construction Noise during Restricted Hours

- 4.2.4 The NCO provides statutory control on general construction works (excluding percussive pilling) conducted during restricted hours (ie 1900 to 0700 hours (of the next day) from Monday to Saturday and at any time on Sundays or public holidays). A Construction Noise Permit (CNP) is required for carrying out of any general construction activities involving the use of any Powered Mechanical Equipment (PME) within restricted hours from the Authority under the NCO. The noise criteria and the assessment procedures for issuing a CNP are specified in the GW-TM under the NCO.
- 4.2.5 The use of Specified PME (SPME) and/or the undertaking of Prescribed Construction Work (PCW) within a Designated Area (DA) under the NCO during the restricted hours are controlled by the TM-DA. The relevant technical details in Technical Memorandum on Noise from Construction Work in Designated Areas (TM-DA) under NCO can be referred. The acceptable noise levels for construction during the restricted hours are summarized in Table 4.2 below.

Table 4.2 Construction Noise Standards During Restricted Hours

Uses	Acceptable Noise Level for Area Sensitive Ratings, dB(A)		
	A	B	C
All weekdays during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day and evening (0700 to 2300 hours)	60(45)	65(50)	70(55)
All days during the night-time (2300 to 0700 hours)	45(30)	50(35)	55(40)

Note: Figures in brackets are ANLs for SPME construction work in designated areas

- 4.2.6 The Area Sensitive Rating depends on the type of area and the degree of impact that Influencing Factors (IFs) have on the NSRs and is determined from Table 4.3 below. Industrial area, major road or the area within the boundary of Hong Kong International Airport shall be considered to be an IF.

Table 4.3 Area Sensitivity Ratings (ASRs)

Type of Area containing NSR	Degree to which NSR is affected by IF		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

- 4.2.7 For carrying out of any general construction activity involving the use of any Powered Mechanical Equipment (PME) within restricted hours, a Construction Noise Permit (CNP) is required from the authority under the NCO. The noise criteria and the

assessment procedures for issuing the CNP are specified in the GW-TM under the NCO. According to the construction programme, the proposed construction works would be carried out during non-restricted hours. It is the Contractor's responsibility to ensure compliance with the NCO and the relevant TMs in case of any construction activities during restricted hours. There is no guarantee that a CNP will be issued for the project construction. The Noise Control Authority will consider a well justified CNP application, once filed, for construction work within restricted hours as guided by the relevant TMs issued under the NCO.

Traffic Noise

4.2.8 EIAO-TM Annex 5 "*Criteria for Evaluating Noise Impact*" defines the noise criteria for road traffic noise in term of L_{10} (1-hour) at various NSRs:

- 70 dB(A) for all domestic premises including temporary housing accommodation, hotels and hostels, offices
- 65 dB(A) for educational institutions including kindergartens, nurseries and all others where unaided voice communication is required, and places of public worship and courts of law
- 55 dB(A) for hospital, clinics, convalescences and homes for the aged, diagnostic rooms, wards

Notes:

- [1] The above standards apply to uses that rely on opened windows for ventilation.
- [2] The above standards should be viewed as the maximum permissible noise levels assessed at 1m from the external facade

4.3 Description of Environment

4.3.1 The existing land uses in the vicinity of the Project are mainly residential, recreational and governmental uses. There are also a number of open spaces. Existing Lin Cheung Road, Jordan Road, Canton Road and Austin Road West are the major traffic noise sources nearby.

4.4 Project Road Sections Identification

4.4.1 This section aims to identify road sections of the Project within the meaning of Item A.1 of Schedule 2 of the EIAO "*A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing roads*" for the purpose of traffic noise impact assessment.

4.4.2 As mentioned in Section 1.2 of the EIA Study Brief, the Project comprises the following works:

- (i) Scheme H – Widening of the elevated Nga Cheung Road and provision of a new slip road from Hoi Po Road to West Kowloon Highway northbound
- (ii) Scheme I – Provision of a new link road from elevated Nga Cheung Road to Western Harbour Crossing
- (iii) Scheme J – Provision of a new link road from West Kowloon Highway southbound to Nga Cheung Road
- (iv) Scheme Q – Interim road improvement works along Canton Road

(v) Improvement Works at the junction of Canton Road/Ferry Street/Jordan Road

4.4.3 Based on the information provided by the Project traffic consultant, the road type of each proposed works are provided in **Table 4.4**.

Table 4.4 Road Types of the Project Roads

Project Scheme	Road	Road Type
Scheme H (Part A)	New slip road from Hoi Po Road to West Kowloon Highway northbound	Primary Distributor Road
Scheme H (Part B)	Elevated Nga Cheung Road	Primary Distributor Road
Scheme I	New link road from elevated Nga Cheung Road to Western Harbour Crossing	Primary Distributor Road
Scheme J	New link road from West Kowloon Highway southbound to Nga Cheung Road	Primary Distributor Road
Scheme Q and Improvement Works at the junction of CR/FS/JR	Canton Road	Primary Distributor Road

4.4.4 The roads of Scheme H(Part A), H(Part B), I and J are classified as “New Roads” under this Project. The proposed new slip road from Hoi Po Road to West Kowloon Highway northbound (Scheme H Part A), the new link road from elevated Nga Cheung Road to Western Harbour Crossing (Scheme I), and a new link road from West Kowloon Highway southbound to Nga Cheung Road (Scheme J) are classified as Primary Distributor Road and are considered within the ambits of Item A.1 of Schedule 2 of the EIAO. The whole section of new link roads and slip road are considered as “New Road” for the purpose of this noise assessment.

4.4.5 The Scheme H (Part B) of widening of the elevated Nga Cheung Road (north bound) aims to increase a single link of the road from existing 2 lanes to 3 lanes. This is considered as major improvements to the existing road. As Nga Cheung Road is classified as a Primary Distributor Road, the Scheme H (Part B) of widening a section of the Nga Cheung Road North Bound via a separated viaduct structure is considered within the meaning of Item A.1 of Schedule 2 of the EIAO and the whole widened section of Nga Cheung Road (north bound) is classified as “New Road” for the noise assessment.

4.4.6 The main proposal of road improvement works along Canton Road (Scheme Q) are widening of western footpaths and junctions improvement of Canton Road/Wui Cheung Road and Canton Road/Austin Road. The widening of footpaths as well as junctions improvement would not change the nature of road, the traffic capacity or traffic composition of Canton Road. A short road section in close proximity to the Canton Road/Austin Road junction would increase a lane from existing 7 lanes to 8 lanes, the potential increasing in traffic noise level due to the improvement work shall be assessed. Since the Canton Road is an existing Primary Distributor Road, the Scheme Q for the interim road improvement works along Canton Road is not considered within the ambits of Item A.1 of Schedule 2 of the EIAO if the increase in traffic noise level due to the improvement proposal is insignificant.

4.4.7 The Improvement Works at the junction of existing Canton Road/Ferry Street/Jordan Road would not change the nature of the road, the alignment or the traffic capacity or

traffic composition and hence the improvement works is not considered within the ambits of Item A.1 of Schedule 2 of the EIAO if the increase in traffic noise level due to the improvement proposal is insignificant. The traffic noise impact would be considered significant if the traffic noise level with the road project would be greater than that without the road project at the design year by 1.0 dB(A) or more in according to EIAO Guidance Note “Road Traffic Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 12/2010].

4.4.8 For Scheme Q and the improvement works at the junction of Canton Road/Ferry Street/Jordan Road, a sensitivity test has been conducted in Appendix 4.4A to determine whether the proposed improvement works would result in significant noise impact to the nearby NSRs, thereby constitute to a material change to the exempt road projects from noise front. Referring to the latest EIA for WKCD (EIA reference: EIA-215/2013), the proposed underpass within WKCD development will be connected to the Austin Road West in interim scheme before permanently connected to the Canton Road upon relocation of the existing TST Fire Station. The sensitivity test has been assessed under both the interim and permanent schemes for WKCD underpass for with and without Project scenarios.

4.4.9 Referring to the modelling results, even without Scheme Q and the improvement works at the Junction of Canton Road/Ferry Street/Jordan Road, the traffic noise impact at the nearby NSRs would still exceed the relevant traffic noise criteria for both schemes for WKCD underpass. The increase in traffic noise level at all NSRs due to Scheme Q and improvement works at the junction CR/FS/JR are considered insignificant since the noise level difference between the with Project and without Project scenario at the design year (i.e. Year 2030) are in range of -0.4dB(A) to 0.4 dB(A), which is smaller than 1.0 dB(A). The Scheme Q and improvement works at the junction CR/FS/JR will not constitute any material change on the noise front to exempted projects. Hence, it is not required to consider noise mitigation measures in the context of Scheme Q and improvement works at the junction CR/FS/JR under the EIAO.

4.4.10 **Figure 4.1** shows the Project works boundary, the extent of road sections within the ambits of Item A.1 of the Schedule 2 of the EIAO and other road sections.

4.5 Noise Sensitive Receivers

4.5.1 In order to evaluate the construction and operation noise impact from the Project, representative NSRs, which rely on opened windows for ventilation, within 300m from the Project works area with significant road improvement works were identified in accordance with Section 3 of Annex 13 of the TM-EIAO. Only the first layer of NSRs was identified for assessment because it would provide acoustic shielding to those receivers at further distances behind.

4.5.2 Those planned NSR which will be occupied after the completion of the Project has been excluded for the construction noise impact assessment. There are three GIC areas under planning: the planned Hindu Temple near To Wah Road, the planned Indoor Recreation Centre and the planned West Kowloon Government Office near Lai Cheung Road. The planning status is obtained from Planning Department and the location of three GIC areas can be found in **Appendix 4.1B**. Reviewing the similar type of buildings, central ventilation are likely to be adopted for the Indoor Recreation Centre and the West Kowloon Government Office. These two planned developments would likely not rely on opened window for ventilation and thus the traffic noise

criteria do not applied. For the Hindu Temple, since there is no confirmed intake programme, it is not included in the construction noise impact assessment while it is included in the traffic noise impact assessment given it is not confirmed whether it would be equipped with central ventilation.

4.5.3 Based on the latest information from West Kowloon Cultural District (WKCD) development, the planned developments closest to the Project are Parcel 36 and Parcel 37. However, they are retail/dining/entertainment area and not rely on opened window for ventilation thus they were not identified for noise impact assessment.

4.5.4 The completion of the construction for the planned topside residential development at Austin Station Site C has been scheduled in January 2015 based on the latest information from Planning Department and that of Site D is not confirmed. The occupation programme for both Site C and Site D is also not confirmed. The construction noise impact on NSR ASC, ASD1 and ASD2 have been assessed of Year 2014 and 2015 for conservative approach.

4.5.5 As confirmed with the Planning Department, the Cullinan I are comprised of service apartments and residential units. As the service apartments are not relying on openable windows for ventilation, only the portion with the residential units is selected for noise assessment.

4.5.6 **Table 4.5** shows the representative NSRs for noise impact assessment. Locations of the representative NSRs with the Traffic Noise Study Area are shown in **Figure 4.2 and 4.3**. The photos of the existing NSRs can be found in **Appendix 4.1A**. The summary of the NSRs can be found in **Table 4.5** below.

Table 4.5 Representative Noise Sensitive Receivers

NSR	Description	Land Use	Status	Ground mPD	Height of First NSR Above Ground Level (m)	No. of Storey	Assessment for Construction Phase / Operational Phase #
FR	Florient Rise - Tower 1	Residential	Existing	4.5	28	38	C, O
IHV	Island Harbourview - Block 10	Residential	Existing	4.9	12	37	C, O
PAV	Park Avenue - Tower 1	Residential	Existing	6.1	25	42	C, O
CG	Charming Garden Phase 2 Block 1	Residential	Existing	5.4	5.5	22	C, O
LKPC	Li Kwok Po College	Educational	Existing	5.5	5.5	8	C, O
YCS	Yau Ma Tei Catholic Primary School (Hoi Wang Road)	Educational	Existing	5.9	5.5	7	C, O
HT	Hindu Temple	Worship	Planned	5.6	5.5	10	O
SRT	Sorrento - Tower 1	Residential	Existing	5.5	39.4	65	C, O
YTB	Yue Tak Building	Residential	Existing	4.3	7.5	14	C
CLS	The Cullinan I	Residential	Existing	5.5	34.5	27	C, O
ASC	Austin Station Site C	Residential	Planned	5.0	9.7	23	C,
GB	Garden Building	Residential	Existing	5.5	5.5	11	C
VT	The Victoria Towers -	Residential	Existing	4.3	42.7	52	C

NSR	Description	Land Use	Status	Ground mPD	Height of First NSR Above Ground Level (m)	No. of Storey	Assessment for Construction Phase / Operational Phase #
	Tower 2						
ASD1	Austin Station Site D	Residential	Planned	5.5	9.7	26	C
ASD2	Austin Station Site D	Residential	Planned	5.5	9.7	30	C
FSDO	Fire Services Department - Kowloon Regional Office	Residential	Existing	4.1	19.9	7	C
LCMS	Lai Chack Middle School	Educational	Existing	3.9	4.1	5	C

C=Construction Phase, O=Operation Phase

4.6 Assessment Methodology

Construction Noise

4.6.1 The construction works are planned to start by the early of Year 2014 for completion by the end of Year 2015. Construction works of the Project are planned to be carried out during non-restricted hours. The assessment methodology of construction noise impact is based on the Technical Memoranda on Noise from Construction Work other than Percussive Piling (TM-GW) which is issued under the NCO and the EIAO-TM. The calculation methodology is estimated with the following standard formula:

$$SPL = SWL - DC + FC$$

where

SPL – Sound Pressure Levels on receiver, in dB(A)

SWL – Sound Power Levels of PMEs, in dB(A)

DC – Distance Correction, in dB(A) by $DC = 20 \cdot \log_{10}(D) + 8$ for D is the slant distance between the NSR and noise source location in meters

FC – Façade Correction of 3 dB(A)

4.6.2 The sound power levels in Table 3 of TM-GW have been used for the assessment. For mitigated scenario, Quality PMEs in EPD website are referenced but the contractor(s) can use the similar type of PME with same or lower SWL. Where no relevant sound power level (SWL) to be found in the TM-GW, reference was made to British Standard 5228:Part 1 Noise Control on Construction and Open Sites (BS5228:Part 1) and previous similar studies or from measurements taken at other sites in Hong Kong. 10 dB(A) reduction would be applied to the NSRs as screening correction if they do not have direct line of sight to the sites.

4.6.3 Plant inventory and construction programme for the Project as presented in **Appendix 4.8a** and **4.8b** respectively for various construction activities was developed by the Project engineering consultants. Appropriate on-time percentage of all items of PME was reasonably assumed as shown in **Appendix 4.8a**. The Project engineering

consultants has confirmed the proposed plant inventories as being practical and adequate for completing the works within the scheduled timeframe.

4.6.4 According to the TM-GW, all PME items required for a particular construction activity would be located at the notional source position where such activity is to be performed. The assessment was based on the cumulative SWL of PME likely to be used for each location, taking into account the construction period in the vicinity of the receiver location. To predict the noise level, PME was divided into groups required for each discrete construction task. The objective was to identify the worst case scenario representing those items of PME within the same work group that would be in use concurrently at any given time. The sound pressure level of each construction task was calculated, depending on the number of plant and distance from receivers. The noise levels at NSRs were then predicted by adding up the SPLs of all concurrent construction tasks. Noise sources from the areas greater than 300m of a given NSR are excluded from the assessment.

4.6.5 Cumulative construction noise impact has been assessed with the concurrent projects within the Study Area as shown in **Table 4.6**. For those concurrent project classified as Designated Project, construction work information are made reference to the corresponding EIA report or the latest Environmental Review Report for the application of Variation of Environmental Permit (VEP). For those other projects, reasonable assumptions have been made for the construction plants and sequence of works based on the construction works nature. Information and programme on the West Kowloon Cultural District is made reference to the latest submitted EIA for the WKCD.

Table 4.6 Concurrent Projects Considered During the Construction Phase

Name of Project	Project Proponent	Anticipated Programme
Express Rail Link ^[1]	MTRCL + HyD	Dec 2009 –Jun 2015
West Kowloon Cultural Development ^[2]	WKCDA	2013 – beyond 2020
Road Works at West Kowloon ^[3]	MTRC	2011 – 2014
Construction of Dry Weather Flow Interceptor at Cherry Street Box Culvert and Other Works ^[4]	DSD	2014 – 2018
Trenchless Cable Duct Crossings at Nga Cheung Road ^[5]	CLP	2013 – 2015
Central Kowloon Route & Widening of Gascoigne Road Flyover ^[6]	HyD	2015 – 2020

[1] – Based on the approved EIA and latest VEP for XRL.

[2] –Based on the latest EIA for WKCD

[3] –Based on the approved EIA for “Road Work at West Kowloon”

[4] –Based on the information provided by project’s proponent

[5] – Based on typical trenchless construction method

[6] - Based on the approved EIA for CKR

Operation Noise

- 4.6.6 Road traffic noise will arise from the “New” roads constructed under this Project, the existing roads and the other planned roads which commence operation before the Year 2030 and these have been considered and assessed in this EIA. ‘New’ Roads are the roads that are completely new or existing road sections that undergo major modifications under the Project and would cause significant traffic noise impact (i.e. road sections within the meaning of Item A.1 of Schedule 2 of EIAO). Road traffic noise levels on the representative NSRs have been assessed based on the peak hour traffic flow within 15 years upon commencement of the Project from end of Year 2015 to Year 2030.
- 4.6.7 The in-house computer programme (HFCNoise model) was used to predict the traffic noise levels arising from the road network. It adopts methodology of the UK Department of Transport’s Calculation of Road Traffic Noise (CRTN) which has been accepted for the assessment of road traffic noise impact in the Annex 13 of the EIA-TM. The road traffic noise levels were presented in terms of noise levels exceeded for 10% of the one-hour period for the hour having the peak traffic flow [$L_{10(1\text{-hour})}$ dB(A)].
- 4.6.8 The extent of LNRS for the existing and other planned roads within the study area can be found in **Figure 4.6**. The information of LNRS is based on the approved EIA of CKR and RWWK. The LNRS, noise barriers/enclosures/landscape deck proposed in CKR and RWWK have been considered in the traffic noise model.
- 4.6.9 Consideration of noise mitigation measures will follow Annex 13 of TM-EIAO and EIAO Guidance Note “Road Traffic Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 12/2010]. Direct mitigation measures would be proposed for ‘New’ roads if there would be an adverse environmental impact. Direct mitigation measures are required to reduce the noise from the ‘New’ roads to a level that it: -
- is not higher than the noise standard; and
 - has no significant contribution to the overall noise from other existing roads, if the cumulative noise level (i.e. noise from the new road together with other existing roads) exceeds the noise standard
- 4.6.10 Eligibility of the affected premises for indirect technical remedies have to be determined if any NSR is still exposed to noise levels exceeding the relevant noise criteria after the implementation of all direct mitigation measures. The eligibility of the affected premises for indirect technical remedies is determined with reference to the following three criteria:
- the predicted overall noise level from the road project together with other traffic noise in the vicinity must be above a specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for education institutions, all in $L_{10}(1\text{hr})$);
 - the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and

- the contribution to the increase in the predicted overall noise level from the road project must be at least 1.0dB(A).

4.6.11 The traffic flow data of Year 2030 (With and Without Project) and Year 2013 (Prevailing) can be found in **Appendix 4.2A and 4.2B**. The endorsement letter from TD can also be found in **Appendix 4.2C**.

4.7 Identification of Environmental Impacts

Construction Noise

4.7.1 The major construction activity of the Project will involve non-percussive piling and construction of piers and decks of the elevated roads. There are several construction projects overlapped with the construction programme of the Project. They are CKR, RWWK, XRL, WKCD, Construction of Dry Weather Flow Interceptor at Cherry Street Box Culvert and Trenchless Cable Duct Crossing at Nga Cheung Road. Construction noise from these projects was also identified as key noise sources to the identified NSRs under this project.

Operation Noise

4.7.2 The proposed roads and existing roads within 300m from the New Road's works boundary of the Project have been included in the assessment as shown in **Figure 4.1**. Planned roads by other projects including Central Kowloon Route (CKR), Road Work at West Kowloon (RWWK) and West Kowloon Cultural District (WKCD) were also included for the assessment since these roads would be in operation well ahead of the assessment year for the traffic noise impact assessment of the Project.

4.7.3 As the roads within WKCD are considered as private roads, no traffic data is provided by the Project traffic consultant. Based on the latest EIA report for WKCD, the traffic data of Year 2032 is obtained as the commencements of the Project and WKCD are different. As this is the peak traffic flow within 15 years from Year 2017 to 2032 for WKCD, it is referenced for the Project with design year 2030 for conservative approach as the traffic flow is predicted to be increased by years. The traffic data of WKCD of Year 2032 can be found in **Appendix 4.2D**.

4.8 Prediction and Evaluation of Environmental Impacts

Construction Noise

4.8.1 The construction of the Project involves site preparation and utility diversion, road earth works, excavation for site formation, cast in-situ concreting for viaduct structures, and road formulation and finishing works. The Unmitigated Powered Mechanical Equipment (PMEs) and its Sound Power Level (SWL), Notional Distance, Detailed Calculation and Summary of the Construction Noise of the Project are provided in **Appendix 4.2A – 4.2E**. The percentage on-time of the plants have been reviewed by engineers and have been concluded to be feasible and practical for the purpose of this EIA. The location of construction sites and notional noise sources of the Project can be found in **Figure 4.4 - 4.5**.

4.8.2 The unmitigated construction noise impacts on the selected NSRs are shown in **Table 4.7**. The unmitigated construction noise levels for most of NSRs exceeds the noise criteria by 1dB(A) to 9 dB(A). The calculation of the unmitigated construction noise levels can be found in **Appendix 4.2E**. Mitigation measures are required to reduce the construction noise impact to acceptable levels.

Table 4.7 Unmitigated Construction Noise Impact, dB(A)

NSR	Nature of Use	Predicted Maximum Noise Level from the Project, dB(A)	Noise Criteria, dB(A)	Exceedance, dB(A)
IHV	Residential	76	75	1
FR	Residential	75	75	-
PAV	Residential	77	75	2
CG	Residential	75	75	-
LKPC	Educational	74	*65/70	*9/4
YCS	Educational	73	*65/70	*8/3
SRT	Residential	81	75	6
CLS	Residential	82	75	7
ASD1	Residential	80	75	5
ASD2	Residential	84	75	9
FSDO	Residential	72	75	-
ASC	Residential	79	75	4
LCMS	Educational	71	*65/70	*6/1
VT	Residential	71	75	-
GB	Residential	74	75	-
YTB	Residential	82	75	7

* Daytime Noise criteria 65dB(A) during examination period
Bolded figures mean exceedance of relevant noise criteria

Operation Noise

- 4.8.3 The traffic noise levels at the NSRs along Canton Road in design year (i.e. Year 2030) for Scheme Q and Improvement work at the Junction of CR/FS/JR have been addressed in **Appendix 4.4A**. As discussed in S.4.4.6 to 4.4.7 and Appendix 4.4A, the Scheme Q and Improvement work at the Junction of CR/FS/JR will not constitute to any material change on the noise front to exempt road projects. Therefore, it is not required to consider noise mitigation measures in the context of Scheme Q and improvement works at the junction of CR/FS/JR under the EIAO.
- 4.8.4 Based on the peak hour traffic flows in 2030 (peak hour traffic flow within 15 years upon commencement of the Project in the end of Year 2015), the unmitigated traffic noise levels after completion of the Project at the representative NSRs were calculated as shown in **Table 4.8**. The traffic flow data of Year 2030 can be found in **Appendix 4.3A**. The summary of the calculation is provided in **Appendix 4.5**. The sample calculation of the traffic noise model is provided in **Appendix 4.6**.

Table 4.8 Unmitigated Road Traffic Noise Level (DP Roads), dB(A)

NSR	Noise Criteria	Predicted Noise Level form All Roads, dB(A)	Predicted Noise Level form Other Roads, dB(A)	Predicted Noise Level form New Roads, dB(A)	Max. Contribution from New Roads, dB(A)	Significant Contribution (>1.0 dB(A)) from New Roads
FR	70	74-77	74-77	42-48	0.1	No
IHV	70	76-77	76-77	48-50	0.1	No
PAV	70	68-78	68-78	44-52	0.1	No
CG	70	77-79	77-79	55-56	0.1	No
LKPC	65	77	77	55-56	0.1	No
YCS	65	74	74	55	0.1	No
HT	65	79-80	79-80	48-57	0.1	No
SRT	70	75-80	75-80	61-66	0.2	No
CLS	70	74-76	74-76	48-49	0.1	No

- 4.8.5 Referring to the modelling results, the predicted noise level at all selected NSRs would exceed the relevant traffic noise criteria. However, the noise exceedances are caused by the existing roads. The noise contribution from the “New Roads” of the Project is predicted to be less than or equal to 0.2 dB(A). Moreover, the predicted noise levels on the NSRs from the source of “New Roads” only are all below the relevant traffic noise criteria. Since the traffic noise contribution from the “New Roads” of the Project is less than 1.0 dB(A), the traffic noise impact arising from the Project is considered insignificant. Hence, direct mitigation measures on the “New Roads” are not required as they would not be effective in improving the noise environment at the sensitive receivers.
- 4.8.6 Although there is no significant impact from the project roads without mitigation measures, the prevailing noise levels of Year 2013 without Project have been assessed for reference purpose. The traffic data for Year 2013 without Project can be found in **Appendix 4.3B** and the calculated traffic noise result can be found in **Appendix 4.5**. The traffic noise assessment results for design year (Year 2030) without Project are also provided in **Appendix 4.5** for reference. The road plots of the traffic noise model can be found in **Appendix 4.7** for reference.
- 4.8.7 For eligibility of the indirect technical remedies, only two out of three criteria as mentioned in S.4.6.10 were satisfied. The predicted noise level exceeds the noise criteria for all NSRs and the predicted overall noise levels are at least 1.0 dB(A) more than the prevailing noise level. However, the contribution to the increase in the predicted overall noise level from the New Roads is less than 1.0 dB(A). Therefore, none of the representative NSRs is considered eligible for indirect technical remedies in the form of acoustics insulation and air conditioning under the EIAO-TM.

4.9 Noise Mitigation Measures

Construction Noise

- 4.9.1 Construction noise impact is expected to be acceptable if mitigation measures are properly implemented as follows:
- (a) Adopt good site practice, such as regular maintenance of plant equipment, throttle down unused machines
 - (b) Regular maintenance of plant equipment to prevent noise emission due to impair
 - (c) Position mobile noisy equipment in location and direction away from NSR
 - (d) Use silencer or muffler on plant equipment and should be properly maintained
 - (e) Throttle down or switch off unused machines or machine in intermittent use between work
 - (f) Make good use other structures for noise screening
 - (g) Use Quality Powered Mechanical Equipment (QPME) which produces lower noise level.

Table 4.9 Example Quality PME for Construction Work

PME	QPME Code	Example	SWL, db(A)
Excavator / Loader, wheeled / tracked	EPD-01431	DOOSAN, DX225LC	103
Asphalt Paver	EPD-01226	Volvo, ABG5770	104
Road Roller	EPD-00244	Dynapac, CP210	99
Crane, mobile (diesel)	EPD-01477	KOBELCO, CKE2500-2	104

- (h) Erect movable noise barrier of 3m height to shed large plant equipment (e.g. concrete pump, concrete lorry mixer, excavator/loader, road sweeper, asphalt paver, road roller and lorry) or hand-held items (e.g. Breaker and Poker) near low-rise NSR, with special design where necessary, e.g. with noise absorbing material or bend top. Its length should be at least five times greater than its height. The minimum surface density of the movable noise barrier is 7 kg/m². It is anticipated that a noise reduction of at least 5dB(A) can be achieved. Alternatively, acoustic shed or acoustic mat can be adopted.
- (i) Carry out regular site inspection to audit the implementation of mitigation measures
- (j) Carry out noise quality monitoring throughout the construction period

4.9.2 With the use of quality PMEs and movable noise barriers, the predicted construction noise levels at all representative NSRs are shown in **Table 4.10** below. The mitigated powered mechanical equipment (PMEs) and its sound power level (SWL), the notional distance, detailed calculation and summary of the construction noise level of the Project are provided in **Appendix 4.8A – 4.8E**. Results indicated that predicted construction noise levels on all NSRs are complied with the recommended noise criteria in EIAO-TM.

Table 4.10 Mitigated Construction Noise Level

NSR	Nature of Use	Maximum Mitigated Noise Level from the Project, dB(A)	Noise Criteria, dB(A)	Exceedance, dB(A)
IHV	Residential	68	75	-
FR	Residential	67	75	-
PAV	Residential	68	75	-
CG	Residential	67	75	-
LKPC	Educational	65	*65/70	-
YCS	Educational	64	*65/70	-
SRT	Residential	73	75	-
CLS	Residential	74	75	-
ASD1	Residential	70	75	-
ASD2	Residential	75	75	-
FSDO	Residential	62	75	-
ASC	Residential	69	75	-
LCMS	Educational	61	*65/70	-
VT	Residential	61	75	-
GB	Residential	64	75	-
YTB	Residential	72	75	-

- Daytime Noise criteria 65dB(A) during examination period

4.9.3 There are total six concurrent projects during the construction period of the projects. The total construction noise levels of the concurrent projects have been calculated. The plant list with sound power level, corresponding notional distance, detailed calculation and summary of the construction noise of the concurrent projects are provided in **Appendix 4.9A – 4.9E**.

4.9.4 The predicted cumulative noise level with concurrent projects can be found in **Appendix 4.9F** and **Table 4.11** below. All the NSRs would comply with the noise criteria for normal period. However, results show exceedance of the construction noise criteria on school during examination period for NSRs YCS and LCMS. The predicted cumulative construction noise levels at all representative NSRs are shown in **Table 4.11** below.

Table 4.11 Mitigated Cumulative Construction Noise Level

NSR	Nature of Use	Maximum Mitigated Noise Level from the Project, dB(A)	Maximum Predicted Noise Level from Concurrent Projects, dB(A)	Maximum Predicted Cumulative Noise Level, dB(A)	Noise Criteria, dB(A)	Maximum Exceedance, dB(A)
IHV	Residential	68	68	71	75	-
FR	Residential	67	64	68	75	-
PAV	Residential	68	66	70	75	-

NSR	Nature of Use	Maximum Mitigated Noise Level from the Project, dB(A)	Maximum Predicted Noise Level from Concurrent Projects, dB(A)	Maximum Predicted Cumulative Noise Level, dB(A)	Noise Criteria, dB(A)	Maximum Exceedance, dB(A)
CG	Residential	67	59	67	75	-
LKPC	Educational	65	59	65	*65/70	-
YCS	Educational	64	66	67	*65/70	#2
SRT	Residential	73	67	74	75	-
CLS	Residential	74	63	74	75	-
ASD1	Residential	70	60	70	75	-
ASD2	Residential	75	62	75	75	-
FSDO	Residential	62	74	74	75	-
ASC	Residential	69	62	70	75	-
LCMS	Educational	61	68	69	*65/70	#4
VT	Residential	61	71	71	75	-
GB	Residential	64	68	69	75	-
YTB	Residential	72	67	73	75	-

* Daytime Noise criteria 65dB(A) during examination period

Exceedance during examination period only

Operation Noise

4.9.5 As discussed in Section 4.8.5, the noise exceedances are caused by the existing roads. The contribution of the traffic noise impact arising from the Project is considered insignificant and the predicted noise levels from the “New Roads” only are all below the relevant traffic noise criteria. Hence, direct mitigation measures on “New Roads” are not required as they would not be effective in improving the noise environment at the sensitive receivers.

4.10 Evaluation of Residual Impacts

Construction Noise

4.10.1 According to the Table 4.10, there is no exceedance of the mitigated construction noise of the Project on the NSRs for both normal and examination period.

4.10.2 According to the Table 4.11, there is exceedance of the cumulative construction noise level on the noise criteria during examination period for NSR YCS and LCMS. After reviewing the examination period of the affected schools, the examination periods were found to be December, March and June for the Lai Chack Middle School (NSR LCMS) and November, end of February to early of March and June for Yau Ma Tei Catholic Primary School (NSR YCS). The cumulative construction noise level for NSR YCS would exceed the examination period noise criteria for two months, in March of 2015 and June of 2015 by 1 and 2 dB(A) respectively. For NSR LCMS, the cumulative construction noise level would exceed noise criteria during the examination period for 4 months, in March, June and December in Year 2014 by 1 to 4 dB(A) and in March of 2015 by 1 dB(A). The duration of the noise exceedance at the affected NSRs can be found in **Table 4.12** below. The construction works should

be carried out at summer holiday as far as possible to avoid construction noise impact caused to the educational institutes in the vicinity.

Table 4.12 Adverse Residual Noise Impacts During Examination Period for Year 2014 and Year 2015

NSR	Period	Impact Duration (Month) for Noise Exceedance			
		1 dB(A)	2 dB(A)	3 dB(A)	4 dB(A)
YCS	Examination	1	1	-	-
LCMS	Examination	2	-	1	1

- 4.10.3 All practical and feasible mitigation measures have been proposed, such as adopting QPME movable noise barriers and temporary noise barriers. Those noisy construction activities, such as breaking works and road re-surfacing works should be scheduled to avoid examination periods of the two NSRs as far as practicable. The Contractor should liaise with the school representatives to obtain the examination schedule so as to avoid noisy construction activities during school examination period.

Operation Noise

- 4.10.4 The predicted noise levels at all NSRs would exceed the relevant traffic noise criteria. However, the traffic noise contribution from the proposed “New Roads” is less than 1.0 dB(A) that the traffic noise impact arising from the Project is considered insignificant. Moreover, the traffic noise emanating from the Project roads would also comply with the relevant standard. No mitigation measure is required.

4.11 Environmental Monitoring and Audit Requirements

Construction Phase

- 4.11.1 Given residual airborne noise impact is predicted during the examination period of the construction phase, regular noise monitoring will be proposed at representative NSRs to ensure that relevant noise standard can be met. The EM&A requirements are detailed in a standalone EM&A Manual.
- 4.11.2 A hotline is proposed to set-up by the contractor(s) to service complaint from the NSRs in the vicinity about the adverse construction noise produced from the Project.

Operation Phase

- 4.11.3 In the operational phase, traffic noise generated in the newly constructed road will not contribute to significant impact on the NSRs. No monitoring or audit is proposed.

4.12 Conclusion

Construction Noise

- 4.12.1 Construction noise will be generated from use of plant equipment. With the implementation of mitigation measures such as adoption of good site practice and use of quieter PMEs and mobile noise barrier, construction noise impact for all the representative noise sensitive receivers are predicted to comply with the daytime acceptable level during normal period. Residual construction noise impacts are predicted at the two schools (YCS & LCMS) during examination period. However, the impacts are considered temporary and reversible. With all the proposed mitigation measures, the adverse residual impact exceeding the construction noise criterion has

been reduced to be minimal. Moreover, regular noise monitoring will be carried out and hotline to service any complaint will be set up.

Operation Noise

- 4.12.2 **In the operational phase, traffic noise exceedance is predicted at all NSRs. However, the noise exceedances are caused by the existing roads. The traffic noise level generated by the newly constructed road will not lead to significant impact (>1.0dB(A)) on the NSRs in accordance to the EIAO GN12/2010. Moreover, the traffic noise level from the Project roads only will not exceed the criteria. Therefore, the contribution of this project to the overall traffic noise level is insignificant and hence no mitigation measure is required.**