

4 NOISE

4.1 Introduction

- 4.1.1 This section presents the potential noise impacts arising from the proposed Project during construction and operational phases. It is expected that construction noise impact will arise from the proposed Project as well as the nearby concurrent projects (i.e. Central Reclamation Phase III (CRIII) and Hong Kong Convention and Exhibition Centre Atrium Link Extension (HKCEC ALE). Cumulative daytime construction noise impacts are assessed in this study. At the time of carrying out this EIA, information on the two potential future railway projects (i.e. Shatin to Central Link (SCL) and North Hong Kong Island Line (NIL)) were not available, therefore the cumulative noise impact arising from these two railway projects has not been assessed in this section. An indicative assessment for construction works undertaken within restricted hours has also been undertaken.
- 4.1.2 During the operational phase, traffic noise impacts are anticipated and traffic noise assessment has therefore been undertaken at the representative noise sensitive receivers within 300m from the boundary of the development area (the Study Area). Assessments for helicopter noise from the proposed permanent helipad, ventilation noise from the proposed East and Central Ventilation Buildings and operation noise from re-provisioned Wan Chai North Public Transport Interchange have been undertaken to evaluate the impacts on the nearby sensitive receivers. A re-provisioned saltwater pumping station near the existing Wanchai East Sewage Screening Plant will also incorporate fixed noise sources but it is located underground and buffered from potential receivers. No significant fixed noise impact from the pumping station is anticipated, a quantitative assessment has not been carried out in this EIA.

4.2 Environmental Legislation, Policies, Plans, Standards and Criteria

General

- 4.2.1 Noise impacts have been assessed in accordance with the criteria and methodology given in the Technical Memoranda (TMs) under the Noise Control Ordinance (NCO), and Annexes 5 and 13 in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).
- 4.2.2 The NCO and EIAO provide the statutory framework for noise control. Assessment procedures and standards are set out in five TMs listed below:
- EIAO-TM
 - TM on Noise from Construction Work other than Percussive Piling (GW-TM)
 - TM on Noise from Percussive Piling (PP-TM)
 - TM on Noise from Construction Work in Designated Areas (DA-TM)
 - TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM)

Construction Noise – General Construction Works

- 4.2.3 The NCO provides the statutory framework for noise control of construction work, other than percussive piling, using powered mechanical equipment (PME) between the hours of 1900 and 0700 hours or at any time on Sundays and general holiday (that is, restricted hours). Noise control on construction activities taking place at other times is subject to the *Criteria for Evaluating Noise Impact* stated in Table 1B of Annex 5 in the EIAO-TM. The noise limit is $L_{eq(30\text{ minutes})}$ 75 dB(A) at the façades of dwellings and 70 dB(A) at the façade of schools (65 dB(A) during examinations).

- 4.2.4 Between 1900 and 0700 hours and all day on Sundays and public holidays, activities involving the use of PME for the purpose of carrying out construction work is prohibited unless a construction noise permit (CNP) has been obtained. A CNP may be granted provided that the Acceptable Noise Level (ANL) for the NSRs can be complied with. ANLs are assigned depending upon the area sensitive rating (ASR). The corresponding basic noise levels (BNLs) for evening and night time periods are given in **Table 4.1**.

Table 4.1 Construction Noise Criteria for Activity other than Percussive Piling

Time Period	Basic Noise Level (BNLs), L_{eq} (30-min) dB(A)		
	ASR A	ASR B	ASR C
Evening (1900 to 2300 hours) ⁽¹⁾	60	65	70
Night (2300 to 0700 hours)	45	50	55

Notes: (1) Includes Sundays and Public Holidays during daytime and evening

- 4.2.5 Despite any description or assessment made in this EIA Report on construction noise aspects, there is no guarantee that a Construction Noise Permit (CNP) will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant Technical Memoranda issued under the Noise Control Ordinance. The Noise Control Authority will take into account contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in this EIA Report shall bind the Noise Control Authority in making his decision. If a CNP is to be issued, the Noise Control Authority shall include in it any condition he thinks fit. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.
- 4.2.6 For the purpose of assessing the feasibility of carrying out construction works during restricted hours, the noise sensitive receivers in the Study Area are assumed to be 'ASR B' in a conservative approach. The construction noise criteria for the sensitive receivers would be 65 dB(A) in the evening and 50 dB(A) at night. The Noise Control Authority would decide the Area Sensitivity Rating at the time of assessment of such an application based on the contemporary situations / conditions. It should be noted that the situations / conditions around the sites may change from time to time. The Area Sensitivity Ratings assumed in this EIA Report are for indicative assessment only. The assessment for construction activities during restricted hours is presented in Section 4.10.
- 4.2.7 Percussive piling is prohibited between 1900 and 0700 hours on any weekday not being a general holiday and at any time on Sunday or general holiday. A CNP is required for the carrying out of percussive piling between 0700 and 1900 hours on any day not being a general holiday. PP-TM sets out the requirements for working and determination of the permitted hours of operations. ANLs for percussive piling for different types of NSRs are shown in **Table 4.2**.

Table 4.2 Acceptable Noise Levels for Percussive Piling

NSR Window Type or Means of Ventilation	ANL, L_{eq} (30-min) dB(A)
NSR (or part of NSR) with no windows or other opening	100
NSR with central air conditioning system	90
NSR with windows or other openings but without central air conditioning system	85

Note: 10 dB(A) shall be subtracted from the ANLs shown above for NSRs which are hospitals, medical clinics, educational institutes, courts of law or other NSRs which are considered by the Authority to be particularly sensitive to noise.

- 4.2.8 In accordance with PP-TM, the permitted hours of operation for carrying out of percussive piling work involving use of diesel, pneumatic and/or steam hammers, subject to the issuance of a CNP, are listed in **Table 4.3**.

Table 4.3 Permitted Hours of Operation for Percussive Piling

Amount by which Corrected Noise Level (CNL) exceeds Acceptable Noise Level (ANL), CNL-ANL	Permitted hours of operation on any day not being a general holiday
-10 dB(A) < CNL-ANL	Nil
CNL-ANL ≤ -10 dB(A)	0700 to 1900

- 4.2.9 Under the TM on Noise from Construction Work in Designated Areas, the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW) within a designated area during restricted hours would require a valid CNP. The SPME includes hand-held breaker, bulldozer, concrete lorry mixer, dump truck and hand-held vibratory poker. The PCW are:

- erecting or dismantling of formwork or scaffolding
- loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material
- hammering

- 4.2.10 In general, it should not be presumed that a CNP would be granted for carrying out PCW within a designated area during the restricted hours. The CNP may be granted for the execution of construction works during restricted hours involving the use of PME and / or SPME if the relevant Acceptable Noise Levels and criteria stipulated in the GW-TM and DA-TM can be met.

- 4.2.11 There are no statutory procedures and criteria under the NCO and EIAO for assessing blasting noise impacts. Blasting in this Project, if required, would be carried out underground. Any such blasting noise, which is transient and short in duration, is not assessed in this EIA. However, the administrative and procedural control of all blasting operations in Hong Kong is vested in the Mines Division of the Civil Engineering and Development Department (CEDD). The Dangerous Goods (General) Regulations, Chapter 295 also stipulates that no person shall carry out blasting unless he possesses a valid mine blasting certificate to be issued by the Mines Division of CEDD. The Superintendent of Mines will review the application on a case-by-case basis before issuing the Mine Blasting Certificate.

Operational Traffic Noise

- 4.2.12 Annex 5 “Criteria for Evaluating Noise Impact” of the EIAO-TM defines the criteria $L_{10(1 \text{ hour})}$ for road traffic noise at various NSRs:

- 70 dB(A) at the façades of dwellings, hotels, offices
- 65 dB(A) at the façades of schools, places of public worship, courts of law, places where unaided voice communication is required
- 55 dB(A) at the façades of hospital

4.2.13 If any façades of NSRs are 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 acoustic insulation and air conditioning should be considered under the EIAO-TM and the ExCo Directive “Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads”. The eligibility for indirect technical remedies will be tested against the following three criteria:

- the predicted overall noise level from the new road, together with other traffic noise in the vicinity must be above a specified noise level (for example, 70 dB(A) for domestic premises and 65 dB(A) for educational institutions, all in $L_{10(1 \text{ hour})}$); and
- the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, that is, the total traffic noise level existing before the works to construct the road commence; and
- the contribution to the increase in the predicted overall noise level from the new road must be at least 1.0 dB(A).

4.2.14 For the purpose of the traffic noise assessment in this Report, the roads within 300m from the proposed project alignment are included in the assessment. All roads are described as one of the following:

- ‘Existing’ Roads are the roads that are unchanged or subject to minor changes by the Project.
- ‘New’ Roads are the roads that are completely new or existing road sections that undergo major modifications that would cause significant traffic noise impact (i.e. road sections within the meaning of Item A.1 of Schedule 2 of EIAO).

4.2.15 The noise contribution from “new” roads should be less than 70 dB(A) at any dwellings (less than 65 dB(A) for educational institutions and places of public worship), so as to satisfy the relevant noise criteria, and there should not be any increase in traffic noise impact. In the case of an NSR where existing noise levels already exceed the relevant criteria, any increase in noise level contributed by the “new” roads should be less than 1.0 dB(A).

4.2.16 In accordance with the Study Brief, the scope of the proposed road alignment(s) has been analyzed to identify appropriate road sections within the meaning of Item A.1 of Schedule 2 of the EIAO and other road sections for the purpose of traffic noise impact assessment. The extent of ‘New’ roads under this Project has been depicted in **Figures 4.1 to 4.6**. The following sub-sections have identified the extent of ‘existing’ roads for the purpose of traffic noise impact assessment.

Modifications to Fenwick Pier Street and Convention Avenue (Figure 4.2)

4.2.17 Except the open arena of HKAPA, the NSRs in the close vicinity of these modified road sections would be equipped with central air-conditioning system. Besides, the traffic flow on these road sections with the Project would be less than that without the Project in year 2031. The traffic noise impact due to such modification works would not be considered significant, and hence these road sections would not be regarded as the ‘New’ roads under EIAO. Projected traffic data with and without the Project in year 2031 has been presented in **Appendix 4.1**.

Modifications to Convention Avenue, Expo Drive and Expo Drive East (Figure 4.3)

- 4.2.18 Although the traffic flow on Expo Drive and Expo Drive East with the Project would be more than that without the Project in year 2031, the NSRs in the close vicinity of these two road sections are equipped with central air-conditioning system, and hence no significant noise impact would be expected. For Convention Avenue, the traffic flow with the Project would be less than that without the Project in year 2031, and the road alignment would be shifted northward away from the NSRs. The modification work to Convention Avenue would not cause significant road traffic noise impact on the nearest affected NSR (i.e. Causeway Centre). As a result, these three modified road sections would not be regarded as the 'New' roads under EIAO.

Modifications to Hung Hing Road (Figure 4.4)

- 4.2.19 Traffic flow on Hung Hing Road with the Project would be less than that without the Project in year 2031, and it would basically follow the existing road alignment. The traffic noise impact on the nearby NSRs due to such modification works would not be considered significant, and hence this road section would not be regarded as the 'New' road under EIAO.

Modifications to Hing Fat Street and Victoria Park Road Westbound (Figure 4.5)

- 4.2.20 Traffic flow on Hing Fat Street with the Project would be less than that without the Project in year 2031, and it would basically follow the existing road alignment. The traffic noise impact on the nearby NSRs due to such improvement works would not be considered significant.
- 4.2.21 At-grade road junction improvement will be carried out for Victoria Park Road westbound from the connection of Slip Road 8 at west to the Hing Fat Street in order to facilitate the traffic moving smoothly through the area. As part of junction improvement, a signalized junction will be introduced at Victoria Park Road westbound before entering the Slip Road 8 to reduce the risk of weaving movement for the traffic from Tsing Fung Street Flyover and Hing Fat Street northbound. The Hing Fat Street southbound right turn to Victoria Park Road will be banned. Nevertheless, as existing road alignments are basically maintained, Hing Fat Street and Victoria Park Road westbound would not be regarded as the 'New' roads under EIAO.

Modifications to Eastbound of IEC near Provident Centre and the Eastbound Slip Roads before approaching Victoria Centre (Figure 4.6)

- 4.2.22 Only some marginal widening and re-surfacing at the eastbound of IEC near Provident Centre will be carried out. There would be no demolition and reconstruction of the existing bridge deck at this section of IEC but only road widening and connection to the existing structure. Traffic flow on this section of IEC with the Project (i.e. 6,535 veh/hour) would only be 0.17% more than that without the Project (i.e. 6,524 veh/hour) in year 2031, and the source line will be shifted away from the NSRs if the Project is in place. The change in traffic noise level due to such marginal widening and re-surfacing work would not be significant, therefore these road sections would not be regarded as the "New" roads under EIAO. Besides, only re-surfacing at the eastbound slip roads before approaching Victoria Centre will be carried out, this section of eastbound slip road would not be regarded as the "New" road.

Fixed Noise

- 4.2.23 Fixed noise source such as ventilation noise is controlled by the NCO and IND-TM. The appropriate Acceptable Noise Levels (ANL) generated by fixed plant at neighbouring NSRs are provided in the IND-TM. The representative NSRs in the vicinity of ventilation buildings are located in urban area and are near busy roads such as Gloucester Road and Island Eastern Corridor with an average daily traffic flow in excess of 30,000. Most of the NSRs would be directly or indirectly affected by traffic noise. In this connection, the Area Sensitivity Rating (ASR) for these NSRs has been assumed as 'C'. However, some NSRs face north with Gloucester Road at the back of the receivers, the ASR for these NSRs has been assumed as 'B'. The ANLs for an ASR of 'B' and 'C' under the IND-TM are shown in **Table 4.4**. Since the EIAO-TM recommends that noise standard for fixed noise source is 5 dB(A) below the appropriate ANL, the noise criteria of 60/65 dB(A) (daytime and evening) and 50/55 dB(A) (night-time) has been adopted for assessment.

Table 4.4 Acceptable Noise Level for Fixed Plant Noise

Time Period	NCO criteria		EIAO-TM	
	L _{eq} (30-min) dB(A)		L _{eq} (30-min) dB(A)	
	ASR 'B'	ASR 'C'	ASR 'B'	ASR 'C'
Daytime and Evening (0700-2300 hours)	65	70	60	65
Night-time (2300-0700 hours)	55	60	50	55

- 4.2.24 In any event, the Area Sensitivity Rating assumed in this EIA Report is for indicative assessment. It should be noted that the fixed noise sources are controlled under section 13 of the NCO. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions/situations of adjoining land uses. Nothing in this EIA Report shall bind the Noise Control Authority in the context of law enforcement against all the fixed noise sources being assessed.

Helicopter Noise

- 4.2.25 According to Table 1A of Annex 5 "Criteria for Evaluating Noise Impact" in the EIAO-TM, the noise criteria for helicopter noise is 90 dB(A) L_{max} for offices and 85 dB(A) L_{max} for domestic premises, hotels, hostels, educational institutes, hospitals and places of worship during 0700 to 1900 hours. The standards apply to uses that rely on openable windows for ventilation.
- 4.2.26 The helicopter noise is controlled under the Civil Aviation (Aircraft Noise) Ordinance, for which, Civil Aviation Department is the control authority.

4.3 Description of the Environment

- 4.3.1 The existing land uses in Wan Chai, Causeway Bay and North Point near the proposed development are commercial, residential and recreational uses.
- 4.3.2 The prevailing traffic noise levels at representative NSRs have been predicted based on the traffic forecast in year 2008. The projected traffic data for year 2008 has been presented in **Appendix 4.2**. As shown in **Appendix 4.3**, the overall noise levels at representative NSRs would range from 56 to 87 dB(A). The dominant existing noise source comes from the road traffic on busy Gloucester Road, Victoria Park Road and Island Eastern Corridor.

4.3.3 Since the works programme of WDII & CWB project will overlap with the CRIII and HKCEC ALE projects in some periods, cumulative construction noise impacts would be expected at some noise sensitive receivers.

4.4 Sensitive Receivers

4.4.1 In order to evaluate the construction and operational noise impacts from the Project alignments, representative existing and planned noise sensitive receivers (NSRs) within 300m from the boundary of the Project (Study Area) are identified for assessment. Only the first layer of NSRs has been identified for assessment because it would provide acoustic shielding to those receivers at further distance behind. As the centrally air-conditioned buildings do not rely on opened windows for ventilation, the noise standard as stipulated in Table 1 of EIAO-TM would not be applicable, and hence these buildings have not been identified for noise impact assessment. **Table 4.5** shows the representative NSRs for this noise impact assessment. In the absence of the programme of planned/committed noise sensitive developments, construction noise impact assessment would only focus on existing NSRs. The representative NSRs selected for assessments of construction noise, road traffic noise, fixed noise and helicopter noise have been shown in **Figure 4.7**. The photographs of the representative NSRs are shown in **Appendix 4.4**. These representative assessment points for quantitative noise assessment have been agreed with the Environmental Protection Department (see **Appendix 15.1**).

Table 4.5 Representative Existing and Planned Noise Sensitive Receivers

NSR	Section	Location	Use	Ground elevation (mPD)	No. of Floors
N1	Wanchai	HKAPA (Open Arena)	Performing Arts Centre	5.0	G/F
N2	Wanchai	Causeway Centre	Residential	4.0	42
N3	Wanchai	Gloucester Road 169-170	Residential	3.7	12
N4	Wanchai	Kam Kwok Building	Residential	3.7	18
N5	Wanchai	Hyde Centre	Residential	3.7	22
N6	Causeway Bay	Elizabeth House	Residential	3.7	21
N7	Causeway Bay	Riviera Mansion	Residential	4.3	15
N8	Causeway Bay	Marco Polo Mansion	Residential	4.3	15
N9	Tin Hau	Viking Garden	Residential	4.0	25
N10	Tin Hau	Victoria Court	Residential	4.0	18
N11	Tin Hau	Mayson Garden	Residential	4.0	24
N12	Tin Hau	Gordon House	Residential	4.0	15
N13	Tin Hau	Belle House	Residential	3.6	24
N14	Tin Hau	Hoi Tao Building	Residential	4.0	30
N15	Tin Hau	Staff Quarters of FEHD	Residential	4.0	4
N16	Tin Hau	Victoria Centre	Residential	4.0	30
N17	Tin Hau	Harbour Heights	Residential	4.3	44
N17-A	Tin Hau	Harbour Heights	Residential	4.3	44
N18	North Point	City Garden, Block 10	Residential	4.0	27
N18-A	North Point	City Garden, Block 11	Residential	4.0	27
N18-B	North Point	City Garden, Block 10	Residential	4.0	27
N19	North Point	City Garden, Block 7	Residential	4.0	27
N19-A	North Point	City Garden, Block 7	Residential	4.0	27
N20	North Point	Hong Kong Baptist Church Henrietta Secondary School	Educational Institution	4.0	6

NSR	Section	Location	Use	Ground elevation (mPD)	No. of Floors
N21	North Point	Provident Centre, Block 1	Residential	4.0	25
N22	North Point	Provident Centre, Block 6	Residential	4.0	25
N23	North Point	Provident Centre, Block 17	Residential	4.0	25
P1-A	Tin Hau	Planned location for Re-provisioned Tin Hau Temple (West Facing Façade)	Temple	3.6	1
P1-B	Tin Hau	Planned location for Re-provisioned Tin Hau Temple (South Facing Façade)	Temple	3.6	1
P2	North Point	A land zoned as "CDA(1)" near Oil Street	CDA(1)	4.0	53 *
P3	North Point	A land zoned as CDA near Oil Street	CDA	4.5	34 *

Note: * The assumed number of floors was based on information provided by Planning Department on the maximum building heights of 165 mPD for CDA(1) site and 100 mPD for CDA site (within 60m of the northwest boundary).

- 4.4.2 According to the relevant draft Outline Zoning Plans for the Project, the land uses of most future developments are commercial, recreational facilities, temple and open spaces. Recreational facilities and open spaces are not defined as NSRs in accordance with Annex 13 of the EIAO-TM. According to the normal practices adopted for similar land uses in Hong Kong (e.g. existing HKAPA, Visitor Centre of Hong Kong Wetland Park), the commercial buildings, HKAPA Extension and the Harbour Education Centre would be provided with central air-conditioning system and they do not rely on openable window for ventilation. Thus, no adverse noise impact upon these premises would be expected and, therefore they are not selected for traffic noise impact assessment. One future NSR, a re-provisioned Tin Hau Temple (NSR P1) that is located near Hing Fat Street, has been identified.
- 4.4.3 Based on the North Point Outline Zoning Plan No. S/H8/21, the areas in between Harbour Heights and City Garden have been zoned as Comprehensive Development Area (1) and Comprehensive Development Area. "Flat" use has been added to Column 2 of the Notes of the "CDA(1)" zone to allow flexibility for residential use. For the land zoned as CDA, according to the revised Planning Brief for the site, residential use should be set back from the Island Eastern Corridor (IEC) for 50m with non-noise sensitive uses to screen the residential use. Based on information on the maximum building height requirements provided by Planning Department, a notional point (NSR P2) representing a 53-storey residential building at CDA(1) site has been assumed on the demarcation line as indicated on the OZP, while a notional point (NSR P3) representing a 34-storey residential building at CDA site has been assumed at 50m setback from the IEC.
- 4.4.4 The staff quarters of FEHD Depot (i.e. NSR 15) and re-provisioned Tin Hau Temple (i.e. NSR P1) are the nearest existing and planned NSRs to the louvers of proposed East Ventilation Building with a buffer distance of about 115m and 250m, respectively. Existing receivers in the vicinity of the central ventilation building such as the Hong Kong Academy for Performing Arts (HKAPA) and the Arts Centre are provided with central air conditioning and do not rely on the openable window for ventilation, and their indoor noise environment would not be affected. As a result, NSR 15 and NSR P1 have been selected for the noise assessment of East Ventilation Building. For the purpose of land use planning, the minimum buffer distances between the NSR and the proposed East and Central Ventilation Buildings would also be identified.

4.4.5 To evaluate the noise from the proposed permanent helipad and re-provisioned PTI, Causeway Centre (i.e. NSR N2) which is closest to the helipad and PTI has been identified as representative NSR for noise assessments.

4.5 Assessment Methodology

Construction Noise During Unrestricted Hours

4.5.1 The Project is scheduled to be commenced in early 2009 and to be completed in 2016. According to the construction programme, there are eight major construction tasks (as shown in **Appendix 2.5**). Some individual tasks have different stages. **Table 4.6** summarises the different tasks and phasing. All construction tasks are planned to be carried out during unrestricted hours. **Figure 3.4** shows the locations of work sites.

Table 4.6 Summary of Construction Tasks and Stages

Item	Tasks and Stages	Construction Period	Main Construction Elements
1 Causeway Bay Reclamation			
1.1	Temporary Relocation Causeway Bay Typhoon Shelter(CBTS)	January 2009 to February 2016	Temporary Breakwater Relocation Mooring to Temporary CBTS Relocation Mooring back to CBTS
1.2	CBTS Temporary Reclamation Stage 1	August 2009 to May 2012	Dredging, temp seawalls and filling (TCBR1) CWB Tunnel (TCBR1) CWB Tunnel (Cross Harbour Tunnel)(CHT)
1.3	CBTS Temporary Reclamation Stage 2	November 2009 to May 2012	Dredging, temp seawalls and filling (TCBR2) CWB Tunnel (TCBR2)
1.4	CBTS Temporary Reclamation Stage 3	January 2011 to April 2014	Dredging, temp seawalls and filling (TCBR3) CWB Tunnel (TCBR3)
1.5	CBTS Temporary Reclamation Stage 4	May 2012 to November 2015	Dredging, temp seawalls and filling (TCBR4) CWB Tunnel (TCBR4)
1.6	Temp Diversion of Cooling Water System	October 2010 to January 2016	
1.7	Promenade along CBTS	November 2015 to March 2016	
1.9	Slip Road & Victoria Park Reprovisioning	August 2013 to March 2015	Victoria Park Road Traffic Division Slip Road 8 & Tunnel Transplant Trees in Victoria Park At-grade Road, Landscaped deck Reinstate Landscape work in VP
2 Ex-PCWA Temporary Reclamation			
2.1	Temporary Reclamation PCWA Stage 1	February 2009 to May 2012	Dredging, Filing and Seawall (PCWAE) CWB Tunnel (PCWAE)
2.2	Temporary Reclamation PCWA Stage 2	March 2012 to May 2015	Dredging, Filing and Seawall (PCWAW) CWB Tunnel (PCWAW)

Item	Tasks and Stages	Construction Period	Main Construction Elements
3 Wan Chai Reclamation			
3.1	Wan Chai Reclamation Stage 1	January 2009 to February 2011	Dredging, Seawalls and Filling Drainage Culverts Cooling Water System CWB Tunnel(WCR1)
3.2	Wan Chai Reclamation Stage 2	January 2011 to May 2013	Dredging, Seawalls and Filling CWB Tunnel Promenade
3.3	Wan Chai Reclamation Stage 3	April 2011 to March 2015	Dredging, Seawalls and Filling CWB Tunnel Promenade
3.4	Wan Chai Reclamation Stage 4	October 2012 to March 2015	Dredging, Seawalls and Filling Drainage Culverts CWB Tunnel Promenade
3.6	Ferry Pier Re-provisioning	February 2009 to May 2011	Temporary Ferry Piers New Ferry Piers
3.7	Helipad Re-provisioning	January 2009 to June 2010	Re-provisioning at HKCEC
3.8	Sewage Outfall	October 2009 to April 2011	Marine Section – Submarine Pipelines Land Section – New Pipeline
3.9	WSD's Salt Water Pumping Station	February 2009 to October 2010	Construct New Pumping Station
3.10	Roads	October 2014 to September 2015	Road P2
4 HKCEC Reclamation			
4.1	HKCEC Reclamation Stage 1 (Water Channel)	January 2009 to April 2016	Dredging, Seawalls and Filling Cooling Water Systems CWB Tunnel
4.2	HKCEC Reclamation Stage 2	January 2009 to March 2014	Dredging, Seawalls and Filling Drainage Culverts CWB Tunnel
4.3	MTR Tunnel Crossing	October 2010 to February 2012	Piling for Tunnel Units and Deck Tunnel and Deck Construction
4.4	HKCEC Reclamation Stage 3	March 2011 to October 2013	Dredging, Seawalls and Filling Drainage Culverts CWB Tunnel
4.5	Roads	March 2014 to November 2015	Road P2
5 Cross Harbour Watermains			
5.1	Submarine Pipeline	January 2009 to September 2010	Lay New Submarine Pipeline
5.2	Lands Sections	September 2009 to May 2010	Lay Land Pipelines HKCEC

Item	Tasks and Stages	Construction Period	Main Construction Elements
6.0 North Point Reclamation			
6.1	North Point Reclamation Stage 1	January 2009 to October 2010	Dredging, Seawalls and Filling CWB Tunnel (NPR1)
6.2	North Point Reclamation Stage 2	April 2009 to November 2012	Dredging, Seawalls and Filling (NPR2E, NPR2W) CWB Tunnel (NPR2W)
6.3	Promenade	August 2016 to December 2016	Promenade (NP) Final
7.0 Construction of Island Eastern Corridor Link (IECL)			
7.2	IEC Connection Work	October 2010 to May 2016	IEC East Bound (E/B) (HFS to Mainline) IEC E/B Traffic Diversion Reconstruction IEC West Bound(W/B) IEC W/B Traffic Diversion Mainline Connection to IEC
7.3	East Portal and IEC Connection	May 2015 to August 2016	Portal Construction Traffic Diversion IEC E/B
10 Tunnel Building and Installation			
November 2011 to May 2016			
10.1	East Ventilation Building	November 2012 to September 2013	Superstructure of the Building E&M Work
10.2	Administration Building	February 2015 to November 2015	Substructure of the Building Superstructure of the Building E&M Work
10.3	Central Ventilation Building	January 2014 to January 2015	Substructure of the Building Superstructure of the Building E&M Work

- 4.5.2 The maximised use of public fill is proposed in the reclamation and the construction noise assessment is based on this construction programme and associated plant use. In considering the alternative greater use of sand fill, the public fill scenarios will require more noise generating plant use over longer periods of time and, in overall terms, the assessment that has been undertaken can therefore be considered to represent the worst case reclamation method.
- 4.5.3 The construction noise assessment has been carried out on a monthly basis from the commencement of the Project. The construction tasks of the Project taking place concurrently within 300 m of a given NSR are considered to contribute to the cumulative impact at that NSR. Noise sources from the areas greater than this distance have been excluded from the assessment.
- 4.5.4 In accordance with the EIAO, the methodology outlined in the GW-TM has been used for the assessment of construction noise (excluding percussive piling). Sound Power Levels (SWLs) of the equipment were taken from Table 3 of this TM. Where no SWL was supplied in the GW-TM, reference was made to BS 5228, previous similar studies or from measurements taken at other sites in Hong Kong. Schedule of powered mechanical equipment (PME) for the different construction tasks during normal daytime working hours is presented in **Appendix 4.5**.

- 4.5.5 In view of the anticipated adverse noise impact at the NSRs in the vicinity of Causeway Bay and North Point reclamation areas due to the limited buffer distance, appropriate on-time percentage for some items of PME, including poker vibrator, crane, excavator and tug boat, dump truck and backhoe were reasonably assumed as presented in **Appendix 4.5**. Besides, instead of percussive piling, bored piling would be deployed in order to minimise the construction noise impact. The Civil Engineering and Development Department (CEDD) and the Highways Department (HyD) have confirmed that it is practicable and feasible in the context of the construction programme (see **Appendix 15.1**).
- 4.5.6 During demolition of the IEC, as the existing elevated IEC superstructures are made of precast U-beams, the practical demolition method is to break the two ends at the piers, separate the U-beams and lift the U-beams by crane. Conventional construction method with mechanical breakers such as excavator mounted breakers etc. has been adopted for the construction noise assessment. While alternative construction method such as saw cutting may be used in localised areas for cutting the slabs to separate the U-beams for removal by lifting one by one, excavator mounted breakers with sound-proof hammer bracket or hydraulic breaker will be used in any case to break the pier head for the connection with the reconstructed IEC. Alternative demolition plant such as hydraulic crushers have been considered, however, hydraulic concrete crusher has limited jaw opening width which is suitable for demolition of walls in buildings or parapets along the bridge deck in this case but not U-beams for highway structures. The use of saw cutting and hydraulic concrete crusher will be used locally for specific demolition works wherever applicable to minimise the construction noise impact. However, from a practical engineering viewpoint, conventional construction method with excavator mounted breakers with sound-proof hammer bracket or hydraulic breaker, which have to be deployed in any case for the IEC demolition work, has been adopted for construction noise assessment for a prediction of reasonable worst case scenario.
- 4.5.7 It was assumed that all PME items required for a particular construction activity would be located at the notional or probable source position of the segment where such activity is to be performed. The assessment is 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 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 SWLs of all concurrent construction tasks.
- 4.5.8 A positive 3 dB(A) façade correction was added to the predicted noise levels in order to account for the façade effect at each NSR. The boundary walls around HKAPA Open Arena are assumed as noise barriers and a 5 dB(A) reduction of the predicted noise levels at receiver N1 is expected due to the shielding effect.
- 4.5.9 The CRIII project has already commenced and is scheduled to be completed in September 2012. Besides, the Hong Kong Convention and Exhibition Centre, Atrium Link Extension (HKCEC ALE) project is scheduled to commence in May 2006 and to be completed in March 2009, according to the *EIA Report for HKCEC ALE* (March 2006). Therefore, some construction tasks of the CRIII and HKCEC ALE projects will be carried out within the same construction period of the Project. The following construction activities of these projects will overlap with the Project:

CRIII Project

- CWB under CRIII main contract (December 2008 – March 2012)
- Drainage Culverts (October 2008 – September 2012)
- Roadworks (October 2008 – September 2012)

HKCEC ALE Project

- Remove marine piles for working platform (October 2008 – November 2008)
- Demolish temporary footbridge (December 2008 – February 2009)
- Remove marine piles for temporary footbridge (January 2009 – March 2009)

4.5.10 The PME for CRIII project with mitigation measures, as shown in **Appendix 4.6**, were made with reference to the *EIA Report for CRIII*. Besides, in accordance with the *EIA Report for HKCEC ALE*, the maximum SWL of the construction activities throughout the construction period would be estimated to be about 127 dB(A). The noise data from these two studies was adopted to calculate the cumulative construction noise impact in this EIA study.

Construction Noise During Restricted Hours

4.5.11 The construction programme for the Project takes into account the likelihood that the contractor will, if permitted, undertake dredging and seawall construction works over a 16-hour working day (0700 to 2300 hours) at the area of PCWA, Wan Chai Reclamation and HKCEC Reclamation. This is in order to maintain his required work rates to meet the tight programme with some allowance for plant downtime, variability in fill supply rates, etc. The longer working hours will also ensure that allowance can be made to cater for possible changes in dredging and filling rates due to deterioration of water quality. Land-based construction activities, on the other hand, will generally be carried out over a 10-hour working day (0800 to 1800 hours). However, where necessary, for example to minimise traffic impacts due to road diversion works, diversion of salt water intake back to existing system in WSD's salt water pumping station and construction of drainage culverts in the existing built up hinterland, construction works during restricted hours may be required.

4.5.12 The following key activities may require construction noise permits for night work.

Marine-based construction activities:

- (i) dredging of reclamation areas and seawalls
- (ii) seawall trench filling
- (iii) seawall construction
- (iv) filling behind seawalls

Land-based plant activities:

- (i) construction of new drainage culverts in the hinterland urban area
- (ii) diversion of existing cooling water mains through the hinterland area
- (iii) diversion of salt water intake and pumping mains along existing roads
- (iv) construction of upgraded sewerage pipelines along existing roads
- (v) construction of new water mains along existing roads
- (vi) connections for water, sewage and cooling water mains
- (vii) traffic diversion works for new road construction

- 4.5.13 According to GW-TM, for any construction works planned during the restricted hours, the Contractor will be required to apply for a CNP from the Noise Control Authority and has the responsibility to ensure compliance with the NCO and relevant TM. Therefore, an indicative noise assessment in this EIA is for the evaluation of whether construction works in restricted hours are feasible or not in the context of programming construction work only. Detailed discussion is presented in Section 4.10.

Operational Phase – Road Traffic Noise

- 4.5.14 Traffic noise was predicted using the methodology provided in the UK Department of Transport Calculation of Road Traffic Noise (CRTN) 1988. The assessment was based on projected peak hour flows for the worst year within 15 years after opening of the road. The roads proposed under the Project are scheduled to open in 2016. Therefore, the traffic data for year 2031, which has been endorsed by Transport Department (see **Appendix 15.1**), was adopted for the assessment. Since traffic flows along the major roads during the peak hour in the morning are generally higher than that in the afternoon, the morning peak hour traffic flows were used for modelling. The projected 2031 am peak hour traffic flows are presented in **Appendix 3.2**.
- 4.5.15 Traffic speeds for the proposed Trunk Road system adopted in the noise model are summarised as follows:

<u>Road</u>	<u>Speed Limit</u>
Trunk Road (Open Section & Underneath Landscaped deck)	70 km per hour
Trunk Road in Tunnel	80 km per hour
Road P2	50 km per hour
Slip Roads	50 km per hour
Operation Roads	50 km per hour

- 4.5.16 The traffic speed for all existing roads has been made reference to the Traffic Aids provided by Transport Department. Based on information provided by Highways Department, low noise road surface on the existing Island Eastern Corridor as shown in **Figure 4.8** has been included in the noise model. Besides, low noise road surface has been assumed for the proposed trunk road (except tunnel section and beneath the landscaped deck at the eastern portal area) with speed limit of 70 km/hour.
- 4.5.17 The road network, proposed building layout and all other features that could have noise screening or reflective effects were digitised in the road traffic noise model. The roads were divided into segments, each of which was assigned a road layout number. A road layout defined the road width, opposing traffic lane separation, road surface type and traffic mix, flow and road design speed. Hard ground as defined in CRTN was assumed throughout the Study Area. Noise levels were calculated at each receiver point at various elevations.

Operational Phase - Ventilation Noise

- 4.5.18 Two ventilation buildings for the CWB tunnel, East Ventilation Building (EVB) and Central Ventilation Building (CVB), are proposed along the CWB within the WDII study area. The CVB will contain its ventilation shaft at the same location. The EVB would be located at the North Point waterfront, while its ventilation shaft would be located at the CBTS eastern breakwater. Fans and damper arrangement at each ventilation building may be refined in detailed design.

- 4.5.19 Potential noise impacts arising from the operation of ventilation fans would be expected at the sensitive receivers, and this fixed plant noise impact has been assessed in accordance with the IND-TM.
- 4.5.20 As the worst case scenario, the assessment has been carried out for the congestion mode when the maximum number of ventilation fans would be in operation. According to information provided by the Ventilation Engineer, 7 duty plus 2 standby ventilation fans are proposed for EVB, while 11 duty plus 2 standby ventilation fans are proposed for CVB. **Table 4.7** summarises the numbers of ventilation fans required for proposed ventilation buildings under congestion condition.

Table 4.7 Number of Ventilation Fans required for the Proposed Ventilation Buildings under Congestion Condition

Ventilation Building	Fan Capacity (m ³ s ⁻¹)	Number of Ventilation Fans Required
East Ventilation Building	125	7 (+2 standby)
Central Ventilation Building	125	11 (+2 standby)

- 4.5.21 It is assumed in the assessment that all duty ventilation fans are operated at each ventilation building. Screening corrections from other buildings / structures and directivity have also been excluded in the assessment. All the ventilation fans installed in each ventilation building will be provided with silencers. The typical length of the silencer proposed for ventilation fan will be 3,000 mm. A positive 3 dB(A) tonality correction was considered in the calculation.

PTI Noise

- 4.5.22 The re-provisioned PTI will be located to the north of Causeway Centre and Sun Hung Kai Centre, and the site is currently occupied as Harbour Road Sport Centre and a open carpark. The PTI will be implemented with the construction of the Exhibition Station for North Hong Kong Island Line/Shatin to Central Link.
- 4.5.23 As the layout and operational details of the re-provisioned PTI is not available at the time of carrying out this EIA, a qualitative approach would be adopted to address the noise nuisance arising from the operation of the PTI.

Helicopter Noise

- 4.5.24 The proposed permanent helipad will be located next to the HKCEC Extension. It has been confirmed by Government Flying Service that the operation parameters for the proposed helipad, which was adopted in the previously approved *EIA Report on Wan Chai Development Phase II*, are still valid for this EIA study (see **Appendix 15.1**). It will be used to serve VIPs as well as for emergency services and, therefore, will be used infrequently. Routine tasking or regular flights are not expected. Only the new types of helicopter, Eurocopter AS-332 L2 (Super Puma) and Eurocopter EC 155B, will operate at the proposed helipad.
- 4.5.25 As stated in the aforesaid EIA Report, there will be no designated approach route and take-off route for the proposed helipad. However, the helicopters will generally fly along the coastline to approach the landing pad.

- 4.5.26 With reference to the *Final EIA Study for Helipad at Yung Shue Wan, Lamma Island* (approved in January 2006), the measured L_{\max} for EC 155B and AS 332 L2 are 87.7 dB(A) and 90.6 dB(A) respectively at reference distance of 150m. Therefore, this assessment has been undertaken based on the noise level associated with an AS 332 L2 helicopter as a conservative approach.
- 4.5.27 The closest NSR (i.e. Causeway Centre) to the helipad has been selected for assessment. The calculation is based on the spherical spreading of the sound waves and atmospheric absorption was not considered.
- 4.5.28 It is understood that the proposed permanent helipad might also be used for commercial helicopter services based on the principle that government operations shall have absolute priority in the use of helipad over commercial operations at all times.
- 4.5.29 The helicopter noise is controlled under the Civil Aviation (Aircraft Noise) Ordinance, for which, Civil Aviation Department is the control authority.

Level of Uncertainty

- 4.5.30 The predictions of construction and road traffic noise impacts were based on the methodologies described in the GW-TM under the NCO and the UK Department of Transport "Calculation of Road Traffic Noise" (1988) respectively. The methodology which had previously been applied in other EIA studies is generally accepted for use in assessing construction and traffic noise impacts against EIAO-TM noise criteria.
- 4.5.31 There would be some limitations such as the accuracy of the predictive base data for future conditions e.g. traffic flow forecasts, plant inventory for the proposed construction works and fixed plant for future operation. Uncertainties in the assessment of impacts have been considered when drawing conclusions from the assessment.
- 4.5.32 In carrying out the assessment, realistic worst case assumptions have been made in order to provide a conservative assessment of noise impacts. The construction noise impact was assessed based on conservative estimates for the types of plant and methods of working. As for the assessment of road traffic noise impact, peak hourly traffic flows representing the worst case scenario were adopted.
- 4.5.33 For ventilation noise assessment, being the worst case scenario, the assessment has been carried out for the congestion mode when the maximum number of ventilation fans would be in operation. All duty ventilation fans have been assumed to operate concurrently 24 hours daily. For determining the distance correction factors, the horizontal distances between the noise source positions and the NSRs were used for representing the worst level of the representative NSRs.
- 4.5.34 For helicopter noise assessment, the operation parameters for the proposed helipad, which was adopted in the previously approved WDIICFS EIA Report, have been adopted for this EIA study. With reference to the noise data in *Final EIA Study for Helipad at Yung Shue Wan, Lamma Island* (approved in January 2006), this assessment has been undertaken based on the noise level associated with an AS 332 L2 helicopter as a conservative approach.

4.6 Identification of Environmental Impacts

Construction Phase

4.6.1 The scope of this Project includes reclamation; construction of the trunk road and Road P2 and associated connecting roads and local access roads, construction of CVB and EVB and Administration Building. Potential construction impacts of the Project may arise from the following activities:

- dredging works and seawall construction
- filling behind seawall
- reprovisioning of ferry pier
- road formation and earthworks, and road pavements
- tunnel construction
- drainage culvert construction

4.6.2 The construction works for the CRIII project and HKCEC ALE project would also contribute to the cumulative construction noise impacts.

4.6.3 Drilling and breaking method would be adopted for the tunnelling works for the Trunk Road section crossing beneath the Cross Harbour Tunnel, while cut-and-cover method would be adopted for the rest of the tunnel sections. The ground-borne construction noise is only addressed for the tunnelling work near the Cross Harbour Tunnel because it is the only section that would have underground drilling and breaking. The tunnelling work at other sections would be exposed and the dominating noise would be the air-borne construction noise that would be assessed separately in this EIA.

4.6.4 With reference to an EIA Report on KCRC Kowloon Southern Link, a ground-borne noise assessment on the hydraulic breaker was presented. Four hydraulic breakers working at a distance of around 22m in rock media would produce around 30 dB(A) ground-borne noise inside the Studio Theatre of the Hong Kong Cultural Centre. This noise level was well below the noise criterion of 65 dB(A) and hence the ground-borne noise impact generated by hydraulic breaker was not significant. In this regard, the ground-borne noise impact of rock breaking activity on the most affected noise sensitive receivers (Hoi Kung Court, Hoi To Court and Hoi Deen Court at Gloucester Road) would be minimal, taking into account the buffer distance of more than 150m.

Operational Phase

4.6.5 Operational phase impacts will arise from the following operations:

- road traffic noise
- ventilation noise
- Public Transport Interchange (PTI)
- helicopter noise

- 4.6.6 Road traffic noise will arise from new roads constructed under the Project as well as the existing roads.
- 4.6.7 Ventilation noise affecting sensitive receivers in the study area may arise from the proposed ventilation buildings under the Project (i.e. CVB and EVB). A re-provisioned PTI located to the north of Causeway Centre and Sun Hung Kai Centre may have potential noise impact on the nearby sensitive receivers.
- 4.6.8 Potential noise impacts may arise from the permanent helicopter landing pad which is proposed at the northeast of HKCEC Extension.

4.7 Prediction and Evaluation of Environmental Impacts

Construction Noise During Unrestricted Hours

- 4.7.1 For normal daytime working hours, exceedences of the construction noise criteria ($L_{eq(30\text{ minutes})}$ 75 dB(A) for residential uses and 70 dB(A) for educational institutions (65 dB(A) during examinations)) are predicted at representative NSRs in the absence of mitigation measures. Details of construction noise calculations and results are presented in **Appendix 4.7**. Results show that the predicted noise levels related to the concurrent construction works of the Project, CRIII and HKCEC ALE projects are in the range of 57 to 101 dB(A) $L_{eq(30\text{-min})}$. A summary of the unmitigated construction noise levels of the representative NSRs during normal daytime working hours within the construction period of the Project is listed in **Table 4.8**. Noise mitigation measures would therefore be required to reduce noise levels to the stipulated standard.

Table 4.8 Summary of Unmitigated Construction Noise Levels at Representative NSRs During Normal Daytime Working Hours

Representative NSRs	Predicted Unmitigated Construction Noise Levels during Normal Daytime Working Hour ($L_{eq(30\text{-min})}$ dB(A))
N1	67 - 81
N2	67 - 83
N3	62 - 79
N6	68 - 78
N8	65 - 85
N11	57 - 101
N13	60 - 84
N15	66 - 88
N17	63 - 96
N18	62 - 98
N20 #	65 - 90
N22	64 - 79

Note: # For normal daytime working hours, the noise criteria are 70 dB(A) and 65 dB(A) for normal teaching periods and examination periods, respectively.

- 4.7.2 The proposed cross harbour water mains will extend from Wan Chai near the HKCEC Extension to connect to the existing system near the Museum of Arts at the Tsim Sha Tsui promenade. The major construction activities include laying new submarine and landside pipelines. These are not major noise generating activities. The NSRs close to the construction sites at Wan Chai and Tsim Sha Tsui are the HKCEC Extension, the Hong Kong Space Museum and the Museum of Arts. Since they have blank façades / fixed windows and are provided with central air conditioning (i.e. they do not rely on openable windows for ventilation), there will be no construction noise impacts on the indoor environment of these NSRs.

Road Traffic Noise

- 4.7.3 Traffic noise levels have been predicted at a total of 31 representative noise assessment points including existing residential dwellings, institutional uses, re-provisioned temple and future uses on land zoned as CDA(1) an CDA. Noise screening effect of a landscaped deck connecting the eastern portal of the CWB tunnel (see **Figure 4.6**), being a built-in design of the Project, has been taken into account for the assessment. In view of the visual quality, south-facing panel of the landscaped deck would be installed with transparent material. **Appendix 4.8** gives the breakdown of the noise contributions from the new roads and existing roads at all representative existing and planned NSRs. Sample output files for 10 representative assessment points, as agreed with the EPD, are included in **Appendix 4.9**. Road-plots of the traffic noise model are included in **Appendix 4.9a**.
- 4.7.4 Without the noise mitigation measures in place, the predicted noise levels at the identified NSRs would range from 60 to 87 dB(A) L₁₀ (1-hour). The following paragraphs discuss the potential noise impacts at each broad group of NSRs under study.

Wan Chai Area (NSRs N1 – N5)

- 4.7.5 For the open arena of HKAPA, the performance area is set at the lowest level with tiered seating for the audience. Given the existing 2.5m high barriers surrounding the open arena, the predicted noise level of 60 dB(A) at N1 would comply with the noise limit of 65 dB(A). On the other hand, noise exceedences by 2 to 17 dB(A) are predicted at NSRs N2 to N5. Noise exceedences at NSRs N2 to N5 are mainly attributed to the existing roads (i.e. Harbour Road and Gloucester Road). The noise levels of 'New' roads would be less than 70 dB(A) and their contribution to the overall noise levels would be less than 1.0 dB(A). Direct mitigation measures on 'New' roads are therefore not required as they would not be effective in improving the noise environment at the sensitive receivers.

Causeway Bay Area (NSRs N6 – N8)

- 4.7.6 The predicted noise levels at N6 to N8 exceed the noise criterion of 70 dB(A) by 8 to 15 dB(A). However, the noise exceedences are caused by the existing roads. As the new road in front of these NSRs will be mainly constructed in the form of tunnel, the 'New' road noise contribution to the overall noise level would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below 70 dB(A). 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.

Tin Hau Area (NSRs N9 – N17, P1-A and P1-B)

- 4.7.7 The predicted noise levels at N9 to N17 exceed the noise criterion of 70 dB(A) by 1 to 11 dB(A), while the predicted noise level at P1-A and P1-B (i.e. re-provisioned Tin Hau Temple) exceed the noise criterion of 65 dB(A) by up to 7 dB(A). With the exception of N16, N17 and N17-A, the noise exceedences at other NSRs (i.e. N9 to N15) are mainly attributed to the existing roads, while the 'New' road noise contribution to the overall noise level would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below 70 dB(A). Hence, direct mitigation measures on 'New' roads would be required for N16, N17 and N17-A.

- 4.7.8 While the noise levels of ‘New’ roads at the re-provisioned Tin Hau Temple (NSRs P1-A and P1-B) would be less than 65 dB(A) and their contribution to the overall noise levels would be less than 1.0 dB(A), placing planned NSR near busy road which would be subject to traffic noise levels exceeding EIAO-TM noise limit should be under more scrutiny from Schedule 3 EIA land use planning perspective. Given no alternative site could be identified for this temple at this stage, mitigation measure at the temple will be considered and examined.

North Point Area (NSRs N18 – N23, P2 and P3)

- 4.7.9 The predicted noise levels at N18 to N19 and N21 to N23 exceed the noise criterion of 70 dB(A) by 3 to 11 dB(A), while the predicted noise level at N20 (i.e. Hong Kong Baptist Church Henrietta Secondary School) exceeds the noise criterion of 65 dB(A) by 12 dB(A). With the exception of N21 to N23, the ‘New’ road noise contributions to the overall noise levels at other NSRs (i.e. N18 to N20) would be more than 1.0 dB(A) and the ‘New’ road noise levels at these NSRs would be above 70 dB(A) for residential dwellings and 65 dB(A) for educational institutions. Hence, direct mitigation measures would be required to reduce the noise impact from ‘New’ roads for NSRs N18 to N20.
- 4.7.10 The ‘New’ road noise contributions to the overall noise levels at planned NSRs (i.e. P2 and P3) would be more than 1.0 dB(A) and the ‘New’ road noise levels at these two NSRs would be above 70 dB(A) for residential dwellings. Hence, direct mitigation measures would be required to reduce the noise impact.

Ventilation Noise

- 4.7.11 Since the ventilation fans are expected to operate 24 hours daily, referring to Table 4.4, the calculation is based on the stringent fixed noise night-time criteria of 50/55 dB(A) L_{eq} (30-min) in the assessment according to EIAO-TM requirement. It is assumed in the assessment that all duty ventilation fans would be operated for each ventilation building. As the two proposed ventilation buildings are quite far away from each other, no cumulative fixed noise impact is determined in this case.
- 4.7.12 Taking into account the installation of silencers at each ventilation fan, any NSRs located within the following distances from the ventilation louvres of EVB and CVB would be subject to an exceedence of the noise criteria of 50/55 dB(A). Detailed assessment results are presented in **Appendix 4.10**.

<u>Ventilation Building</u>	<u>Distance from the ventilation louvres (m)</u>	
	ASR ‘B’	ASR ‘C’
EVB	119	67
CVB	149	84

- 4.7.13 Land uses around these two proposed ventilation buildings, within these zones of noise criteria exceedence, are commercial, infrastructural or open space. The staff quarters of FEHD Depot (NSR 15) and re-provisioned Tin Hau Temple (NSR P1) are located about 115m and 250m away from the sea-facing louvres of EVB respectively, while the open arena of HKAPA is located about 190m away from the louvers of CVB. Thus, no adverse ventilation noise impacts would be expected. From a land use planning point of view, new land uses in this area should take these zones of noise exceedence into account.

- 4.7.14 According to current planning intentions, the proposed ventilation building for the MTR North Island Line (NIL) would be located near the junction of Fleming Road and Convention Ave, and it would be about 300m away from the CVB. The nearest NSR relying on openable window for ventilation (i.e. Causeway Centre) is located at more than 500m from CVB and about 270m from the ventilation building of NIL. Also, ventilation noise would be substantially screened by the buildings in between the ventilation buildings and Causeway Centre. Thus, no adverse cumulative fixed noise impacts of both ventilation buildings would be expected. Further, it is noted that the proposed NIL has to undergo a statutory EIA and it is expected that the noise level generated from the ventilation fans would comply with the EIAO-TM and NCO requirements.

PTI Noise

- 4.7.15 A re-provisioned PTI would be located to the north of Causeway Centre and Sun Hung Kai Centre. The site is currently occupied by Harbour Road Sport Centre, Wan Chai Training Pool and open carpark. It is expected that the major potential noise impact arising from the operation of the PTI would be the noise nuisance from bus engine in particular during night-time and early morning affecting the adjoining high-rise building. Causeway Centre, which is about 82m away from the geographical centre of the re-provisioned PTI, has been identified to be the nearest affected NSR. Assuming the operational scale of the re-provisioned PTI is similar to that of the existing Wan Chai North PTI, potential noise issues are likely at Causeway Centre if no control measures are applied.

Helicopter Noise

- 4.7.16 With reference to basic acoustic principles and based on the measured noise level for a AS 332 L2 helicopter, a setback distance of about 286m to the nearest residential premises is required in order to meet the EIAO-TM noise standard of 85 dB(A) L_{max} (domestic premises) for helicopter noise (see **Appendix 4.12**). It is noted that for the EC 155B helicopter, which is quieter than the AS 332 L2 helicopter, lesser set-back distances from the proposed helipads would be required. The distance between the permanent helipad and the closest residential NSR (Causeway Centre) is about 530m, therefore it is considered that the proposed helipad locations would be acceptable in terms of noise levels.
- 4.7.17 It is understood that the proposed permanent helipad might also be used for commercial helicopter services based on the principle that government operations shall have absolute priority in the use of helipad over commercial operations at all times. At this stage, it would be difficult to make the assumptions (e.g. frequency of flights, type of helicopters, etc.) of commercial helicopter services for noise assessment. However, in view of the considerable buffer distance between the NSRs and the helipad (i.e. about 530m), adverse helicopter noise impact would not be anticipated. Furthermore, CEDD has separately commissioned a detailed helipad assessment, which includes noise assessment to prepare an optimal layout for helipad and to avoid adverse helicopter noise impact. Noise mitigation measures proposed under the separate study includes a noise barrier of 6m high around the landward side of the helipad site, although it is noted that this is still subject to the endorsement under that study.

Other Fixed Noise Sources

- 4.7.18 Other existing fixed noise sources identified within 300m of the proposed CVB include Wanchai West Sewage Screening Plant and Kwong Wan Fire Station. According to the relevant draft Outline Zoning Plans for the Project, Wanchai West Sewage Screening Plant will be demolished and replaced by the Hong Kong Academy of Performing Arts Extension. The nearest NSR relying on openable window for ventilation (i.e. Causeway Centre) is located at more than 300m from the fire station and CVB, and the re-provisioned PTI will be more than 300m away from the fire station and CVB. Thus, no adverse cumulative fixed noise impact would be expected.

4.7.19 Other existing fixed noise sources identified within 300m of the proposed EVB include Tung Lo Wan Fire Station, electric sub-station near Whitfield Road Rest Garden and open car/lorry park along the waterfront and near Harbour Heights. According to the relevant draft Outline Zoning Plans for the Project, open car/lorry park along waterfront will be replaced by a waterfront park. The fixed noise sources (i.e. Tung Lo Wan Fire Station, electric sub-station and open car/lorry park near Harbour Heights) are located in the range of 175m to 275m away from the proposed EVB. Given the total Sound Power Level (SWL) of 96.5 dB(A) for the ventilation fans of EVB, the predicted noise level at the nearest NSR (i.e. staff quarters of FEHD Depot – about 115m from sea-facing louvers of EVB) would be 50 dB(A) which is 5 dB(A) below the night-time noise limit of 55 dB(A). As such, it is anticipated that noise contribution from the proposed EVB to the cumulative fixed noise impact would not be significant.

4.8 Mitigation of Adverse Environmental Impacts

Construction Noise

4.8.1 In order to reduce the excessive noise impacts at the affected NSRs during normal daytime working hours, mitigation measures such as adopting quiet powered mechanical equipment, movable noise barriers and temporary noise barriers are recommended. The above mitigation measures have been vetted and confirmed by the CEDD and HyD as being practicable in completing the works within scheduled timeframe. The Contractor may be able to obtain particular models of plant that are quieter than the PME's given in GW-TM. It is considered too restrictive to specify that a Contractor has to use specific items of plant for the construction operations. It is practical to specify the total SWL of all plant to be used on site so that the Contractor is allowed some flexibility to select plant to suit his needs.

4.8.2 In this assessment, the recommended quiet PME are taken from the BS 5228: Part 1: 1997 and the website of EPD, and the PME are known to be available in Hong Kong. The quiet PME adopted for the CRIII construction tasks are in accordance with CRIII EIA Report.

4.8.3 The lists of quiet PME adopted in the construction tasks of the Project during normal daytime working hours are shown in **Appendix 4.13**. For the following construction tasks of the Project, it is considered necessary to adopt quiet PME:

- Piling activity for construction of temporary breakwater at Causeway Bay Typhoon Shelter
- Temporary seawall construction, filling behind seawall, for whole of WDII construction
- Diaphragm wall, excavation, construction of slabs and backfilling in CWB tunnel construction
- Rock excavation at CWB tunnel (Cross Harbour Tunnel section)
- Temporary diversion of cooling water pipeline at CBTS 4
- Slip Road 8 and Victoria Park Road reprovisioning and at-grade road construction
- Substructure and superstructure for landscaped deck, connection of IECL
- Demolition of structure, including the IEC structure
- Drainage culverts construction
- Ferry pier reprovisioning, including construction of new ferry pier and demolition of existing structure.
- WSD's salt water pumping station construction
- Road works construction
- MTR Tunnel crossing

- Cross harbour watermains
- Foundation of East Ventilation Building

- 4.8.4 To alleviate the construction noise impact on the affected NSRs, two types of noise barriers (movable and temporary noise barriers during construction) are proposed to be provided for particular items of plant and construction works. It is anticipated that a movable noise barrier with a cantilevered upper portion located within 5m from any static or mobile plant can provide 5 to 10 dB(A) noise reduction. Temporary noise barriers (5m in height) with cantilevered upper portion (3.5m in length) are also proposed in NPR2W, NPR1, NPR2E work sites along the diaphragm wall of the tunnel section and retaining walls of the tunnel approach ramp for alleviation of construction noise during construction of diaphragm walls and substructures of the tunnel approach ramp. Temporary noise barriers with height up to the soffit of the bridge deck area are proposed along the existing IEC structure for alleviation of construction noise during the demolition and construction of substructures for the IEC and construction of adjacent tunnel approach ramp structures. Locations of the temporary noise barriers are presented in **Figure 4.9**. A 10 dB(A) noise reduction can be achieved by eliminating the line of sight from the receivers along the construction areas. The barrier material shall have a surface mass of not less than 14 kg/m^2 on skid footing with 25mm thick internal sound absorptive lining to achieve the maximum screening effect.
- 4.8.5 Additionally, apart from the temporary noise barrier as proposed and presented in **Figure 4.9**, temporary noise barriers are also proposed on the temporary working platform on piers or pile caps for the demolition works of existing piers and crossheads for the marine section of the existing IEC. Locations of temporary noise barriers are presented in **Figure 4.9a**.
- 4.8.6 PME grouping as noise mitigation measures would be implemented at NSR N11, N13, N17, N18 and N20. In order to minimize the noise impact to the surrounding NSRs, either Group 1 or 2 would be operated at any one time under the construction schedule. Based on the construction programme, at-grade road construction including reinstatement of Victoria Park Road would be carried out for 8 months (i.e. 1-month works period has been assumed at Hing Fat Street between Wing Hing Street & Tsing Fung Street and associated road works at Wing Hing Street and Tsing Fung Street, the closest distance between PME and NSR N11 is about 7m; and a 7-month works period has been assumed in the area outside Hing Fat Street between Wing Hing Street & Tsing Fung Street and associated road works at Wing Hing Street and Tsing Fung Street including reinstatement of Victoria Park Road). Taking into account the site constraint and commercial activities at the ground level alongside Hing Fat Street, movable and temporary noise barriers would not be considered practicable for such at-grade roadworks.
- 4.8.7 Considering the noise impact arising from the demolition and construction of superstructure would move along with the IECL construction programme, the corresponding noise impact sections have therefore been identified and taken into account in noise calculations. **Figure 4.10** shows the corresponding impact sections (N17 – section 1 and 4; N18 – section 2 and 5; and N20 – section 3 and 6) during demolition works. **Figure 4.10a** shows the corresponding impact section (N17 – section C; N18 – section B; and N20 – section A and D) during construction of superstructure works.
- 4.8.8 The shortest distance between the corresponding noise impact sections and NSR would represent the worse case scenario and the duration of noise exceedance would also be calculated based on the construction programme. Noise impact from adjacent sections, other than the corresponding sections, would be decreased as the construction programme progresses along the site and the noise level would be complied with acceptable criteria. For NSR N18, land section and marine section for one specific task (i.e. demolition of structure and construction of superstructure and retaining structure) was assumed since different types and numbers of PME with different sound power levels would be identified in this assessment.

- 4.8.9 The mitigation measures for the items of PME in each construction task have been shown in **Appendix 4.13**.
- 4.8.10 As shown in **Appendix 4.14**, with the use of quiet equipment, movable / temporary noise barriers PME grouping, the overall noise levels at NSRs would be reduced by 7 to 31 dB(A) L_{eq} (30-hour), depending on the type of construction activities. With the exception of NSRs N11, N17, N18 and N20, the predicted construction noise levels arising from the Project at all other NSRs selected for construction noise impact assessment would comply with the EIAO-TM construction noise criteria.
- 4.8.11 In view of the limited buffer distance between the NSRs and the nearest work areas (N11 – 7m, N17 – 20m, N18 – 16m and N20 – 42m), the predicted construction noise levels at these NSRs would exceed the noise criteria. Practical mitigation measures (i.e. use of quiet equipment, movable barriers, temporary barriers and PME grouping) have been exhausted, taking into account the engineering and programming point of view. For N11 (i.e. Mayson Garden), the predicted noise level would exceed the noise standard of 75 dB(A) for 1 month by 10 dB(A) with Group 2 PME. For N17 (i.e. Harbour Heights), the predicted noise level would exceed the noise standard of 75 dB(A) by up to 5 dB(A) with Group 1 or Group 2 PME for a total of 8 weeks. For N18 (i.e. City Garden), the predicted noise level would exceed the noise standard of 75 dB(A) by up to 9 dB(A) with Group 1 or Group 2 PME for a total of 16 weeks. For N20 (i.e. Hong Kong Baptist Church Henrietta Secondary School), the predicted noise level with Group 1 or Group 2 PME would exceed the noise standard of 65 dB(A) by up to 12 dB(A) during examination periods for a total of 28 weeks in 2009, 2013 and 2015. For the normal teaching period, the noise level would exceed the noise standard of 70 dB(A) by 7 dB(A) with Group 1 or Group 2 PME for 13.5 weeks. A summary for mitigated noise levels during normal daytime working hours at representative NSRs is presented in **Table 4.9**.

Table 4.9 Summary of Mitigated Construction Noise Levels at Representative NSRs during Normal Daytime Working Hours

Representative NSRs	Predicted Mitigated Construction Noise Levels during Normal Daytime Working Hour (L_{eq} (30-min) dB(A))
N1	53 - 72
N2	63 - 73
N3	57 - 67
N6	57 - 69
N8	61 - 75
N11	44 - 70 (Group 1 PME)
N11	51 - 85 (Group 2 PME)
N13	55 - 71 (Group 1 PME)
N13	55 - 71 (Group 2 PME)
N15	62 - 75
N17	58 - 80 (Group 1 PME)
N17	58 - 80 (Group 2 PME)
N18	54 - 84 (Group 1 PME)
N18	54 - 84 (Group 2 PME)
N20 #	60 - 77 (Group 1 PME)
N20 #	60 - 77 (Group 2 PME)
N22	62 - 72

Note: # For normal daytime working hours, the noise criteria are 70 dB(A) and 65 dB(A) for normal teaching periods and examination periods, respectively.

Traffic Noise

- 4.8.12 Direct mitigation measures would be proposed for ‘New’ roads (i.e. within the meaning of Item A.1 of Schedule 2 of EIAO-TM) if there would be adverse environmental impact. If the NSRs are affected by noise from other existing roads, direct mitigation measures are required to reduce the noise from the ‘New’ roads to a level that it
- (i) is not higher than the noise standard; and
 - (ii) 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.
- 4.8.13 As mentioned in Sections 4.7.5 to 4.7.10, direct mitigation measures on some ‘New’ roads would be required to mitigate the noise impact at NSRs N16, N17, N17-A, N18, N18-A, N18-B, N19, N19-A, N20, P2 and P3. Besides, mitigation measures at NSR P1 (i.e. re-provisioned Tin Hau Temple) would be examined for land use planning perspective.
- 4.8.14 The following direct mitigation measures, as shown in **Figure 4.11**, have been proposed. Taking into account the visual quality, these direct noise mitigation measures would be installed with transparent panels:
- about 500m length of noise semi-enclosure covering the westbound slip road from the IEC;
 - about 230m length of noise semi-enclosure covering the main carriageways (eastbound and westbound) of the CWB and IEC;
 - about 135m length of 5.5m high cantilevered noise barrier with 3m cantilever inclined at 45° on the eastbound slip road to the IEC;
 - about 95m length of 5.5m high cantilevered noise barrier with 1m cantilever inclined at 45° on the eastbound slip road to the IEC; and
 - about 350m length of 3.5m high vertical noise barrier on the eastbound slip road to the IEC.
- 4.8.15 A section of 500m length of noise semi-enclosure covering the westbound slip road from the IEC will protect both existing and future/planned NSRs. Of this noise semi-enclosure, a section of the noise semi-enclosure (~265m long) located in between the Electric Centre (next to City Garden) and CDA(1) site would only be required to be constructed before the occupation of future/planned NSRs (i.e. P2 and P3). For the purpose of determining the extent of noise semi-enclosure to be constructed before the occupation of future/planned NSRs, the following additional noise assessment points at Oil Street as shown in **Figure 4.11** have been included in the assessment. Considering the NSRs alongside Electric Road (e.g. Carson Mansion, Swanhill Mansion, Wah Hoi Mansion) would be shielded by the buildings at the front row, they would not be included in the assessment.

NSR	Section	Location	Use	Ground elevation (mPD)	No. of Floors
N24	Tin Hau/North Point	Block B, Fu Lee Loy Mansion	Residential	4.9	20
N25	Tin Hau/North Point	Wan Wah Mansion	Residential	4.9	24

- 4.8.16 **Appendix 4.15** presents the predicted road traffic noise levels at all representative NSRs, assuming this section of noise semi-enclosure is not in place. The results show that the predicted noise impact of 'New' roads on all representative existing NSRs would comply with the criteria as stated in Section 4.8.12 above. In order to minimise disruption to road traffic after road opening, the steel frame for this section of noise semi-enclosure will be erected in advance during the construction of the westbound slip road, while the panels will be installed before the occupation of future/planned NSRs in CDA and CDA(1) sites.
- 4.8.17 The remaining sections of noise semi-enclosure, cantilevered noise barrier and vertical noise barrier shall be implemented before commencement of operation of the proposed road project. **Figure 4.11** differentiates the direct mitigation measures for existing and future/planned NSRs. Section drawings of these direct noise mitigation measures have been shown in **Figures 4.12 to Figure 4.14**.
- 4.8.18 As the layout and design of the re-provisioned Tin Hau Temple is not available at the time of carrying out this EIA, a 2.5m high boundary wall along the southern and eastern boundary of the re-provisioned temple has been examined for its noise reduction effectiveness. However, in view of the traditional design of Tin Hau Temple, it would not be considered desirable to erect a boundary wall along the western boundary of the temple, as this will block the seaview. With the southern and eastern boundary wall in place but without the western boundary wall, the predicted noise levels at the temple (i.e. NSRs P1-A and P1-B) would still exceed EIAO-TM noise limit of 65 dB(A) by 4 dB(A) L_{10} (1-hour) due to the existing roads. It should be noted that the 'New' road noise contributions to the overall noise levels would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below 65 dB(A). Instead of a western boundary wall, the openable windows of the temple, if any, should rather be orientated so as to avoid direct line of sight to the existing Victoria Park Road as far as practicable. To examine the practicality of such mitigation measure, an indicative layout showing the orientation of sensitive façade (i.e. openable windows of the temple) represented by NSR P1-C has been assumed for assessment (see **Figure 4.15**). The results show that the predicted overall noise level at P1-C would be 62 dB(A) L_{10} (1-hour) which complies with the noise limit of 65 dB(A). The predicted noise exceedance for the re-provisioned temple would be at the west and south facing façades only. The project proponent of the temple will need to take into account such environmental requirements/constraints and review the mitigation measures during the detailed design of the temple with a view to eliminating the need for the boundary wall.
- 4.8.19 **Appendix 4.16** presents the breakdown of noise contribution from the new roads and existing roads at all representative NSRs when all the proposed direct mitigation measures are in place. In view of the seaward open face of semi-enclosure and dominant noise impact caused by vehicle traffic on open roads, tunnel portal effect on noise would be considered insignificant and hence has not been included in this report.
- 4.8.20 With these proposed noise semi-enclosure, cantilevered and vertical noise barriers in place, the predicted overall noise levels at N17, N17-A, N18, N18-A, N18-B, N19, N19-A, P2 and P3 are in the range of 51 to 66 dB(A) L_{10} (1-hour) which comply with the noise limit of 70 dB(A).
- 4.8.21 For N16, the predicted overall noise levels at certain floors would still exceed the noise limit of 70 dB(A) by 1 dB(A) due to the noise contributions from existing roads. However, the 'New' road noise contributions to the overall noise levels would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below 70 dB(A). Hence, no further direct mitigation measures are considered effective in mitigating the noise impact.

- 4.8.22 For the secondary school (NSR N20), the predicted overall noise levels at upper floors would still exceed the noise limit of 65 dB(A) by 2 to 6 dB(A) L_{10} (1-hour) due to the noise contribution from existing roads. Thus, no further direct mitigation measures would be considered effective in mitigating the noise impact. Considering the school has already been provided with air-conditioners, the noise impact would not be significant.
- 4.8.23 With the proposed direct mitigation measures in place, the predicted overall noise levels at most of the NSRs would still exceed the relevant noise limits due to the noise contributions from existing roads. The 'New' road noise contributions to the overall noise levels would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below the relevant noise limits. Hence, no further direct mitigation measures are considered effective in mitigating the noise impact.
- 4.8.24 Nevertheless, even though the noise level exceedence is due to noise contributions from existing roads, the overall traffic noise impact for representative NSRs particularly in Tin Hau area and North Point area would be improved by the Project and its associated noise barrier/noise semi-enclosure on the 'New' road. A comparison between the prevailing road traffic noise level and the mitigated road traffic noise level at representative NSRs in Tin Hau area and North Point area is summarised below.

NSR ID	Prevailing Road Traffic Noise Level in Year 2008, L10 (1-hr) dB(A)	Mitigated Road Traffic Noise Level in Year 2031, L10 (1-hr) dB(A)
N16 – N17	68 – 81	51 - 71
N18 – N20	68 – 82	51 - 71

Ventilation Noise

- 4.8.25 As mentioned in Sections 4.7.11 to 4.7.14, there are no NSRs which will be affected by noise from the proposed East Ventilation Building and Central Ventilation Building. Mitigation measures are not required.

PTI Noise

- 4.8.26 As mentioned in Section 4.7.15, potential noise issues are likely at Causeway Centre if no control measures are applied. To mitigate the noise impact arising from the re-provisioned PTI, covering of the whole bus bay areas would be recommended to be incorporated into the design of PTI. The roof cover structure should be designed such that the idling vehicles at the bus bay areas would be substantially screened by a cover. With the proper design of the roof cover, no adverse PTI noise impact on the nearby NSRs would be expected.
- 4.8.27 The re-provisioned PTI will be subject to the detailed design and it will be implemented with the construction of the Exhibition Station for North Hong Kong Island Line/Shatin to Central Link. The noise impact arising from the PTI will be further assessed in the relevant EIA study for NIL/SCL.

Helicopter Noise

4.8.28 As mentioned in Sections 4.7.16 to 4.7.17, adverse noise impact from the proposed permanent helipad would not be expected at the nearest NSR. Mitigation measures are not required.

4.9 Evaluation of Residual Impacts

Construction Noise

4.9.1 With the exception of N11, N17, N18 and N20, the construction noise levels at other NSRs selected for construction noise impact assessment are predicted to comply with the noise standards stipulated in the EIAO-TM with the implementation of the above-mentioned mitigation measures. Residual impacts at these affected NSRs are summarised in **Table 4.10**.

4.9.2 The on-site survey has revealed that NSR N20 (Hong Kong Baptist Church Henrietta Secondary School) has already been noise insulated with air-conditioners. With the provision of air-conditioners, it is considered that the noise impact would be minimised by keeping the windows closed during the construction activities. Notwithstanding this, due to a limited buffer distance and a more stringent noise criterion of 65 dB(A), it is recommended that particularly noisy construction activities, especially those associated with the demolition of the IEC Structures, should be scheduled to avoid examination periods as far as practicable.

Table 4.10 Construction Noise Residual Impacts

NSR	Exceedance of the EIAO-TM Criterion of 75 dB(A)	Construction Activity Causing Exceedance	Approximate duration of Exceedance
N11	10 (Group 2 PME)	At-grade road	1 month (February 2014)
N17	5 (February 2013) 1 (August 2013) 4 (February 2015) (Group 1 or Group 2 PME)	Demolition of structure and construction of superstructure	3 weeks (February 2013) 3.5 weeks (August 2013) 1.5 weeks (February 2015)
N18	7 (May 2013) Land section for Group 1 or Group 2 PME 9 (June 2013) Marine section for Group 1 or Group 2 PME 4 (January 2014) Marine section for Group 1 or Group 2 PME 1 (February 2014) Land section for Group 1 or Group 2 PME 5 (March 2015) Land section for Group 1 PME 6 (March 2015) Land section for Group 2 PME	Demolition of structure and construction of superstructure and retaining structure	1.5 weeks (May 2013) 2.5 weeks (June 2013) 2 weeks (January 2014) 2 weeks (February 2014) 2.5 weeks (March 2015) 2.5 weeks (April 2015) 3 weeks (November 2015)

NSR	Exceedance of the EIAO-TM Criterion of 75 dB(A)	Construction Activity Causing Exceedance	Approximate duration of Exceedance
	7 (April 2015) Marine section for Group 1 or Group 2 PME 2 (November 2015) for Group 1 or Group 2 PME		
N20 (Normal Teaching period)	7 (July 2013) 3 (September 2013 – mid November 2013) Group 1 or Group 2 PME	Demolition of structure and construction of superstructure	4 weeks (July 2013) ## 9.5 weeks (September 2013 – mid November 2013) ##
N20 (Examination Period)	3* (May - June 2009) 6* (May – mid-June 2013) 12* (June 2013) 10* (April 2015) 2* (May - June 2015) (Group 1 PME)	Dredging, demolition of structure and / or construction of substructure	8 weeks # (May - June 2009) 5.5 weeks # (May – mid-June 2013) 2.5 weeks # (June 2013) 4 weeks # (April 2015) 8 weeks # (May - June 2015)
N20 (Examination Period)	3* (May - June 2009) 8* (May – mid-June 2013) 12* (June 2013) 10* (April 2015) 5* (May - June 2015) (Group 2 PME)	Dredging, demolition of structure and / or construction of substructure	8 weeks # (May - June 2009) 5.5 weeks # (May – mid- June 2013) 2.5 weeks # (June 2013) 4 weeks # (April 2015) 8 weeks # (May - June 2015)

Notes:

* Against the noise EIAO-TM noise criterion of 65 dB(A) for examination periods.

Public examination is assumed to be held in March, April and May, while school examination is assumed to be held in December and June of each year.

Normal teaching period is assumed to be held in September of each year to July of the following year.

4.9.3 In addition to the above-mentioned mitigation measures, the good site practices listed below shall be adopted by all the Contractors to further ameliorate the noise impacts. Although the noise mitigating effects are not easily quantifiable and the benefits may vary with the site conditions and operating conditions, good site practices are easy to implement and do not impact upon the works schedule.

- Only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction program.
- Silencers or mufflers on construction equipment shall be utilised and shall be properly maintained during the construction program.
- Mobile plant, if any, shall be sited as far away from NSRs as possible.

- Machines and plant (such as trucks) that may be in intermittent use shall be shut down between works periods or shall be throttled down to a minimum.
- Plant known to emit noise strongly in one direction shall, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.
- Material stockpiles and other structures shall be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

Traffic Noise

- 4.9.4 With the proposed direct noise mitigation measures in place, the ‘New’ road noise contributions to the overall noise levels at all representative NSRs would be less than 1.0 dB(A) and the ‘New’ road noise levels would all be below the relevant noise criteria. No adverse noise impacts arising from the ‘New’ roads would be predicted at any of the representative NSRs. Noise exceedances at the representative NSRs, if any, would be due to the existing roads. The effectiveness of direct mitigation measures, in terms of the number of residential dwellings and classrooms that will either be protected or benefited (by at least 1 dB(A)), has been shown in **Appendix 4.17**.
- 4.9.5 In order to redress the residual impacts, indirect technical remedies in the form of window insulation and provision of air-conditioning should be considered subject to the fulfilment of EPD’s eligibility criteria for consideration by the ExCo.
- 4.9.6 Results of the eligibility assessment are presented in **Appendix 4.18**. Due to high prevailing noise levels and/or dominant noise contribution from other roads, none of the representative NSRs is eligible for consideration for indirect technical remedies under the EIAO-TM and the ExCo Directive “Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads”.

Ventilation Noise

- 4.9.7 No residual noise impacts are predicted and setback distances from the ventilation buildings have been evaluated to ensure that only non-sensitive land uses are planned in these areas.

PTI Noise

- 4.9.8 No residual noise impacts are expected at the representative NSR for the operation of proposed PTI.

Helicopter Noise

- 4.9.9 No residual noise impacts are expected at the representative NSRs for the proposed permanent helipad during normal operations.

4.10 Construction Activities during Restricted Hours

- 4.10.1 As mentioned in Section 4.5.10 and 4.5.11, marine works may be undertaken over a 16-hour working day (0700 to 2300). These activities will be under the control of the NCO and the contractors are required to apply for a CNP from the Noise Control Authority before works commence. An indicative assessment has been undertaken to determine the impacts. As discussed in Section 4.2.6, the construction criterion of 65 dB(A) in the evening was adopted in this assessment.

4.10.2 The PME's for construction tasks during restricted hours and assessment results are presented in **Appendices 4.19** and **4.20**, respectively. On-time percentage for tug boat and crane has been reasonably assumed in this indicative assessment. As marine-based construction activities to be carried out during restricted hours would be confined to the area of PCWA, Wan Chai Reclamation and HKCEC Reclamation, therefore only NSRs N1 to N3 and N6 (i.e. within 300m of these reclamation sites) were selected for this assessment. A summary of unmitigated noise levels at these representative NSRs is presented in **Table 4.11**.

4.10.3 The lists of quiet PME adopted in the construction tasks of the Project during restricted hours are shown in **Appendix 4.21**. The following construction tasks of the Project would need to adopt quiet PME:

- Dredging, seawalls construction, rockfill for seawall foundations, filling behind seawall in the areas of WCR1, WCR2, WCR3, WCR4, HKCEC1, HKCEC2 and HKCEC3 East and West.

Table 4.11 Summary of Unmitigated Construction Noise Levels at Representative NSRs During Restricted Hours

Representative NSRs	Predicted Unmitigated Construction Noise Levels during Restricted Hour (1900 to 2300 on weekday) (L_{eq} (5-min) dB(A))
N1	57 – 72
N2	63 – 71
N3	62 – 64
N6	64 – 68

4.10.4 For restricted hours construction works, movable noise barriers would be provided for mobile PME, such as excavator and poker vibrator, 5 dB(A) noise screening reduction was assumed in the assessment. A 10 dB(A) noise screening reduction was assumed for stationary PME such as air compressor (see **Appendix 4.20**).

4.10.5 Predicted noise levels after mitigation at representative NSRs are shown in **Appendix 4.22**. A summary of mitigated noise levels at representative NSRs is presented in **Table 4.12**.

Table 4.12 Summary of Mitigated Construction Noise Levels at Representative NSRs During Restricted Hours

Representative NSRs	Predicted Mitigated Construction Noise Levels during Restricted Hour (1900 to 2300 on weekday) (L_{eq} (5-min) dB(A))
N1	53 – 63
N2	55 – 67
N3	57 – 62
N6	60 – 65

- 4.10.6 With the adoption of the recommended mitigation measures, the predicted noise levels at NSRs N1 (HKAPA Open Arena), N3 (Gloucester Road 169-170) and N6 (Elizabeth House) would comply with the construction noise criterion of 65 dB(A) during restricted hours. For N2 (Causeway Centre), there would be 2 dB(A) exceedance of noise limit due to dredging works based on the current information. The Applicant (i.e. the Contractor) shall implement all practicable noise mitigation measures to mitigate the noise impact. In applying for a Construction Noise Permit, the Contractor shall be required to demonstrate to the satisfaction of the Noise Control Authority the Sound Power Level of the quiet PMEs and/or the noise reduction effect of other mitigation measures to be adopted. Otherwise, values in the GW-TM will be used in assessing the application.
- 4.10.7 The above assessment only demonstrates that the construction works in restricted hours would be feasible in the context of programming construction work. If the Contractor considers that there is a need to carry out construction works during restricted hours, a Construction Noise Permit shall be obtained from the Noise Control Authority prior to commencement of such works. There are some factors affecting the assessment results of a CNP application, such as the assigning of Area Sensitivity Rating, Acceptable Noise Levels etc. The Noise Control Authority would decide these at the time of assessment of such application based on the contemporary situations / conditions. It should be noted that the situations / conditions around the sites may change from time to time. The Authority may make correction for multiple permit situations if in the opinion of the Authority the NSR will be materially affected by noise from construction work associated with more than one CNP, and the Authority may make such correction to the relevant noise level as it considers appropriate having regard to standard acoustical principles and practices. The Area Sensitivity Ratings assumed in this EIA Report are for indicative assessment only.

4.11 Environmental Monitoring and Audit

Construction Noise

- 4.11.1 An EM&A programme is recommended to be established according to the predicted occurrence of noisy activities. All the recommended mitigation measures for daytime normal working activities should be incorporated into the EM&A programme for implementation during construction. Details of the programme are provided in the stand-alone EM&A Manual.

Operational Noise

- 4.11.2 No residual impacts from PTI noise and helicopter noise are expected at the NSRs. Therefore, no monitoring is required during operation of the PTI and helipad.
- 4.11.3 The assessment has indicated that the noise from ventilation buildings would comply with the EIAO-TM standards. As part of the design process, however, monitoring of operation noise from proposed EVB during the testing and commissioning stage would be recommended to verify the maximum sound power levels as assumed in the noise assessment in this EIA.
- 4.11.4 Road traffic noise levels should be monitored at representative NSRs, which are in the vicinity of the recommended direct mitigation measures, during the first year after road opening. Details of the programme are provided in the stand-alone EM&A Manual.

4.12 Conclusion

Construction Phase

- 4.12.1 This assessment has predicted the construction noise impacts of the Project during normal daytime working hours, taking into account other concurrent projects including the CRIII and HKCEC ALE projects. The predicted unmitigated noise levels would range from 57 to 101 dB(A) at the representative NSRs. With the use of quiet PME, movable barriers, temporary barriers and PME grouping for construction tasks under the Project and implementation of the noise mitigation measures proposed in the CRIII Reports, the noise levels at the NSRs selected for construction noise impact assessment except N11, N17, N18 and N20 would comply with the construction noise standard.
- 4.12.2 Having exhausted practicable noise mitigation measures, the predicted noise level at N11 (i.e. Mayson Garden) would exceed the noise standard of 75 dB(A) for 1 month by 10 dB(A) with Group 2 PME. For N17 (i.e. Harbour Heights), the predicted noise level would exceed the noise standard of 75 dB(A) by up to 5 dB(A) with Group 1 or Group 2 PME for a total of 8 weeks. For N18 (i.e. City Garden), the predicted noise level would exceed the noise standard of 75 dB(A) by up to 9 dB(A) with Group 1 or Group 2 PME for a total of 16 weeks. For N20 (i.e. Hong Kong Baptist Church Henrietta Secondary School), the predicted noise level with Group 1 or Group 2 PME would exceed the noise standard of 65 dB(A) by up to 12 dB(A) for Group 1 or Group 2 PME during examination periods for a total of 28 weeks in 2009, 2013 and 2015. For the normal teaching period, the noise level would exceed the noise standard of 70 dB(A) by 7 dB(A) with Group 1 or Group 2 PME for 13.5 weeks. However, the school has been noise insulated with air conditioners and, by keeping the windows closed during construction activities, noise impacts at the indoor environment can be avoided. Notwithstanding this, it is recommended that the particularly noisy construction activities be scheduled to avoid examination period as far as practicable.
- 4.12.3 Whilst this impact assessment does indicate some noise exceedances for limited periods of time, even with the consideration of all practicable mitigation measures, during the actual construction period as much as practically possible will be done to reduce construction noise still further, and there will be on-going liaison with all concerned parties and site monitoring to deal with and minimise any exceedances.
- 4.12.4 The proposed cross harbour water mains will extend from Wan Chai near the HKCEC Extension to connect to the existing system near the Museum of Arts at the Tsim Sha Tsui promenade. Insignificant construction noise impacts are expected on the indoor environment of the NSRs such as the HKCEC Extension, the Hong Kong Space Museum and the Museum of Arts, which are close to the construction sites at Wan Chai and Tsim Sha Tsui, as they have blank façades / fixed windows and are provided with central air conditioning, and therefore do not rely on openable windows for ventilation.
- 4.12.5 An indicative assessment has been undertaken for possible construction activities during restricted hours (1900 to 2300) associated with the reclamation works of the Project. With the adoption of quiet PME and movable noise barriers, the predicted noise levels at the NSRs selected for noise impact assessment except NSR N2 would comply with construction noise criterion of 65 dB(A). It should be noted that the results of the construction noise impact assessment for restricted hours (1900 to 2300) are for indicative purposes, the Noise Control Authority will process any CNP application based on the NCO and the relevant technical memoranda in addition to considering the contemporary situations / conditions.
- 4.12.6 A construction noise EM&A programme is recommended to check the compliance of the noise criteria during normal daytime working hours.

Operational Phase

- 4.12.7 The potential road traffic noise impacts have been assessed based on the worst case traffic flows in 2031. The noise levels at most of the NSRs in the areas of Wanchai, Causeway Bay, Tin Hau and North Point are predicted to exceed the EIAO-TM traffic noise criteria due to the existing roads. Without the noise mitigation measures in place, the predicted noise levels at the NSRs would range from 60 to 87 dB(A). As a result, direct mitigation measures have been proposed to mitigate the noise impacts at NSRs N16, N17, N17-A, N18, N18-A, N18-B, N19, N19-A, N20, P2 and P3 where 'New' road noise levels would exceed the relevant noise criteria and 'New' road noise contributions to the overall noise levels would be more than 1.0 dB(A).
- 4.12.8 With the proposed noise semi-enclosure, cantilevered noise barrier and vertical noise barrier in place, the predicted overall noise levels at N17, N17-A, N18, N18-A, N18-B, N19, N19-A, P2 and P3 would be in the range of 51 to 66 dB(A) which comply with the noise limit of 70 dB(A). For all other affected NSRs, the 'New' road noise contributions to the overall noise levels would be less than 1.0 dB(A) and the 'New' road noise levels would all be below the relevant noise criteria, although the overall noise levels would still exceed the relevant noise criteria. However, it should be noted that such noise exceedances at the representative NSRs are due to the existing roads. Nevertheless, there will be an overall reduction of noise brought about by the project, which may be considered an environmental benefit.
- 4.12.9 A section of the noise semi-enclosure (~265m long) located in between the Electric Centre and CDA(1) site would only be required to be constructed before the occupation of future/planned NSRs (P2 – A land zoned as "CDA(1)" near Oil Street and P3 – A land zoned as CDA near Oil Street), while the remaining sections of noise semi-enclosure and vertical noise barrier shall be implemented before commencement of operation of the proposed road project.
- 4.12.10 For noise mitigation at the proposed site of the reprovisioned floating Tin Hau Temple, at the south-east corner of the CBTS, a 2.5m high boundary wall along the southern and eastern boundary of reprovisioned Tin Hau Temple has been examined for its noise reduction effectiveness. However, in view of the traditional design of a Tin Hau Temple, it would not be considered desirable to erect a boundary wall along the western boundary of the temple, as this will block the seaview. With the southern and eastern boundary wall in place but without the western boundary wall, the predicted noise levels at the temple would still exceed EIAO-TM noise limit of 65 dB(A) by 4 dB(A) due to the existing roads. Instead of a western boundary wall, the openable windows of the temple should rather be orientated so as to avoid direct line of sight to the existing Victoria Park Road as far as practicable. An indicative layout for the temple has demonstrated that the traffic noise criterion would be met with proper orientation of the sensitive façade. The project proponent of the temple will need to take into account such environmental requirements/constraints and review the mitigation measures during the detailed design of the temple with a view to eliminating the need for the boundary wall.
- 4.12.11 No adverse impacts in respect of the NCO and the EIAO-TM noise criteria arising from the operation of the proposed permanent helipad and fixed noise sources including ventilation buildings and the reprovisioned Wan Chai North PTI are anticipated at existing and planned NSRs.
- 4.12.12 Monitoring of road traffic noise is recommended to verify the effectiveness of the mitigation schemes during the first year after road opening. Besides, as part of the design process, monitoring of operation noise from proposed EVB during the testing and commissioning stage would be recommended to verify the maximum sound power levels as assumed in the noise assessment in this EIA.