

Contents

	Page
6 NOISE IMPACT	1
6.1 Legislation and Standards	1
6.2 Noise Sensitive Receivers	4
6.3 Potential Concurrent Projects	5
6.4 Construction Noise Assessment	6
6.5 Road Traffic Noise Assessment	12
6.6 Assessment for Aircraft & Helicopter Noise	15
6.7 Assessment for APM Ground-borne Noise	15
6.8 Assessment for Fixed Noise Sources	16
6.9 Conclusion	18

Appendices

Appendix 6A	Designated Area – Lantau Island West
Appendix 6B	Noise Sensitive Receivers
Appendix 6C	Construction Programme
Appendix 6D	Construction Plant Inventory
Appendix 6E	Sound Power Level of Construction Plant Inventory
Appendix 6F	Separation Distance between NSRs and Notional Construction Noise Sources
Appendix 6G	Monthly Construction Noise Calculation – Unmitigated Scenario
Appendix 6H	Predicted Construction Noise Impacts – Unmitigated Scenario
Appendix 6HA	Sample Calculation of Construction Noise
Appendix 6I	Monthly Construction Noise Calculation – Mitigated Scenario
Appendix 6J	Predicted Construction Noise Impacts – Mitigated Scenario
Appendix 6K	Extent of Friction Course Materials
Appendix 6L	Road Category for Road Traffic Noise Assessment
Appendix 6M	Predicted Road Traffic Noise Impacts
Appendix 6N	Proposed APM Alignment
Appendix 6O	APM Vibration Measurement Locations
Appendix 6P	APM Vibration Level Measurements
Appendix 6Q	APM Groundborne Noise Assessment
Appendix 6R	Locations of Prevailing Background Noise Measurement

Figures

Figures 6.1a-j	Locations of Noise Sensitive Receivers
Figure 6.2	Location of Concrete Batching Plants
Figure 6.3	Location of the Ventilation Building at Scenic Hill
Figure 6.4	Locations of Fixed Noise Sources

6 NOISE IMPACT ASSESSMENT

6.1 Legislation and Standards

6.1.1 Construction Noise

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

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

6.1.1.2 To ensure a better environment, the TM-EIAO promulgated under the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) has imposed more stringent criteria. For construction, there is no statutory limit on daytime construction noise under the NCO and related TMs. Nevertheless, the TM-EIAO stipulates criteria of 65 - 75dB(A) for daytime construction activities, as shown **Table 6-1**.

Table 6-1 Noise Standards for Construction Activities

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

Notes:

^[1] The above standards apply to uses that rely on opened windows for ventilation.

^[2] The criteria laid down in the relevant technical memoranda under the NCO for designated areas and construction works other than percussive piling may be used for planning purpose. A Construction Noise Permit (CNP) shall be required for the carrying out construction work during the period.

Construction Noise During Restricted Hours

6.1.1.3 The NCO also provides statutory control on general construction works during restricted hours (ie 1900 to 0700 hours (of the next day) from Monday to Saturday and at any time on Sundays or public holidays). The use of Powered Mechanical Equipment (PME) for construction works during restricted hours would require a Construction Noise Permit (CNP). The TM-GW details the procedures adopted by EPD for assessing such application. The granting of a CNP is subject to conditions stated in the CNP and it may be revoked at any time for failure to comply with the permit conditions.

6.1.1.4 In addition to the general controls on the use of PME during restricted hours, the use of Specified Powered Mechanical Equipment (SPME) and the undertaking of Prescribed Construction Work (PCW) during the restricted hours in a designated area are controlled by the TM-DA. Construction plant or equipment classified as SPME under the TM-DA includes hand-held breakers, bulldozers, concrete mixer lorries, dump trucks and poker vibrators. The PCW includes the erection or dismantling of formwork or scaffolding, hammering, handling of rubble, wooden

boards, steel bars, or scaffolding material, and the disposal of rubble through plastic chutes.

- 6.1.1.5** The TM-DA details the procedures that should generally be adopted by the Authority for assessing the use of SPME during restricted hours and for determining whether a CNP would be issued.
- 6.1.1.6** Maximum noise levels from construction activities during restricted hours at affected NSRs are controlled under the TMs and shall not exceed the specified Acceptable Noise Levels (ANLs). These ANLs are stipulated in accordance with the Area Sensitivity Ratings established for the NSRs. The ANLs for construction works in Designated Areas are more stringent than those given in the GW-TM and summarised in **Table 6-2**.

Table 6-2 Acceptable Noise Levels for Construction during Restricted Hours

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

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

- 6.1.1.7** As defined in the Noise Control Designated Area Plan No. EPD/NP/NT-05 (see **Appendix 6A**), Tung Chung areas are within the Designated Area. Sha Lo Wan and Shan Shek Wan are however not within the Designated Area.
- 6.1.1.8** Despite any description made in this EIA, there is no guarantee that a CNP will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant TMs issued under the NCO. 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 a decision in granting a CNP. Nothing in the EIA report shall bind the Noise Control Authority in making a decision. If a CNP is to be issued, the Noise Control Authority shall include in it any conditions demand. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution under the NCO.

Percussive Piling

- 6.1.1.9** Under the TM-PP, CNPs are also required for percussive piling involving the use of diesel, pneumatic and / or steam hammer. This TM specifies the permitted hours and other conditions for percussive piling. **Table 6-3** lists the acceptable percussive piling noise levels for various types of NSR.

Table 6-3 Acceptable Noise Levels for Percussive Piling

NSR Window Type or Means of Ventilation	ANL (dB(A))
(i) NSR (or part of NSR) with no window or other opening	100
(ii) NSR with central air conditioning system.	90
(iii) NSR with windows or other openings but without central air conditioning system	85

- 6.1.1.10** Depending on the numbers and types of piling machines and the separation from NSRs, percussive piling may be restricted to 12, 5 or 3 hours per day. For NSRs that are particularly sensitive to noise, such as hospitals, medical clinics, educational institutions and courts of law, a further reduction of 10 dB(A) shall be applied to the above ANLs.

6.1.2 Operational Noise

6.1.2.1 The TM-EIAO has stipulated the noise standards for various noise sources as shown in the following table.

Table 6-4 Noise Standards for Operational Phase

Common Uses	Noise Standards ^[1]				
	Aircraft Noise (Noise Exposure Forecast: NEF)	Helicopter Noise L _{max} dB(A)	Road Traffic Noise L ₁₀ (1hour) dB(A)	Rail Noise	Fixed Noise Sources
All domestic premises including temporary housing accommodation	25	85	70	(see Note 2)	(a) 5dB(A) below the appropriate Acceptable Noise Levels (ANL) shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites, or
Hotels and hostels	25	85	70	(a) The appropriate Acceptable Noise Levels shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites and	(b) the prevailing background noise levels (For quiet areas with level 5 dB(A) below the ANL)
Offices	30	90	70	(b) L _{max} (2300-0700 hours) = 85dB(A)	
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	25	85	65		
Places of public worship and courts of law	25	85	65		
Hospitals, clinics, convalescences and homes for the aged, diagnostic rooms, wards	25	85	55		

Notes:

[1] The above standards apply to uses that rely on opened windows for ventilation.

[2] Rail noise is under the control of the Noise Control Ordinance and shall comply with the Acceptable Noise Levels laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The criteria for noise transmitted primarily through the structural elements of the building or buildings should be 10dB(A) less than the relevant acceptable noise level.

Fixed Noise Sources

6.1.2.2 Operational noise from fixed noise sources is controlled under the NCO's *Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites*. To plan for a better environment, the TM-EIAO has specified the following requirements, whichever is more stringent.

- 5 dB(A) below the appropriate ANLs in the Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites; or
- the prevailing background noise levels.

- 6.1.2.3** The ANLs for different Area Sensitivity Ratings during different periods are summarized in the following table.

Table 6-5 Acceptable Noise Levels (ANL) for Fixed Noise Sources

Time Period	ANL, dB(A)			ANL-5, dB(A)		
	ASR A	ASR B	ASR C	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70	55	60	65
Evening (1900 to 2300 hours)	60	65	70	55	60	65
Night (2300 to 0700 hours)	50	55	60	45	50	55

ASR – Area Sensitivity Rating

Road Traffic Noise

- 6.1.2.4** The criteria for assessing road traffic noise is given in the TM-EIAO and tabulated in **Table 6-4**. For domestic premises, hotels, hostels and offices, the criterion is 70dB(A). For educational institutes and places of worship, the criterion is 65dB(A). For hospitals, clinics etc, a more stringent criterion of 55dB(A) is stipulated. It should be noted that all these criteria only apply to NSRs that rely on open-windows for ventilation.

Aircraft & Helicopter Noise

- 6.1.2.5** The noise criteria for aircraft and helicopter noise are given in **Table 6-4**. For aircraft noise, NSRs should be planned beyond the NEF25 contour, except for offices which should be beyond the NEF30 contour.
- 6.1.2.6** For helicopter noise, NSRs should be planned beyond to have the noise impacts less than 85dB(A) L_{max} , except for offices which should be exposed to noise impacts less than 90dB(A) L_{max} .
- 6.1.2.7** Similar to the road traffic noise, all these criteria only apply to NSRs replying on open-windows for ventilation.

6.2 Noise Sensitive Receivers

- 6.2.1** With reference to Annex 13 of the TM-EIAO, NSRs include residential uses (all domestic premises including temporary housing), institutional uses (educational institutions including kindergarten and nurseries), hospitals, medical clinics, homes for the aged, convalescent homes, places of worship, libraries, court of law, performing arts centres, auditoria and amphitheatres, country park and others.
- 6.2.2** Representative NSRs within a distance of 300 m from the either side of the project boundary have been identified. For HKBCF, all the buildings within 300m from the project boundary are provided with sealed facade and hence would not be a adversely affected by noise. Hence, the nearest NSRs at distance further away and with a direct line of sight will also be included in the assessment. For HKLR, there are village houses within 300m from the project boundary. These NSRs are considered in this noise assessment.
- 6.2.3** The first layer of NSRs has been identified and selected as Assessment Points (APs). These APs will cover all existing sensitive developments (including those occupied before completion of the construction) for construction noise assessment, and both the existing and planned developments for operational noise assessment.
- 6.2.4** The existing NSRs are identified by means of topographic maps, aerial photos, land status plans and several site surveys. Planned/committed NSRs are identified by making reference to relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other published plans in relation to the

Planning and Development on Lantau.

- 6.2.5** According to the latest information, all the premises within HKBCF are facility offices and would be provided with air-conditioning. Hence, there are no NSRs within the boundary of HKBCF. HKLR is a viaduct and tunnel and there are no other developments of NSRs.
- 6.2.6** The existing and planned NSRs in the vicinity, which may be affected by HKBCF and HKLR are identified in the following table. The locations of the NSRs are shown on **Figures 6.1a-j** and the assessment points are illustrated in **Appendix 6B**.

Table 6-6 Existing / Planned NSRs

No.	NSR	Assessment Points	No. of Storey	Nature
N1	San Shek Wan	101 - 102	3	Residential
N2	Sha Lo Wan Chung Hau	103	1	Temple
		104	1	Residential
N3	Tin Sum	105	3	Residential
N4	Ma Wan Chung	106 - 107	3	Residential
N5	Yat Tung Estate	108 - 110	50	Residential
N6	Tung Chung Crescent	113	30	Residential
N7	Fu Tung Estate	115	33	Residential
N9	Seaview Crescent	126, 127	50	Residential
N10	Coastal Skyline	128, 130, 132	50	Residential
N11	LeBleu	134	50	Residential
N12	Caribbean Coast	138 - 149	3	Residential
N13	Ho Yu College (Sik Sik Yuen)	149	6	School
N13	Ho Yu Primary School (Sik Sik Yuen)	150	6	School
N14	Tung Chung West Development (Planned Development)	152 - 153	To be determined	To be determined
N15	Tung Chung East Development (Planned Development)	156 - 161	To be determined	To be determined

[1] The NSRs at the eastern coast of Tung Chung East Future Development are included in the EIA for TMCLKL.

6.3 Potential Concurrent Projects

- 6.3.1** The concurrent projects that would have cumulative environmental impacts during the construction and operation phases of HKBCF and HKLR is given in **Section 1**. Environmental impacts considered include noise, air quality, water quality, ecology, fisheries, landscape etc.
- 6.3.2** The following concurrent projects are relevant for the assessment of cumulative noise assessment.

Construction Phase

- Lantau Logistics Park (LLP)^[1];
- Tuen Mun – Chek Lap Kok Link (TMCLKL)^[1];
- Hong Kong-Zhuhai-Macao (HZMB) Main Bridge^[1].

Operation Phase

- Lantau Logistics Park^[1];
- Possible Lantau Logistics Park Extension or other compatible uses^[3];
- Future Tung Chung East and West Future Developments^[3];
- Road P1 (Sham Shui Kok to Sunny Bay) at North Lantau;

- Future commercial development (such as hotels) at HKIA;
- TMCLKL;
- HZMB Main Bridge^[4].

[1] LLP, TMCLKL and HZMB Main Bridge are located more than 2 km from the NSRs of concern. Hence, there would not be any significant cumulative construction noise impacts.

[2] The induced traffic from all these projects has been included in the cumulative assessment.

[3] These are separated DP under the EIAO and hence and fixed plant noise would be mitigated by the respective project proponents to ensure compliance with the legislative criteria.

[4] Any fixed noise sources would be located more than 4 km from the NSRs of concern.

6.4 Construction Noise Assessment

6.4.1 General Assessment Procedures

6.4.1.1 Construction noise assessment will be conducted based on the following procedures:

- Determine the assessment area, and identify representative NSRs that may be affected by the works;
- Obtain the construction method and work sequence for the construction period;
- Obtain the plant items for each corresponding construction work sequence;
- Determine the sound power levels of the plant items according to the information stated in the TM-GW or other recognised sources of reference, where appropriate;
- Calculate the correction factors based on the distance between the NSRs and the notional noise source positions of the work sites;
- Apply corrections for façade, distance, barrier attenuation, acoustic reflection where applicable;
- Quantify the level of impact at the NSRs, in accordance with TM-GW; and
- Predict the cumulative noise impacts by any concurrent construction works in the vicinity.

6.4.2 Locations of Representative NSRs

6.4.2.1 For construction noise assessment, representative NSRs locations that would be must affected by the construction activities have been chosen from **Table 6-6** and are summarised as below.

Table 6-7: Representative NSRs for construction noise assessment

No.	NSR	Assessment Points	Nature
N1	San Shek Wan	101 - 102	Residential
N2	Sha Lo Wan Chung Hau	103	Temple
		104	Residential
N3	Tin Sum	105	Residential
N4	Ma Wan Chung	106	Residential
N6	Tung Chung Crescent	113	Residential
N9	Seaview Crescent	126	Residential
N11	LeBleu	136	Residential

No.	NSR	Assessment Points	Nature
N12	Caribbean Coast	147	Residential
N13	Ho Yu College (Sik Sik Yuen)	149	School

6.4.2.2 For construction noise assessment, only existing NSRs are considered. NSRs for the planned development will not be occupied during the construction stage and hence will not be included in the construction noise assessment.

6.4.3 Tentative Construction Programme

6.4.3.1 Tentatively, the construction of HKBCF and the HKLR would commence in 2010 and would last for about 7 years. According to the current programme, construction work during restricted hours is not required. The following table summarise the key construction date. **Appendix 6C** presents the tentative construction programme.

Table 6-7A Summary of Key Construction Date

Project	Commencement	Completion	Duration
HKBCF – Phase 1	2010	2015	~ 5 Year
HKBCF – Phase 2	2011	2016	~ 6 Year
HKLR	2011	2015	~ 4 Year

6.4.3.2 Proposed Work Area 2 will be used for site office, storage and maintenance. Hence, it will not be included in the construction noise assessment.

6.4.3.3 A total of 2 concrete batching plants will be located at Tai Ho (near Siu Ho Wan Sewage Treatment Work) and To Kau Wan (near Toll Plaza of NLH). As there are no NSRs within 300m of the sites, these sites will not be included in the construction noise assessment. Location of the sites is shown on **Figure 6.2**.

6.4.4 Construction Noise Sources

6.4.4.1 According to the latest engineering design, the construction would mainly comprise of the following activities.

HKBCF

- Reclamation of about 130ha;
- Diversion of existing roads and utilities;
- Internal infrastructure;
- APM construction.

HKLR

- Reclamation of about 23ha;
- Viaduct of about 9.4km
- Tunnel of about 1.1 km

6.4.4.2 As discussed in **Section 6.3.2**, other concurrent projects including LLP, TMCLKL and HZMB Main Bridge are all located at more than 2 km from existing NSRs of concern. Hence, there would not be any significant cumulative construction noise impacts.

6.4.4.3 The plant inventory for the above activities is provided by the Engineer and is given in **Appendix 6D**. Powered Mechanical Equipment (PME) that would be used for the construction includes excavators, trucks, hydraulic breakers, concreting equipment etc.

6.4.5 Cut-off Distance for Notional Noise Source

6.4.5.1 Since some of the notional noise sources for HKBCF and HKLR are located at more than 3km from respective NSRs, it is considered that the noise impacts would be insignificant and would not be included in the construction noise assessment.

6.4.6 Utilisation Rates of Powered Mechanical Equipment

6.4.6.1 Practically, the PME's will not be operating for all times within a work site. In this assessment, the utilization rates have been reviewed by the engineer and have been concluded to be practicable for the purpose of this EIA. **Appendix 6E** tabulates the adopted utilisation rates and table below summarizes the utilization rate.

Table 6-8 Utilization Rates of PME

PME	Typical Utilization Rate
Asphalt paver	50%
Hand-held breaker, hydraulic breaker	50%
Breaker (Pneumatic)	80%
Hydraulic Breaker	80%
Mobile crane	30%
Derrick lighter	70%
Excavator	70%
Backactor	70%
Lorry	70%
Roller	50%
Tug boat	20%
Deck Traveller	20%

6.4.7 Noise Assessment Tool

6.4.7.1 An in-house program has been used for construction noise calculations. Initially, the program runs were conducted without any mitigation measures (ie the "Unmitigated Scenario"). Where noise level exceedance was identified, further runs would be made assuming different combinations of mitigation measures to be incorporated (ie the "Mitigated Scenario").

6.4.8 Assessment Results for the Unmitigated Scenario

6.4.8.1 According to the latest engineering design, the construction would mainly comprise of the activities as described in Section 3. The corresponding Sound Power Levels (SWLs) of these activities have been estimated according to the PME's SWLs and the assessment methodology in the GW-TM. **Appendix 6E** presents the calculation of the SWLs for each PME. **Appendix 6F** presents the distance between the notional sources and the NSRs, screening effects due to terrains etc. **Appendix 6G** presents the calculation of the SWLs for each month during the construction period.

6.4.8.2 **Appendix 6H** also presents the calculated construction noise impacts at selected representative NSRs. The predicted construction noise impacts on the NSRs are summarised in the tables below. **Appendix 6HA** shows a sample of calculation.

Table 6-9 Construction Noise Impact at Noise Sensitive Receivers

ID	NSR	AP	Total Noise Impacts, dB(A)	Criterion, dB(A)	Compliance (Y/N)	Uses
N1	San Shek Wan	101	72	75	Y	Residential
		102	71	75	Y	Residential
N2	Sha Lo Wan Chung Hau	103	74	75	Y	Temple

ID	NSR	AP	Total Noise Impacts, dB(A)	Criterion, dB(A)	Compliance (Y/N)	Uses
		104	80	75	N	Residential
N3	Tin Sum	105	70	75	Y	Residential
N4	Ma Wan Chung	106	70	75	Y	Residential
N6	Tung Chung Crescent	113	71	75	Y	Residential
N9	Seaview Crescent	126	74	75	Y	Residential
N11	LeBleu	136	72	75	Y	Residential
N12	Caribbean Coast	147	70	75	Y	Residential
N13	Ho Yu College (Sik Sik Yuen)	149	71	65	N	School

6.4.8.3 It can be seen from the above table that assessment points of 104 in Sha Lo Wan Chung Hau (N2) and 149 of Ho Yu College Sik Sik Yuen (N13) exceed the criterion of 75 dB(A) and 65dB(A) by 5dB(A) and 6dB(A) respectively.

6.4.9 Assessment Results for the Mitigated Scenario

6.4.9.1 The predicted noise levels show that the unmitigated construction noise impacts would exceed the daytime noise criteria. Mitigation measures are therefore required. The following mitigation measures have been considered:

- Good site practices to limit noise emissions at the source;
- Use of quiet plant and working methods;
- Use of site hoarding as noise barrier to screen noise at ground level of NSRs;
- Use of shrouds / temporary noise barriers to screen noise from relatively static PMEs;
- Scheduling of construction works outside school examination periods in critical area; and
- Alternative use of plant items within one worksite, wherever practicable.

6.4.9.2 The above mitigation measures would need to be implemented in all work sites as good practices. It should be noted that whilst “Good Practice” mitigation measures would help to alleviate the noise impacts, some of these measures have not be included in the quantitative assessment as discussed in the following sections. This would ensure a more conservative assessment.

6.4.9.3 Detailed descriptions of these mitigation measures are given in the following sections.

6.4.10 Good Site Practices and Noise Management Techniques

6.4.10.1 Good site practice and noise management techniques could considerably reduce the noise impact from construction site activities on nearby NSRs. The following measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;
- machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;
- silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;

- mobile plant should be sited as far away from NSRs as possible and practicable; and
- material stockpiles, site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

6.4.10.2 The benefits of these techniques can vary according to specific site conditions and operations. The environmental noise climate would certainly be improved through these control practices, although the improvement can only be quantified during implementation when specific site parameters are known. The assessment has therefore not taken into account the effectiveness of “Good Site Practices and Noise Management Techniques”.

6.4.11 Use of Site Hoarding

6.4.11.1 Purpose built temporary noise barriers (approx 2.5m high) located on the site boundaries between noisy construction activities and NSRs could generally reduce noise levels at low-level zone of NSRs through partial screening. In general, this would provide minimum 5 dB(A) attenuation for the low level receivers. It would be possible for the Contractor to provide these in the form of site hoardings to achieve this attenuation effect, provided that the barriers have no openings or gaps and have a superficial surface density of at least 14kg/m². Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period. For conservative assessments, however, the site hoarding has not been taken into consideration in the construction noise assessments.

6.4.12 Use of Movable Noise Barrier & Full Enclosure for Relatively Static Plant

6.4.12.1 Movable temporary noise barriers that can be located close to noisy plant and be moved concurrently with the plant along a worksite can be very effective for screening noise from NSRs. A typical design which has been used locally is a wooden framed barrier with a small-cantilevered upper portion of superficial density no less than 14kg/m² on a skid footing with 25mm thick internal sound absorptive lining. This measure is particularly effective for low level zone of NSRs. A cantilevered top cover would be required to achieve screening benefits at upper floors of NSRs.

6.4.12.2 Movable barriers will be used for some PME (e.g. pipe pile rigs, auger). It is anticipated that suitably designed barriers could achieve at least 5 - 10dB(A) reduction. For a conservative assessment, only a reduction of 5dB(A) is assumed.

6.4.12.3 The use of full enclosure has been considered in this assessment to shelter relatively static plant including air compressor, generator. These enclosure barriers can provide about 10dB(A) noise reduction. For electric saw, movable noise barriers of 5dB(A) attenuation have been assumed.

6.4.12.4 A summary of the barrier and enclosure adopted for various PMEs, and the associated noise reduction is given in **Appendix 6E** and summarised as below:

<u>PME</u>	<u>Enclosure / Barriers</u>	<u>Attenuation, dB(A)</u>
Compressor	Enclosure	-10dB(A)
Breaker (Pneumatic)	Movable Barrier	-5dB(A)
Concrete Truck	Movable Barrier	-5dB(A)
Concrete Pump	Movable Barrier	-5dB(A)
Generator	Enclosure	-10dB(A)
Water Pump	Enclosure	-10dB(A)

6.4.13 Use of “Quiet” Plant and Working Methods

6.4.13.1 The use of quiet plant is a feasible solution to tackle adverse noise impacts associated with construction works. It is generally known (supported by field measurement) that particular models of construction equipment are quieter than standard types given in the TM-GW. Whilst it is generally considered too restrictive to specify that the Contractor has to use specific models or items of plant, it is reasonable and practicable to set plant noise performance specifications for specific PME so that some flexibility in selection of plant is allowed. A pragmatic approach would be to request that the Contractor independently verifies the noise level of the plant proposed to be used and demonstrates through furnishing of these results, that the plant proposed to be used on the site meets the requirements.

6.4.13.2 The use of quiet plant associated with the construction works is prescribed in British Standard “Noise Control on Construction and Open Sites, BS5228: Part 1: 1997” which contains the SWLs for specific quiet PME. It should be noted that while various types of silenced equipment could be found in Hong Kong, EPD when processing a CNP application for evening or night time works may apply the noise levels specified in the TM-GW and TM-DA. CNP applications which contain sufficient details of any particularly quiet items of PME or any special noise control measures which the CNP applicant proposes to employ on the site may be given special consideration by the Noise Control Authority.

6.4.14 Sequencing Operation of Construction Plant Equipment

6.4.14.1 In practice, some plant items will operate sequentially within the same work site, and certain reduction of the predicted noise impacts could be achieved. However, any additional control on the sequencing of plant will impose a restrictive constraint to the Contractor on the operation and planning of plant items, and the implementation of the requirement would be difficult to be monitored. Hence, sequencing operation of PME has not been taken into consideration in the construction noise assessments, except those specified in **Section 6.4.6** for which the realistic operating time has been incorporated.

6.4.15 Assessment Results for the Mitigated Scenario

6.4.15.1 With the adoption of the above mitigation measures, **Appendix 6I** presents the calculation of the SWLs for each month during the construction period.

6.4.15.2 **Appendix 6J** presents the calculated construction noise impacts at selected representative NSRs. The predicted construction noise impacts on the NSRs are summarised in the tables below.

Table 6-10 Construction Noise Impact at Noise Sensitive Receivers

ID	NSR	AP	Total Noise Impacts, dB(A)	Criterion, dB(A)	Compliance (Y/N)	Uses
N2	Sha Lo Wan Chung Hau	104	72	75	Y	Residential
N13	Ho Yu College (Sik Sik Yue)	149	65	65	Y	School

6.4.15.3 It can be seen from the above table that assessment points of 104 in Sha Lo Wan Chung Hau (N2) and 149 of Ho Yu College Sik Sik Yuen (N13) would comply the criterion of 75 dB(A) and 65dB(A) respectively.

6.4.16 Cumulative Construction Noise

6.4.16.1 The assessment mentioned on **Section 6.4.15** has included the cumulative construction noise from HKLR and HKBCF. As far as the existing NSRs are concerned, there are no other construction activities from other concurrent

projects. The results presented in **Section 6.4.15** illustrate the cumulative construction noise impacts.

6.5 Road Traffic Noise Assessment

6.5.1 Road Traffic Noise

- 6.5.1.1** Road traffic noise calculation is based on the method of UK Department of Transport “Calculation of Road Traffic Noise (CRTN)”. The predicted noise levels at the sensitive receivers include 2.5dB(A) facade reflection and correction factors of effects due to gradient, distance, view angle, road surface and barriers. The standard 0.8m solid parapet along viaduct has also been included in the assessment.
- 6.5.1.2** The computer programme, RoadNoise 2000, has been used to model traffic noise from road networks. It complies with the *Calculation of Road Traffic Noise (CRTN)* developed by the UK Department of Transport. The road traffic noise will be presented in terms of noise levels exceeded for 10% of the one-hour period for the hour having the peak traffic flow [i.e. $L_{10(1hr)}$ dB(A)].
- 6.5.1.3** According to the EIA Study Brief, calculations of future road traffic noise will be based on the peak hourly flow for the maximum traffic projected within a 15 years period upon commencement of operation. The traffic projection will take into account the induced traffic due to the operation of other planned roads and committed projects. Since the commencement year for BCF and HKLR is Year 2016, the assessment year for road traffic noise is taken as Year 2031.
- 6.5.1.4** The extent of road sections paved with friction course materials has been provided by Highways Department and are shown in **Appendix 6K**. This information has been included in the road traffic noise model accordingly.
- 6.5.1.5** The following table summarises the traffic flow data for the key roads assumed in the noise assessment. The traffic forecast has been submitted to TD and TD has no objection for use in this EIA.

Table 6-11 Summary of Peak Hour Traffic Flow Data at 2031

Road Section	Projected Peak Hour Flow (veh/h)	% Heavy Vehicle	Design Speed (km/h)
North Lantau Highway, East of Tung Chung Eastern Interchange (Airport bound)	3,613	47	110
North Lantau Highway, East of Tung Chung Eastern Interchange (Tsing Yi bound)	3,545	49	110
Cheung Tung Road	400	30	50
North Lantau Highway, West of Tung Chung Eastern Interchange (Airport bound)	1,984	42	110
North Lantau Highway, West of Tung Chung Eastern Interchange (Tsing Yi bound)	1,649	46	110
HKLR (In bound)	1,121	62	100
HKLR (Out bound)	982	63	100
Road P1 (Sham Shui Kok to Sunny Bay)	965	38	50
TMCLKL (BCF and Tuen Mun bound)	1,321	57	80
TMCLKL (Tsing Yi and Airport bound)	1,479	53	80

- 6.5.1.6** For the purpose of this assessment, roads will be classified as the following categories. **Appendix 6L** shows the extent of these road categories.

- (i) New roads including roads within HKBCF, and those roads connecting from HKBCF to Hong Kong International Airport (HKIA) and HKLR;

- (ii) Existing roads within the study boundary including existing roads that remain either completely unchanged or that undergo only very minor alterations; and
- (iii) Other planned roads within the study boundary including the future Road P1 (from Sham Shui Kok to Sunny Bay), TMCLKL etc.

6.5.2 Locations of Representative NSRs

6.5.2.1 For road traffic noise assessment, representative NSRs locations will be chosen from **Table 6-6** and are summarised as below.

Table 6-12A Representative NSRs for road traffic noise

No.	NSR	Assessment Points	No. of Storey	Nature
N1	San Shek Wan	101 - 102	3	Residential
N2	Sha Lo Wan Chung Hau	103	1	Temple
		104	1	Residential
N3	Tin Sum	105	3	Residential
N4	Ma Wan Chung	106 - 107	3	Residential
N14	Tung Chung West Development (Planned Development)	152 – 153	To be determined	To be determined
N15	Tung Chung East Development (Planned Development)	156 – 161	To be determined	To be determined

6.5.2.2 It should be noted that the planned NSRs at the western coast of Tung Chung East Future Development are closer to HKBCF and HKLR than existing NSRs in Tung Chung. Hence, as far as the impacts due to HKBCF and HKLR are concerned, the selected NSRs (i.e. 156 - 161) would better represent the noise impacts to Tung Chung East Future Development.

6.5.3 Predicted Road Traffic Noise Impacts

6.5.3.1 As discussed in **Section 6.2.5**, all the premises in BCF would be provided with air-conditioning and do not rely on open-windows for ventilation. Hence, noise assessment points would not be included for the buildings within the HKBCF.

6.5.3.2 The predicted road traffic noise levels at the representative NSRs in the vicinity of BCF and HKLR are summarized in the following table and **Appendix 6M** includes the noise impacts on various levels.

Table 6-12B Predicted Road Traffic Noise Impact (Year 2031)

ID	NSR	AP	Total Noise Impacts, dB(A)	Criterion, dB(A)	Compliance (Y/N)	Uses
N1	San Shek Wan	101	59	70	Y	Residential
		102	58	70	Y	Residential
N2	Sha Lo Wan Chung Hau	103	64	65	Y	Temple
		104	68	70	Y	Residential
N3	Tin Sum	105	69	70	Y	Residential
N4	Ma Wan Chung	106	66	70	Y	Residential
		107	59	70	Y	Residential
N14	Tung Chung West Development (Planned Development)	152	67	70 ^[1]	Y	Undetermined
		153	69	70 ^[1]	Y	Undetermined
		154	69	70 ^[1]	Y	Undetermined

ID	NSR	AP	Total Noise Impacts, dB(A)	Criterion, dB(A)	Compliance (Y/N)	Uses
N15	Tung Chung East Development (Planned Development)	156	67	70 ^[1]	Y	Undetermined
		157	66	70 ^[1]	Y	Undetermined
		158	66	70 ^[1]	Y	Undetermined
		159	66	70 ^[1]	Y	Undetermined
		160	66	70 ^[1]	Y	Undetermined
		161	66	70 ^[1]	Y	Undetermined

[1] Assume residential for assessment purposes.

San Shek Wan and Sha Lo Wan

- 6.5.3.3** The predicted cumulative road traffic noise level for the residential NSRs at San Shek Wan (N1) and Sha Lo Wan Chung Hau (N2) are in the range of 59 – 64dB(A) which do not exceed the stipulated noise criterion of 70dB(A).
- 6.5.3.4** The noise impacts on the temple at Sha Lo Wan is 64dB(A) which also comply with the respective criterion of 65dB(A).
- 6.5.3.5** The predicted cumulative traffic noise impacts comply with the legislative requirements and there are no residual impacts. Additional noise mitigation measures are not required.

Tin Sum

- 6.5.3.6** The predicted cumulative road traffic noise level for the residential NSRs at Tin Sum (N3) is 69dB(A) which do not exceed the stipulated noise criterion of 70dB(A).
- 6.5.3.7** The predicted cumulative traffic noise impacts comply with the legislative requirements and there are no residual impacts. Additional noise mitigation measures are not required.

Ma Wan Chung

- 6.5.3.8** The predicted cumulative road traffic noise level for the residential NSRs at Ma Wan Chung (N4) is 59 - 66dB(A) which do not exceed the stipulated noise criterion of 70dB(A).
- 6.5.3.9** The predicted cumulative traffic noise impacts comply with the legislative requirements and there are no residual impacts. Additional noise mitigation measures are not required.

Tung Chung East and West Future Developments

- 6.5.3.10** There are no confirmed implementation programme and landuse for Tung Chung East and West Future developments. It is not sure whether there are NSRs (ie NSRs 152 & 153) at locations close to their project boundary. For the purposes of this EIA, it is however assumed that there would be residential premises. Results indicates that the predicted traffic noise impacts on Tung Chung West development would be in the order of 67 – 69dB(A) which would comply the criterion of 70dB(A) for residential premises. The predicted traffic noise impacts on Tung Chung East Development would be 66 – 67dB(A) and hence would also comply with the 70dB(A) noise criterion for residential premises.
- 6.5.3.11** As discussed in S.6.5.2.2, the planned NSRs at the eastern coast of Tung Chung East Future Development are assessed under the EIA for TMCLKL. According to their assessment finding, the traffic noise impacts would comply with the relevant criterion and mitigation measures are not required.

6.5.4 Cumulative Traffic Noise Impacts

6.5.4.1 The traffic forecast has included all planned projects by 2031. The traffic noise impact assessment mentioned in Section 6.5.3 has included the traffic induced by all these concurrent projects (including LLP, TMCLKL, Tung Chung East and West Future Developments etc). Hence, the assessment results presented in Section 6.5.3 represent the cumulative traffic noise impacts.

6.6 Assessment for Aircraft & Helicopter Noise

6.6.1 Since the NSRs within the BCF would be provided with air conditioning and hence do not rely on open windows for ventilation, there would not be any adverse helicopter noise and aircraft noise impacts on the project.

6.6.2 Since there will not be helipad facilities within the HKBCF and HKLR, there would not be any helicopter noise impact caused by HKBCF and HKLR.

6.7 Assessment for APM Ground-borne Noise

6.7.1 A new APM alignment would run about 5m from the existing Marriot Hotel located to the east of the Airport Island. The new APM would adopt similar design as the existing one. **Appendix 6N** shows the new APM alignment.

6.7.2 2 APM lines are proposed within the existing airport providing connection between the airfield, T1, T2, and the SkyPier. The APMs would be in a 4-car arrangement. The average operating speed will be about 24 kph. The APMs would be installed with inflated tyres as ordinary vehicles and hence any ground-borne noise induced from these inflated tyres would not be significant. However, these APMs will have guide wheels on both sides of the car body. The guide wheels may generate some ground-borne noise.

6.7.3 Most of the buildings along the proposed APM alignment are offices, open space etc. However, the Sky Marriott Hotel is located within 5m horizontal distance from the proposed APM line. According to the TM-EIAO, a hotel is classified as Noise Sensitive Receiver (NSR) by nature. Since this hotel has been installed with sealed glazing and central air-conditioning, impacts due to air-borne noise would not be any issue. However, the Sky Marriott Hotel shall still be considered as a NSR for ground-borne noise assessment.

6.7.4 According to the information available, the lowest level of guestrooms in the Sky Marriott Hotel is about 20m above the local ground and there are no noise sensitive basement areas.

6.7.5 The study area is classified as “urban”. An Area Sensitivity Rating of “C” is considered appropriate for the NSR not influenced by road traffic noise from major roads.

6.7.6 The following table shows the ground-borne noise criteria for the APM.

Table 6-13 Ground-borne Noise Criteria for APM

Period	ASR	Noise Level, dB(A)	
		ANL (Leq, 30 mins)	ANL – 10 (Leq, 30 mins)
Day & Evening	C	70	60
Night	C	60	50

6.7.7 Liaison had been made with the airport operator in identifying locations that are as close to the existing APM lines as possible. Results indicate that there are no office areas or other noise sensitive areas that are close to the existing APM lines. The most favourable locations are at a PSD Control Room and a Motor Control Centre Room located at about 2.5 – 7m from the existing APM line. The following

table and **Appendix 6O** summarise the measurement locations.

Table 6-14 APM Vibration Measurement Distance

Location	Separation Dist, m		Remark
	Horiz	Vert	
PSD Control Room	7.0	0	APM leaving / arriving platform
Motor Control Center Room	2.5	0	APM travelling at constant speed of about 24 kph

Note: Passby duration is about 6 seconds.

- 6.7.8** Accelerometers were located on the floor to measure the RMS vibration level. **Appendix 6P** shows the results of vibration level measurement. The maximum vibration measurement results are 75dB (ref 1x10⁻⁹mm/s) and the corresponding APM travelling speed was about 24kph. It should be noted that the max vibration level collated from the PSD room (resulting from accelerating and decelerating APM) has been adopted as the worst case assessment.
- 6.7.9** **Appendix 6Q** shows the assessment results which are based on the measured vibration levels and other correction factors as appropriate (eg US Federal Transit Administration “Transit Noise and Vibration Impact Assessment”, Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise).
- 6.7.10** Key information in the assessment is confirmed by the future operator and is given below:
- Smooth rail running surfaces for guide rail systems as the existing APM system is maintained
 - The separation distance between the 2 APM tunnels and the Sky Marriot Hotel is at least 5m
 - The maximum speed of the APM is 62kph.
 - The train headway is about 13 per direction in 30 minutes
 - APM is in 4-car arrangement (total length ~39m) with a total weight of about 52 tonne (or 76 tonne with passenger)
- 6.7.11** Results indicate that, with the above key assumptions, the predicted ground-borne noise impacts are 43dB(A). This would comply with daytime noise criterion of 60dB(A) and the night-time noise criterion of 50dB(A). There are therefore no adverse ground-borne noise impacts and hence mitigation measures are not required.

6.8 Assessment for Fixed Noise Sources

6.8.1 Area Sensitivity Rating

6.8.1.1 For assessing fixed noise sources, the Area Sensitivity Ratings at the NSRs are defined in accordance with the relevant TMs. NLH is considered as an Influencing Factor (IF) due to the daily traffic flow of greater than 30,000 vehicles. In addition, the Hong Kong International Airport is an IF. An Area Sensitivity Rating of “B” is therefore assigned for the NSRs indirectly influenced by the IF and “C” for NSR directly influenced by the IF according to the TM.

6.8.1.2 The Area Sensitivity Ratings are determined based on the best available information at this stage and are unlikely to be different at the time of project implementation unless there are substantial changes such as building redevelopment or land use changes in the near vicinity of the NSRs. Nothing in this report shall bind the Noise Control Authority in the context of law enforcement against any fixed noise sources being assessed.

6.8.2 Prevailing Noise Levels

6.8.2.1 Noise measurements have been conducted to establish the prevailing noise levels along the proposed alignment. **Appendix 6R** shows the location of prevailing background noise measurement. A summary is given in **Table 6-15**.

Table 6-15 Prevailing Noise Measurements

Area	Time Period ^[1]	Prevailing Noise Levels ^[2] , dB(A) L _{eq, 30} min, dB(A)
Tung Chung Public Pier	Day & evening	51 - 59
	Night	45 - 47
Ngong Ping Skyrail Tung Chung Terminal	Day & evening	65 - 68
	Night	52 - 54
Coastal Skyline – Facing Tung Chung Waterfront Road	Day & evening	51 - 55
	Night	42 – 44
Caribbean Coast – Facing Ying Hei Road	Day & evening	61 – 63
	Night	50 - 53
Tung Chung East Future Development	Day & evening	48 - 58
	Night	45 - 55

Note:

^[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

^[2] Measurements conducted on March 2009

6.8.3 Noise Criteria

6.8.3.1 A summary of the noise criteria at NSRs caused by fixed plant noise is given in the following table. The prevailing noise level at each NSRs is based on its nearest prevailing background noise measurement location as shown in **Appendix 6R** and the prevailing noise level is extracted from **Table 6-16**.

Table 6-16 Summary of Noise Criteria at NSRs for Fixed Noise Sources

Area	Time Period ^[1]	Prevailing Noise Levels, dB(A) [1]	ASR	ANL-5 dB(A) [2]	Criteria dB(A) [#]
San Shek Wan (N1), Sha Lo Wan Chung Hau (N2), Tin Sum (N3), Ma Wan Chung (N4)	Day & evening	51	B	60	51
	Night	45	B	50	45
Yat Tung Estate (N5), Tung Chung West Development (N14)	Day & evening	51	B	60	51
	Night	45	B	50	45
Tung Chung Crescent (N6), Fu Tung Estate (N7) – Flats facing North	Day & evening	65	B	60	60
	Night	52	B	50	50
Seaview Crescent (N9), LeBleu (N11)	Day & evening	51	C	65	51
	Night	42	C	55	42
Caribbean Coast (N12), School near Caribbean Coast (N13) – Flats facing NLH	Day & evening	61	B	60	60
	Night	50	B	50	50
Tung Chung East Development (N15)	Day & evening	48	B	60	48
	Night	45	B	50	45

[#] = minimum of [1] & [2]

6.8.4 Fixed Noise Sources

HKBCF

6.8.4.1 A summary of the fixed noise sources within the HKBCF and HKLR include:

- Sewage Treatment Plant;
- Power Substation; and
- Seawater Intake Pumping Station

6.8.4.2 All the above noise sources (see Figure 6.4 for locations) would be accommodated inside solid buildings with louvers. In addition, all the NSRs are located at more than 1km from the above fixed industrial noise give the large separation distance, it is considered that the noise impacts would be insignificant and special noise mitigation measures are not required.

HKLR

6.8.4.3 The only fixed noise source in the HKLR is tunnel ventilation building at Scenic Hill (see Figure 6.3)

6.8.4.4 The separation distance between the tunnel ventilation building at Scenic Hill to the nearest NSRs at Tung Chung West Development (N14) is 550-650m. The resulting night-time sound power level for the tunnel ventilation building which comply the stipulated criterion of 45dB(A) as shown in Table 6-16 is 104dB(A) (See Table 6-16A for details). The sound power level calculation was taken account into 3dB(A) of facade effect and 3dB(A) of tonality. The daytime sound power level is 110dB(A) and has been estimated taking into account of the daytime noise criterion.

6.8.4.5 The future design and selection of the ventilation shall also aim to reduce the effect of tonality at the sensitive receivers.

Table 6-16A Calculation of Maximum Sound Power Level of the Ventilation Building of Scenic Hill Tunnel

	dB(A)	Remark
Night-time Noise Limit	45	AP154 of N14
Distance correction	+63	Separation distance of 550-650m
Tonality	-3	
Facade	-3	
Max SWL	104	Daytime SWL is 104 + 6 = 110 dB(A)

6.9 Conclusion

6.9.1 Construction noise assessment has been conducted. Results indicate that the noise impacts after the implementation of good site practices, quiet plant and some mitigation measures (eg temporary noise barriers etc) would comply with the stipulated noise criteria. Residual noise impacts are not anticipated.

6.9.2 Cumulative road traffic noise impacts on neighbouring noise sensitive receiver has been assessed to comply with statutory requirement. Residual traffic noise impacts are not anticipated.

6.9.3 The proposed APM would not generate adverse noise impacts on the neighbouring receivers and hence additional noise mitigation measures are not required.

6.9.4 Assessments have also been conducted for the operation activities within HKBCF and HKLR. Given the large separation distance from the neighbouring receivers and they are house in concrete buildings, it has been concluded that adverse impacts are unlikely.