

## 4 Noise Impact

### 4.1 Introduction

- 4.1.1.1 As discussed in Section 1, there are currently two public hospitals with helipad facilities for Helicopter Emergency Medical Services (HEMS) provided by the Government Flying Services (GFS) in Hong Kong. The majority of helicopter landings for the HEMS occurred at the helipad of the PYNEH.
- 4.1.1.2 The GFS mainly provides emergency services, such as search and rescue, air ambulance, medical evacuation, firefighting as well as supporting the law enforcement agencies.
- 4.1.1.3 The development of the Proposed Helipad aims at upgrading the HEMS and maintaining the speedy transfer of patients or organs to the hospitals as well as transportation of medical team to the emergency scene. The Proposed Helipad will be located at the rooftop of the New Block of QMH for the purpose of medical emergencies.
- 4.1.1.4 This section provides an evaluation of the potential noise impacts associated with the construction and operational phases of the Proposed Helipad. In the vicinity of the project, there are student halls, schools, residential buildings, etc., potential noise impact during construction and operation of the Helipad is anticipated.
- 4.1.1.5 The Proposed Helipad will be constructed after the completion of superstructure work for the New Block of the QMH. During construction phase of the helipad, Powered Mechanical Equipment (PME) to be used for the construction will be the primary noise sources. The major noise generating activities shall include:
- Construction of helipad, safety walkway, access ramp and the proposed noise mitigation measures (i.e. noise barriers and noise reducers).
- 4.1.1.6 The Proposed Helipad will only be used for medical emergencies and will not be used for commercial operations, transportation of guests and training flights or other non-emergency uses (except trial flights). The major noise source during the operational phase of the Project will be from helicopter activities as indicated below:
- Helicopter approach (approaching) towards the helipad while it is descending at an angle to the helipad;
  - Helicopter landing on and directly over the helipad (hovering, touch down and idling); and
  - Helicopter departure (taking-off) from the helipad while it is climbing up at an angle from the helipad surface during departure.
- 4.1.1.7 Noise impact assessment for the Proposed Helipad has been conducted in accordance with the requirements of Annexes 5 and 13 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO).

## 4.2 Criteria and Guidelines

### 4.2.1 Legislation, Standards and Guidelines

4.2.1.1 The local legislations and related guidance applicable to this noise impact assessment include:

- Noise Control Ordinance (NCO) (Cap. 400);
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499);
- Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO);
- Technical Memorandum on Noise from Construction Work other than Percussive Piling (TM-GW);
- Technical Memorandum on Noise from Construction Work in Designated Areas (TM-DA); and
- EIAO Guidance Note - Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance (GN 9/2010).

### 4.2.2 Construction Stage

#### ***Construction Noise during Non-restricted Hours***

4.2.2.1 Noise arising from construction for designated projects during the non-restricted hours, i.e., between 07:00-19:00 hours on any days not being a Sunday or general holiday, is assessed with reference to the noise criteria listed in Table 1B, Annex 5 of the TM-EIAO, which are summarised in [Table 4.1](#).

**Table 4.1 Noise Standards for Daytime Construction Activities (Non-restricted Hours)**

Uses	$L_{eq}$ (30 mins), dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)

Notes:

1. The above standards apply to uses which rely on opened windows for ventilation.
2. The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external façade.

### 4.2.3 Operational Phase

#### ***Helicopter Noise (Daytime Period)***

4.2.3.1 The standards for the helicopter noise (between 07:00 and 19:00 hours) for planning purposes are stipulated in Table 1A, Annex 5 of the TM-EIAO. They are summarised in [Table 4.2](#).

**Table 4.2 Helicopter Noise Standards for Planning Purpose**

Uses	Helicopter Noise $L_{max}$ dB(A) 07:00 to 19:00 hours
All domestic premises including temporary housing accommodation; Hotel and hostels; Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required; Places of public worship and courts of law; and Hospitals, clinics, convalescences and home for the aged, diagnostic rooms, wards	85
Offices	90

## Notes:

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

***Helicopter Noise (Evening and Night-time Period)***

- 4.2.3.2 In the TM-EIAO, there is no specific noise standard for helicopter operations during evening and night-time periods (i.e. between 19:00 and 07:00 hours on the next day). The assessment methodology and criteria shall be established on a case-by-case basis and made reference to similar projects in Hong Kong or the practices accepted by national/international organisations. A review on local and overseas/international practices has been conducted to investigate suitable assessment approach for the noise impact arising from emergency helicopter operations during evening and night-time periods.
- 4.2.3.3 There are four EIA reports for helipad developments in Hong Kong that have previously been approved under the EIAO. They included Peng Chau Helipad (EIA-107/2005), Expansion of Heliport Facilities at Macau Ferry Terminal (EIA-113/2005), Helipad at Yung Shue Wan, Lamma Island (EIA-114/2005), and Police Facilities in Kong Nga Po (KNP) (EIA-239/2016).
- 4.2.3.4 Helipads at Peng Chau and Yung Shue Wan are intended solely for emergency uses. A noise criterion  $L_{max}$  85dB(A) was adopted for assessing the helicopter noise impact on residential premises during daytime period while the noise criterion for emergency operation in evening and night-time was not proposed in both EIA studies.
- 4.2.3.5 The expansion of heliport facilities at Macau Ferry Terminal (MFT) in Sheung Wan provided additional capacity for its commercial helicopter services between Macau and Hong Kong. The EIA study adopted the statutory requirement of  $L_{max}$  85 dB(A) and  $L_{max}$  90 dB(A) for residential premises and offices respectively during daytime period. There is no helicopter events during night-time period and therefore the night-time helicopter noise criterion was not considered in the assessment. For flights during evening time period, a noise criterion  $L_{eq,4hr}$  65dB(A) was adopted which was established by considering the local existing noise environment of the study area (mainly commercial area) and compared with the noise standards adopted in overseas countries with similar circumstances. It was also

recommended to include the assessment criterion,  $L_{\max}$  85dB(A) for residential uses during the period 1900-2300 hours. The helicopter services provided in MFT are all scheduled for commercial purpose. It is different from the emergency helicopter services provided by the GFS in the Proposed Helipad which occurs randomly round the clock with a surrounding area mainly for residential uses. According to the information provided by the GFS, the existing emergency helicopter operation in PYNEH is only one flight in 2 days, 9 days, and 6 days during daytime, evening time, and night-time respectively in average. Hence, the noise criterion  $L_{\text{eq},4\text{hr}}$  65dB(A) is not suitable for this EIA study of the Proposed Helipad.

4.2.3.6 According to the EIA study for the Police Facilities in KNP, a proposed helipad was planned for police training (restricted from 0700 to 1900 only) and emergency operations (without time restriction). The EIA study reviewed the past projects in Hong Kong with similar issue and the noise criteria adopted in several overseas cities / countries (e.g. California (United States), Singapore, Japan and Victoria (Australia)). The findings revealed that no evening time / night-time noise criteria nor guidelines adopted for emergency helicopter operations (such as firefighting, medical emergencies and law enforcement) in those reviewed overseas cities / countries.

4.2.3.7 In this EIA, 1 review was also conducted on overseas/ international practices on helicopter noise and other associated requirements for helicopter operations in some cities with urban setting similar to Hong Kong. Key review findings are provided in [Appendix 4.1](#). The findings show that there is no statutory noise criterion for emergency helicopter services during evening and night-time periods. The emergency helicopter operations were generally exempted from the flight restrictions (noise standards and helicopter operations during evening and night-time periods) for the purposes such as medical emergencies, law enforcement, firefighting, military in those reviewed overseas countries. The situation is similar to the Project taking into account the necessity of HEMS in Hong Kong and the benefits provided by the Proposed Helipad in QMH.

## 4.3 Description of the Environment

4.3.1.1 The QMH is situated at Pok Fu Lam, the south western side of Hong Kong Island. It started providing services in April 1937. The Proposed Helipad will be constructed at the rooftop of the New Block of the QMH which is adjacent to the existing Block K. Site visits were conducted in August 2014, and April, May and July 2015 to investigate the existing environment in vicinity of the Project site. The area surrounding the Site was predominately residential with medium population density, including student halls of the University of Hong Kong.

4.3.1.2 The Project is located near a section of Pok Fu Lam Road from Mount Davis Road to Sassoon Road. Based on the site observation, the existing noise environment in the vicinity of the Proposed Helipad was dominated by the noise from the road traffic at Pok Fu Lam Road.

## 4.4 Noise Sensitive Receivers

- 4.4.1.1 Noise Sensitive Receivers (NSRs) (existing and planned) have been identified in accordance with Annex 13 of the TM-EIAO making reference to the relevant Outline Zoning Plans (i.e. Pok Fu Lam OZP No. S/H10/15, Kennedy Town & Mount Davis OZP No. S/H1/20, and Mid-levels West OZP No. S/H11/15), Development Permission Area Plan, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department.
- 4.4.1.2 In accordance with the EIA Study Brief, the spatial scope of the noise impact assessment shall include all areas within 300m from the project boundary and areas potentially affected by the flight paths of helicopter. NSRs along the flight path which are potentially affected by the helicopter operation, but located over 300m from the Proposed Helipad, were also included in the assessment. The representative existing and planned NSRs within the assessment area are identified and presented in [Table 4.3](#).
- 4.4.1.3 In QMH, the New Block and most other existing blocks are provided with central air-conditioning system and well-gasketed windows and do not rely on opened window for ventilation. According to the information from HA, Nurse Quarters A & B in QMH was converted into places for short-term or overnight resting and changing facilities for doctors, nurses and supporting staff on call or on shift duties since 2002. Window-type air conditioners and well-gasketed windows with good acoustic insulation are provided in the Nurse Quarters A & B. Also, the air-conditioning systems in Nurse Quarters A & B are operating constantly with all the well-gasketed windows kept closed except for maintenance and cleaning purposes. In the converted Senior Staff Quarters (SSQ), there would be no prescribed windows. The on call rooms in the converted SSQ will be equipped with air-conditioning and will not rely on opened window for ventilation.

4.4.1.4 Based on the information provided by the AFCD, only hiking trails, picnic site, information boards and shelter exist in the study area within the Country Park. Hence, no noise sensitive uses as mentioned in Table 1A of Annex 5 of the TM-EIAO is identified.

4.4.1.5 As observed in the desktop study and site visits, there are student halls located in the vicinity of the Proposed Helipad, including Madam S. H. Ho Residence, Lee Hysan Hall, Wei Lun Hall and R. C. Lee Hall. Schools and residential premises within the assessment area have also been identified. Hilly topography is located from north-northeast to south-southeast of the Project site and the NSRs are located at the other side of the hill. Detailed descriptions and locations of all representative NSRs are summarised in Table 4.3 and indicated in Figure 4.1 and Figure 4.1a to Figure 4.1c. The height information and photos of all representative NSRs are shown in Appendix 4.2 and Appendix 4.2a respectively. The NSR nearest to the Proposed Helipad and relying on opened windows for ventilation is selected as the representative NSR for the worst-case scenario assessment of the construction noise impact.

**Table 4.3 Representative Noise Sensitive Receivers**

NSR ID	Description	Land Use	No. of Storeys (Above Ground)	Hor. Dist. (m)	Ver. Dist. (m)	Existing/Planned	CNIA	HNIA
NSR 1	Planned NSR 1	Residential	19	509	53	Planned	-	✓
NSR 2	Radcliffe	Residential	23	475	83	Existing	-	✓
NSR 3	Royalton	Residential	25	423	83	Existing	-	✓
NSR 4	Ebenezer School	School	6	491	149	Existing	-	✓
NSR 5	Royalton II	Residential	19	391	85	Existing	-	✓
NSR 6	13 - 15 Northcote Close	Residential	6	422	189	Existing	-	✓
NSR 7	9 - 11 Northcote Close	Residential	6	441	179	Existing	-	✓
NSR 8	Patrick Manson Building	Residential	2	420	167	Existing	-	✓
NSR 9	R.C. Lee Hall	Residential	17	327	116	Existing	-	✓
NSR 10	Wei Lun Hall	Residential	17	273	112	Existing	✓	✓
NSR 11	Lee Hysan Hall	Residential	17	324	113	Existing	-	✓
NSR 12	Madam S.H. HO Residence for Medical Students	Residential	9	302	143	Existing	-	✓
NSR 13	23 Bisney Road	Residential	4	372	187	Existing	-	✓
NSR 14	21 Bisney Road	Residential	4	358	187	Existing	-	✓
NSR 15	18 - 24 Bisney Road	Residential	4	352	187	Existing	-	✓
NSR 16	Glamour Court Blocks A-B	Residential	4	336	190	Existing	-	✓
NSR 17	Glamour Court Blocks C-E	Residential	4	335	190	Existing	-	✓
NSR 18	Victoria Garden, Block 1	Residential	40	533	128	Existing	-	✓

NSR ID	Description	Land Use	No. of Storeys (Above Ground)	Hor. Dist. (m)	Ver. Dist. (m)	Existing/Planned	CNIA	HNIA
NSR 19	Victoria Garden, Block 2	Residential	40	518	127	Existing	-	✓
NSR 20	Cherry Court	Residential	4	494	219	Existing	-	✓
NSR 21	3 Consort Rise, Blocks 7 - 8	Residential	4	454	222	Existing	-	✓
NSR 22	TWGHs Jockey Club Care & Attention Home for the Elderly - Nurse's Quarters	Residential	3	568	277	Existing	-	✓
NSR 23	TWGHs Jockey Club Care & Attention Home for the Elderly	Homes for the aged	4	572	273	Existing	-	✓
NSR 24	English School Foundation - West Island School	School	7-10	511	238	Existing	-	✓
NSR 25	Greenvale, Block 5	Residential	2	521	211	Existing	-	✓
NSR 26	Greenvale, Block 4	Residential	3	515	202	Existing	-	✓
NSR 27	Greenvale, Block 3	Residential	3	479	204	Existing	-	✓
NSR 28	Greenvale, Block 2	Residential	3	458	204	Existing	-	✓
NSR 29	Greenvale, Block 1	Residential	3	453	198	Existing	-	✓
NSR 30	Mount Davis Village, House A7	Residential	2	488	184	Existing	-	✓
NSR 31	The High House	Residential	3	539	173	Existing	-	✓
NSR 32	7 Mount Davis Road	Residential	3	413	195	Existing	-	✓
NSR 33	Four Winds Apartments	Residential	13	467	154	Existing	-	✓
NSR 34	Mount Davis Garden	Residential	3	395	193	Existing	-	✓
NSR 35	Greenery Garden	Residential	16	428	152	Existing	-	✓
NSR 36	On Lee, Blocks A-B	Residential	3	473	167	Existing	-	✓
NSR 37	On Lee, Blocks C-E	Residential	3	460	168	Existing	-	✓
NSR 38	Kai Ming Temple	Public Worship	4	338	175	Existing	-	✓
NSR 39	Fook Wai Mansion	Residential	5	494	171	Existing	-	✓
NSR 40	Yue Yan Mansion, Block C	Residential	13	478	131	Existing	-	✓
NSR 41	Yue Yan Mansion, Block D	Residential	13	466	130	Existing	-	✓
NSR 42	Pokfulam Court	Residential	13	509	127	Existing	-	✓
NSR 43	Pokfulam Mansion	Residential	13	512	129	Existing	-	✓
NSR 44	92E Pok Fu Lam Road	Residential	4	541	168	Existing	-	✓
NSR 45	La Clare Mansion, Block A	Residential	13	601	130	Existing	-	✓
NSR 46	La Clare Mansion, Block B	Residential	13	606	131	Existing	-	✓

NSR ID	Description	Land Use	No. of Storeys (Above Ground)	Hor. Dist. (m)	Ver. Dist. (m)	Existing/Planned	CNIA	HNIA
NSR 47	La Clare Mansion, Block C	Residential	13	619	129	Existing	-	✓
NSR 48	La Clare Mansion, Block D	Residential	13	624	131	Existing	-	✓

Note:

1. CNIA – Construction Noise Impact Assessment.
2. HNIA – Helicopter Noise Impact Assessment.

4.4.1.6 In the construction noise impact assessment, the horizontal distance between the notional source position of the PME and the representative NSR has been determined in accordance with the methodology described in TM-GW for the evaluation of noise impact on the NSR during the construction of the Project.

4.4.1.7 For helicopter noise impact assessment, the shortest slant distances between the highest floors of the NSRs and the helicopter locations during different operation modes have been adopted for the evaluation of the helicopter noise impact on the representative NSRs.

## 4.5 Construction Stage

### 4.5.1 Assessment Methodology

4.5.1.1 The construction noise impact assessment has been conducted based on the typical construction plant inventory for helipad construction. The construction program, construction plant inventory, and percentage on time of each piece of PME have been provided and confirmed reasonable, feasible and practicable by the ArchSD based on the best available information at the moment. The inventory will be subject to change by the D&C contractor in future. The construction schedule provided by the ArchSD has been prepared based upon an assumption that all works will be undertaken during non-restricted hours only.

4.5.1.2 The assessment of noise impact from the construction (excluding percussive piling) of the Project is based on the methodology in Annex 13 of the TM-EIAO. The typical approach is summarised as follows:

1. Formulate construction programme and typical work sequence;
2. Identify representative NSRs which may be affected by the construction works;
3. Establish construction plant inventory and assign Sound Power Level (SWL) for each piece of PME based on the TM-GW and the list of SWLs of other commonly used PME;
4. Determine the correction factors based on the separation distances between the NSRs and the notional noise source positions at different works areas;
5. Apply noise corrections for distance, barrier attenuation, operation time, façade correction where applicable;

6. Predict construction noise level at each NSR by applying the above correction factors and compare against the noise standards as summarised in [Table 4.1](#); and
7. Predict cumulative noise impacts due to other concurrent construction works in the vicinity of the proposed work where necessary.

4.5.1.3 The predicted construction noise level at the NSR is calculated based on the following equation:

$$CNL = SWL_{Total} + C_D + C_B + C_T + C_F$$

Where,

$SWL_{Total}$	-	Total sound power level, dB(A);
$C_D$	-	Distance correction, dB(A);
$C_B$	-	Barrier correction, dB(A);
$C_T$	-	Percentage on time correction, dB(A);
$C_F$	-	Façade correction, dB(A).

## 4.5.2 Impact Prediction and Assessment

4.5.2.1 The Proposed Helipad will be built on the rooftop of the New Block of Queen Mary Hospital. Demolition work, site formation and superstructure works are not required for the Project. The potential construction noise source will only be the construction activities for steel framework, helipad structure, safety walkway, access ramp and the proposed noise mitigation measures (i.e. noise barriers and noise reducers). The construction work area for the Proposed Helipad is indicated in [Figure 4.2](#).

4.5.2.2 The type, operation time and quantities of the PMEs likely to be used for the construction works and their SWLs are presented in [Table 4.4](#) and [Appendix 4.3](#).

**Table 4.4 Powered Mechanical Equipment for Construction of the Proposed Helipad**

Powered Mechanical Equipment	Ref. ID	Quantity	Sound Power Level, dB(A)
Air compressor	CNP 002	1	102
Concrete lorry mixer	CNP 044	1	109
Concrete pump	CNP 047	1	109
Crane, tower (electric)	CNP 049	1	95
Poker, vibratory, hand-held	CNP 170	2	113
Breaker, hand-held	CNP 026	1	114
Welding set	Note (1)	2	78

Note:

Note (1) - SWL of Welding Plant was referenced from the approved EIA Report of Sheung Shui to Lok Ma Chau Spur Line (AEIAR-052/2002)

4.5.2.3 All pieces of the PME for general construction works have been assumed to be grouped at a single notional source at a position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR. This position is referred to as the notional source position according to the TM-GW.

A positive correction of 3dB(A) has been applied to the predicted noise levels due to façade reflection.

- 4.5.2.4 The predicted maximum construction noise level at the representative NSR during the construction period is presented in [Table 4.5](#). Detailed calculations of the construction noise impact provided in [Appendix 4.3](#).

**Table 4.5 Predicted Construction Noise Level  $L_{eq}$  (30 mins) dB(A)**

NSR	Description	Predicted Construction Noise Level	Assessment Criterion, dB(A)
		( $L_{eq}$ (30 mins), dB(A))	
NSR 10	Wei Lun Hall	67	75

- 4.5.2.5 According to the assessment result presented in [Table 4.5](#), the predicted maximum construction noise level at the nearest representative NSR (NSR 10) does not exceed the noise criterion of 75dB(A).

- 4.5.2.6 The period of structural works for the Proposed Helipad would take approximately 4 months only. Given the short duration of construction works, no adverse construction noise impact is anticipated

### 4.5.3 Cumulative construction noise impact

- 4.5.3.1 The existing 3-storey linen store of the HA at No.3 Sassoon Road will be demolished in 2017. After the demolition of the linen store, an academic building of the University of Hong Kong will be constructed and expected to be completed in 2020. As such, the construction for the academic building of the University of Hong Kong should be completed before the commencement of construction of the Proposed Helipad.

- 4.5.3.2 The Proposed Helipad will be constructed at the rooftop of the New Block of QMH. Based on the current available information, all major foundation, sub-structure and superstructure works for the New Block will be completed in 2022, before commencement of the construction of the Proposed Helipad. However, there will be concurrent construction of the Proposed Helipad and the finishing and building services installation works for the New Block between years 2022 and 2024. The type, operation time and quantities of the PME likely to be used for the construction works of the New Block and their SWLs are presented in [Table 4.6](#) and [Appendix 4.3a](#). The construction program and construction plant inventory are provided and confirmed reasonable, feasible and practicable by the ArchSD.

**Table 4.6 Powered Mechanical Equipment for Construction of the New Block of QMH**

Powered Mechanical Equipment	Ref. ID	Quantity	Sound Power Level, dB(A)
<b>Finishing and BS Installation Works</b>			
Dump truck (<=38 tonnes)	Note (1)	1	105
Generator, silenced	CNP 102	2	100
Water pump (electric)	CNP 281	2	88
Crane, tower (electric)	CNP 049	2	95

Note:

Note (1) - SWL quoted from "Sound Power Levels of Other Commonly Used PME" published by the EPD.

4.5.3.3

The cumulative maximum construction noise level at the representative NSR is presented in [Table 4.7](#). Detailed calculation of the cumulative construction noise is provided in [Appendix 4.3a](#).

**Table 4.7 Cumulative Construction Noise Level  $L_{eq}$  (30 mins) dB(A)**

NSR	Concurrent Project	Noise Level due to Concurrent Project, dB(A)	Noise Level due to the Project, dB(A)	Cumulative Noise Level, dB(A)	Assessment Criterion, dB(A)
NSR 10 Wei Lun Hall	Finishing and BS Installation Works of New Block of QMH	57	67	67	75

4.5.3.4

According to [Table 4.7](#) above, the cumulative impact of the concurrent project has been assessed. The predicted cumulative construction noise level at the representative NSR (NSR 10) does not exceed the noise criterion of 75dB(A).

#### 4.5.4

##### Good Site Practices and Use of Quieter PMEs

4.5.4.1

The assessment result showed that there would be no adverse noise impact at the identified NSRs. Good site practices are still favourable to minimise the noise impact during the construction of the Proposed Helipad. The following good site practices for the construction of the Project are recommended:

- Only well-maintained plants should be operated on-site and plant shall be serviced regularly during construction;
- Machines and plant (such as pumps, trucks, cranes, etc.) that may be in intermittent use should be shut down between works periods or shall be throttled down to a minimum; and
- Plant known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from nearby NSRs.

## 4.6 Operation Stage

### 4.6.1 Helicopter Noise

4.6.1.1 Noise will be generated from the HEMS associated with the Proposed Helipad. Helicopter noise impact assessment has been conducted to evaluate the potential noise impact for different helicopter operation modes.

4.6.1.2 The helicopter noise impact assessment for daytime helicopter operations shall be assessed in terms of  $L_{max}$  which is the maximum noise level as stipulated in the TM-EIAO and presented in [Table 4.2](#).

4.6.1.3 There is no other noise source associated with the Project in the operational phase. Other noise sources such as outdoor air-conditioning equipment for the New Block of QMH shall be assessed under a separate environmental study and designed to fulfil the relevant planning requirements.

#### Helicopter Operational Mode

4.6.1.4 Noise will be generated by helicopters during manoeuvring over the helipad, lateral (approaching / departure) flight movement and flyover. The different operational modes that may generate noise are summarised as follows:

#### **Non-lateral Movements**

Helicopter manoeuvring above the helipad within the Final Approach and Take-Off (FATO) area includes several modes:

- **Hovering:** Helicopter turns on the spot over the helipad to achieve the desirable orientation for touchdown / lift-off;
- **Touchdown:** Helicopter descends on the helipad surface;
- **Idling:** Helicopter remains on the helipad surface with its rotary blades kept running; and
- **Lift-off:** Helicopter ascends vertically from the helipad surface to achieve a hover before departure.

#### **Lateral Movements**

- **Approach:** Helicopter approaches the helipad while it is descending at an angle to the helipad surface; and
- **Take-off:** Helicopter leaves the helipad and start to climb up at an angle to the helipad surface.

#### Flight Sectors

4.6.1.5 The considerations of the selection of flight sectors for the Proposed Helipad were discussed in Section 2. The flight sectors in north-west and south are recommended by the GFS for the Proposed Helipad. The GFS has emphasized that the proposed flight sectors are the best compromise with all factors, and have been kept to a minimum in size so as to minimise the noise impact on the surroundings. As advised by the GFS, during the operation, the chosen flight paths may be altered slightly subject to the actual weather conditions and the obstacles

clearance to the surroundings (e.g. movement of birds or unexpected localized turbulence). The extent of flight sectors and locations of representative NSRs are presented in [Figure 4.3](#).

4.6.1.6 In preparation for the provision of 24-hour emergency services, trial flights will be conducted by the GFS at least two months (or earlier if the helipad facilities are available) prior to the commissioning of the Proposed Helipad. 2 to 3 trial flights will be arranged per week at daytime and evening time. The purposes of trial flights are to confirm the flight perimeters of the flight sectors, and for the GFS's aircrew to familiarize with the operational procedures and operating environment. Before the helipad commissioning, the GFS will conduct trial flights mainly at daytime to begin with, and then proceeding to some evening trials (from 19:00 to 23:00). It is noted that the GFS will minimise the evening trials and will not conduct trial flights during night-time (from 23:00 to 07:00 of the next day) to reduce the possible noise impact to the surroundings. During the helipad operation, trial flights will only be arranged on a need basis (e.g. for pilots away from office during the familiarization phase, for new GFS pilots or some major new developments in the vicinity of the Proposed Helipad that may cause concern on the flight safety), which are the cases for the existing helipads at TMH and PYNEH.

#### Flight Profile

4.6.1.7 According to the advice on the helicopter operation from the GFS, in preparing for departure, the helicopter will descend with a gentle slope until it reaches the flight height 300ft above the helipad. Within 300ft above the helipad, the flight path shall be projected at a gradient of 8% (about 4.6 degrees) for both approaching and departure. The typical flight profiles during approaching and departure operations are presented in [Figure 4.4](#). The summary of the typical flight profile is as follows:

1. **Cruise / Flyover:** Typical flight height 1500ft above mean sea level with flight speed 140kts, descends 500ft/min with flight speed 100kts until 300ft above the helipad (about 2 - 3 sec. for travelling over each NSR);
2. **Approach:** From 300ft above the helipad, flight speed reduces from 60kts to 0kts with approach angle of 4.6 degrees within 60 sec.;
3. **Hovering (Approach):** Achieve desirable orientation for touchdown within 5 sec., around 2.5m above helipad;
4. **Touchdown:** Descends on to the helipad within 3 sec.;
5. **Idling:** 5 minutes for casualty handover under normal circumstances;
6. **Lift-off:** Ascends from helipad to achieve a hover before departure within 3 sec.;
7. **Hovering (Departure):** Achieve desirable orientation for take-off within 5 sec., around 2.5m above helipad;
8. **Take-off:** Flight speed increases from 0kts to 60kts with departure angle of 4.6 degrees within 60 sec up to 300ft above the helipad; and
9. **Cruise / Flyover:** Ascends 500ft/min with flight speed 100kts until achieved typical flight height 1500ft above mean sea level, at typical flight height, the flight speed increases to 140kts (about 2 - 3 sec. for travelling over each NSR).

Flight Frequency

- 4.6.1.8 The proposed new helipad in QMH will be solely for emergency use but not for scheduled helicopter operation. Table 4.8 shows the record of the GFS's emergency helicopter operations in PYNEH between 2011 and 2015.

**Table 4.8 Emergency Helicopter Operation Records at PYNEH (2011 – 2015)**

Helipad	2011			2012			2013			2014			2015		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
<b>Flight at PYNEH</b>	177	31	45	181	39	43	179	38	54	183	28	59	152	17	32
<b>Average no. of day(s) per flight</b>	2	11	8	2	9	8	2	10	6	2	12	6	2	20	10
<b>Total Annual Flight</b>	253			263			271			270			201		

Note:

D – Daytime (07:00 – 19:00hrs); E – Evening Time (19:00 – 23:00hrs); N – Night-time (23:00 – 07:00hrs).

- 4.6.1.9 According to Table 4.8, the highest annual emergency helicopter operations at PYNEH was found in 2013. A total of 271 flights were recorded in 2013 including 179 flights in daytime, 38 flights in evening time and 54 flights in night-time. The flight records reflected that the average daily emergency helicopter operation was less than one. The emergency helicopter operation in daytime period was about once every two days on average. Also, the evening and night-time emergency helicopter operations at PYNEH were one flight in more than nine days and six days respectively on average.

- 4.6.1.10 The Proposed Helipad in QMH shall share the existing HEMS and thus the flight frequency at PYNEH would be reduced in future.

Helicopter Noise Level

- 4.6.1.11 As advised by the GFS, there is a replacement programme for the existing helicopter fleet. The current three Super Puma AS332 L2 helicopters and four Dauphin EC155 B1 helicopters will be replaced by seven medium-sized single-model helicopters Airbus H175 in the coming future. According to the latest information provided from the GFS, the newly procured helicopters are expected to be commissioned in the first quarter of 2018, the full fleet replacement of new helicopters will be completed before 2024 which is much earlier than the expected commencement date of the Proposed Helipad.

- 4.6.1.12 The new helicopters will be equipped with more advanced engines and likely provide a quieter flight compared with the existing GFS's helicopter Super Puma AS332 L2, and comply with the latest standards on noise for helicopters as stipulated by the International Civil Aviation Organisation (ICAO). The ICAO has stipulated noise standards for helicopters for different flying modes, including approach, take-off and flyover. The maximum Effective Perceived Noise Levels (EPNLs) for helicopters operating in full load condition is used as the noise certification standard adopted by the ICAO Council. However, the GFS stated that the helicopter operation in full load condition is rarely happened. It is anticipated that the actual helicopter operation under most cases shall be quieter.

## 4.6.1.13

The helicopter noise impact assessment has been conducted based on the best available helicopter noise data provided by the helicopter manufacturer and the GFS. However, only the noise data of Airbus H175 in lateral movements is available and it is presented in Table 4.9. Judging from the noise data for lateral movements, the new helicopter will be quieter than the existing Super Puma AS332 L2. For assessment purpose, the noise data of existing Super Puma AS332 L2 in non-lateral movements in the previously approved EIA report for the Helipad at Yung Shue Wan, Lamma Island (i.e. EIA-114/2005) has been adopted for Airbus H175 as a conservative approach. This reference noise data is presented in Table 4.10.

**Table 4.9 Helicopter Noise Data – Lateral Movements**

Mode of Operation	Reference Distance <sup>1</sup> (m)	Noise Level <sup>1</sup>	
		EPNL, EPNdB	L <sub>max</sub> , dB(A)
Approach	120	95.1	82.1
Take-off	150	89.8	76.8
Flyover	150	91.0	78.0

Note:

- The helicopter information of Airbus H175 was provided by the GFS. The above helicopter noise levels are determined under conditions prescribed in Chapter 8 and Appendix 4 of Annex 16 of ICAO, and prescribed in 14 CFR 36 Appendix H.  $L_{max} = ENPL - 13 \text{ dB(A)}$ , with reference to the "Transportation Noise Reference Book" (Nelson, 1987).

**Table 4.10 Helicopter Noise Data – Non-lateral Movements**

Mode of Operation	Reference Distance (m)	Noise Level <sup>1</sup>
		L <sub>max</sub> , dB(A)
Idling	150	82.0 dB(A)
Hovering	150	90.6 dB(A)
Touchdown <sup>2</sup>	150	89.0 dB(A)
Lift-off	150	89.0 dB(A)

Note:

- Noise level is referred to Super Puma AS332 L2 and extracted from previously approved EIA study (EIA-114/2005).
- With reference to the survey record from the previously approved EIA report (EIA-114/2005), noise levels of Super Puma in Touchdown mode is not available. It is observed that noise levels of helicopter EC155 B1 during lift-off are higher than that during touchdown. As such, the noise level for lift-off (i.e. 89 dB(A), L<sub>max</sub>) is assumed as that for touchdown as a conservative approach.

Helicopter and Helipad Buffer Distance

## 4.6.1.14

To keep the noise impact not higher than the criterion L<sub>max</sub> 85dB(A), the minimum buffer distances between residential NSRs and a helicopter in different helicopter operation modes are presented in Table 4.11. The actual distances between NSRs and the helicopter of each operation mode will be subject to the helipad location and the selected flight path.

**Table 4.11 Minimum Buffer Distances for Different Operation Modes**

Mode of Operation	Minimum Buffer Distance (m)
Hovering above helipad	386
Touchdown to helipad	321
Lift-off from helipad	321
Idling on helipad	143
Approach	116
Take-off	79
Cruise / Flyover	90

4.6.1.15 NSRs within the above minimum buffer distances will subject to adverse helicopter noise impact. Noise mitigation measures may be required to alleviate the noise impact on the affected NSRs.

4.6.1.16 As described in the previous section, the typical flight height in cruise mode shall be at 1500ft (about 458.4m) above the mean sea level to minimize noise impact. The GFS confirmed that the minimum buffer distance from NSRs (i.e. 90m) can be achieved in the operation during cruise mode/flyover. Therefore, adverse noise impact due to helicopter operation in cruise mode/flyover in daytime is not anticipated.

## 4.6.2 Assessment Methodology

### Daytime Operation

4.6.2.1 According to Table 1A, Annex 5 of the TM-EIAO, helicopter noise impacts shall be assessed in terms of A-weighted maximum sound pressure level  $L_{max}$  at a NSR. The helicopter noise level ( $L_{max}$ ) at a NSR for different operational modes can be calculated using the following formula:

$$L_{max,ij} = L_{max}(ref)_j + C_D + C_F + C_B$$

where,

- $L_{max,ij}$  - Helicopter noise level at 1m from the external façade of NSR i for operational mode j, dB(A);
- $L_{max}(ref)_j$  - Reference sound pressure level for operational mode j, dB(A);
- $C_D$  - Distance correction, dB(A);
- $C_F$  - Façade correction, dB(A);
- $C_B$  - Barrier correction, dB(A);

4.6.2.2 Since all representative NSRs are located at considerable distances from the Proposed Helipad, helicopter noise can be considered as a 'point' source. Therefore, the sound pressure levels at NSRs have been evaluated based on standard acoustical principles and a 'point' source assumption. The sound pressure / intensity received at NSRs will be inversely proportional to the square of the distance between the noise source and the NSR. To estimate the noise impacts for the worst-case scenarios, the distance  $r_{ij}$  is determined by assuming that the proposed helicopter will fly directly over the representative NSRs for both approaching and departure within the recommended flight sectors. For NSRs

located outside the recommended flight sectors, it is assumed that the helicopter will fly at the nearest flight path within the recommended flight sectors for the helicopter noise assessment. The distance correction for the corresponding operational mode can be calculated using the following formula:

$$C_D = -20 \log_{10} \left( \frac{r_{ij}}{r(ref)_j} \right)$$

where,

- $r_{ij}$  - Shortest distance from a noise source for operational mode j to NSR i, m;
- $r(ref)_j$  - Reference distance from a noise source to a measurement point for operational mode j, m;

4.6.2.3 Barrier correction of -5dB(A) shall be applied where the representative NSRs are being marginally screened with no direct line of sight by a substantial barrier. For the NSRs which totally shielded by a substantial barrier, barrier correction of -10dB(A) should be considered in the calculation.

4.6.2.4 A façade correction of +3dB(A) has been considered at the representative NSRs in order to account for the façade reflection effect.

4.6.2.5 Wind speed and direction can influence sound propagation especially over long distance. However, the wind speed and wind direction are not steady and vary from time to time. According to Section 4.6.1.8 & Section 4.6.1.9, the emergency helicopter operation is expected to be less than once a day (on the average) and the durations of different operation modes range from 2-3 seconds to 5 minutes. The co-existence of wind, which will enhance the sound perceived (e.g. wind bending down after blowing above a ridge line) and the GFS's helicopter operation should be rare. The "Transportation Noise Reference Book" mentioned that the prediction of aircraft noise traditionally and consciously avoids the wind effect by stating noise levels for a "still air" situation. Referring to overseas practices (e.g. Japan and Australia), helicopter noise standards and assessments do not take into account the effect of wind. Besides, according to the practice suggested in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) issued under the NCO, noise measurement should not be carried out at time and locations which are affected by wind as it would generate noise/affect the measurement results. Therefore, the adoption of wind correction is impracticable and is not considered.

4.6.2.6 Ground reflection is significant when there is an extremely steep terrain with hard and flat surface. In the vicinity of the Proposed Helipad, the hill is not steep enough to reflect the sound to NSRs and the direct noise impact is dominant. Besides, based on the site observation, the hill is fully covered with heavy vegetation including shrubs and trees. Some sound energy (i.e. helicopter noise) is expected to be absorbed by parts of the plant such as leaves, branches, twigs and wood. Those large shrubby trees also help on scattering the incoming sound waves from a helicopter. The effect of noise reflection from the ground surface of

the hill is expected to be insignificant. Therefore, the effect of noise reflection from the nearby hill is expected to be negligible.

### 4.6.3 Cumulative Helicopter Noise Impacts

4.6.3.1 As confirmed by the GFS and the CAD, there is no other existing helipad and regular helicopter flight routes identified in the vicinity of the Proposed Helipad that would cause cumulative helicopter noise impacts.

### 4.6.4 Prediction and Evaluation of Helicopter Noise Impacts

#### *Noise Impact (Daytime – Unmitigated)*

4.6.4.1 The predicted helicopter noise levels of the worst operation mode at the representative NSRs for daytime are summarised in [Table 4.12](#). Detailed calculations are presented in [Appendix 4.4](#).

**Table 4.12 Predicted Helicopter Noise Levels ( $L_{max}$ ) of the Worst Operation Mode (Unmitigated)**

NSR ID	Description	$L_{max}^1$ , dB(A)	Compliance? (Y/N)	Operation Mode with Noise Exceedance
NSR 1	Planned NSR 1	84	Y	-
NSR 2	Radcliffe	85	Y	-
NSR 3	Royalton	85	Y	-
NSR 4	Ebenezer School	83	Y	-
NSR 5	Royalton II	85	Y	-
NSR 6	13 - 15 Northcote Close	84	Y	-
NSR 7	9 - 11 Northcote Close	84	Y	-
NSR 8	Patrick Manson Building	79	Y	-
NSR 9	R.C. Lee Hall	82	Y	-
NSR 10	Wei Lun Hall	81	Y	-
NSR 11	Lee Hysan Hall	82	Y	-
NSR 12	Madam S.H. HO Residence for Medical Students	80	Y	-
NSR 13	23 Bisney Road	85	Y	-
NSR 14	21 Bisney Road	85	Y	-
NSR 15	18 - 24 Bisney Road	85	Y	-
NSR 16	Glamour Court Blocks A-B	<b>86</b>	N	Hovering
NSR 17	Glamour Court Blocks C-E	<b>86</b>	N	Hovering
NSR 18	Victoria Garden, Block 1	83	Y	-
NSR 19	Victoria Garden, Block 2	83	Y	-
NSR 20	Cherry Court	83	Y	-
NSR 21	3 Consort Rise, Blocks 7 - 8	83	Y	-
NSR 22	TWGHs Jockey Club Care & Attention Home for the Elderly - Nurse's Quarters	81	Y	-
NSR 23	TWGHs Jockey Club Care & Attention Home for the Elderly	81	Y	-

NSR ID	Description	$L_{max}^1$ , dB(A)	Compliance? (Y/N)	Operation Mode with Noise Exceedance
NSR 24	English School Foundation - West Island School	82	Y	-
NSR 25	Greenvale, Block 5	82	Y	-
NSR 26	Greenvale, Block 4	82	Y	-
NSR 27	Greenvale, Block 3	83	Y	-
NSR 28	Greenvale, Block 2	83	Y	-
NSR 29	Greenvale, Block 1	83	Y	-
NSR 30	Mount Davis Village, House A7	83	Y	-
NSR 31	The High House	82	Y	-
NSR 32	7 Mount Davis Road	84	Y	-
NSR 33	Four Winds Apartments	84	Y	-
NSR 34	Mount Davis Garden	85	Y	-
NSR 35	Greenery Garden	84	Y	-
NSR 36	On Lee, Blocks A-B	83	Y	-
NSR 37	On Lee, Blocks C-E	84	Y	-
NSR 38	Kai Ming Temple	85	Y	-
NSR 39	Fook Wai Mansion	83	Y	-
NSR 40	Yue Yan Mansion, Block C	83	Y	-
NSR 41	Yue Yan Mansion, Block D	84	Y	-
NSR 42	Pokfulam Court	83	Y	-
NSR 43	Pokfulam Mansion	83	Y	-
NSR 44	92E Pok Fu Lam Road	82	Y	-
NSR 45	La Clare Mansion, Block A	82	Y	-
NSR 46	La Clare Mansion, Block B	82	Y	-
NSR 47	La Clare Mansion, Block C	82	Y	-
NSR 48	La Clare Mansion, Block D	82	Y	-

Note:

1. Bold noise levels indicate exceedance of the noise criterion of  $L_{max}$  85 dB(A).

4.6.4.2 Based on the assessment results, the predicted helicopter noise levels of the worst operation mode at representative NSRs range from  $L_{max}$  79 to 86 dB(A). Noise exceedances of 1dB(A) were found at two NSRs including NSRs 16 and 17 during helicopter hovering at the Proposed Helipad.

#### **Mitigation Measures**

4.6.4.3 Direct noise mitigation measures will be required and discussed in this part. The GFS has advised on the practicality of mitigation measures in terms of helicopter operations.

#### *Setback of Helipad*

4.6.4.4 To reduce the noise impact and direct lines of sight at NSRs, the Proposed Helipad is intentionally moved to the north-eastern side of the rooftop of the New Block of QMH which was already considered in the unmitigated scenario of the helicopter

noise impact assessment. The separation distances between the helipad and nearby NSRs are also maximised.

#### *Screening by Noise Barriers*

- 4.6.4.5 Installation of noise barriers at rooftop of the New Block of the QMH can provide noise screening to the Proposed Helipad. The noise barriers can reduce the direct lines of sight between NSRs and the helicopter during hovering, touchdown, lift-off and idling on the helipad, and can achieve up to 10dB(A) noise screening at NSRs. In order to further improve the noise shielding effect, noise reducers should be installed at the top and edges of the noise barriers. Nevertheless, noise barriers at the rooftop should not affect approaching and departure operations of helicopters. Moreover, as advised by the ArchSD, the height of noise barriers shall keep as indicated in [Figure 4.5](#) in order to maintain the cross ventilation for effective heat dissipation of the air-cooled chillers to warrant a stable and reliable operation of air-conditioning plant located at main roof serving the new block of Queen Mary Hospital. [Table 4.13](#) summarised the proposed noise barriers and noise reducers.

**Table 4.13 Summary of Noise Barriers and Noise Reducers**

Location <sup>1</sup>	Noise Mitigation Measure	Barrier Height, m	Top Level <sup>2</sup> , mPD
Roof edge at west	Noise Barrier	1.5 (Height) x 6 (Width)	286.4
Roof edge at west	Noise Barrier	4 (Height) x 48 (Width)	286.4
Roof edge at south-east	Noise Barrier	4 (Height) x 60 (Width)	286.4
Perimeter at roof edge / top edge of noise barrier / top edge of parapet wall at rooftop	Noise Reducer	-	-

Note:

1. Detail locations of noise barriers and noise reducers are presented in [Figure 4.5](#).
2. The level of main roof of the New Block is 282.4mPD.

- 4.6.4.6 The heights of the proposed noise barriers for noise mitigation have been maximised with the consideration of flight safety based on the GFS's advice and the constraints due to building services design based on the ArchSD's advice. The final design will be carried out by the future D&C contractor in the later stage. The locations and height of noise barriers are indicated in [Figure 4.5](#). [Appendix 4.5](#) presents the barrier effect for each NSR.

#### *Quiet Approaching/Departure Procedures*

- 4.6.4.7 A quiet approaching and departure technique would be employed to further alleviate the noise impact. Applying steeper glide slope and larger take-off angle during approaching and departure operations can increase the distances between NSRs and helicopter flight profile, and thus reduce the noise impact.
- 4.6.4.8 Both approaching and departure angles are increased from 4.6 degrees to 10 degrees.
- 4.6.4.9 The recommended flight profile of a quiet helicopter operation is indicated in [Figure 4.6](#). Helicopter operations are expected to be in one-way-direction within the selected flight sectors to minimise the overall exposure of helicopter noise at NSRs. In other words, the arrival flight and departure flight shall be from north to south

and vice versa. Using same flight path for approaching and departure of each operation is not preferred.

*Noise Impact (Daytime – Mitigated)*

4.6.4.10

With the implementation of the abovementioned mitigation measures, the predicted helicopter noise levels ( $L_{max}$ ) of the worst operation mode at the representative NSRs under mitigated scenario are tabulated in [Table 4.14](#). Detailed calculations are presented in [Appendix 4.6](#).

**Table 4.14 Predicted Helicopter Noise Levels ( $L_{max}$ ) of the Worst Operation Mode (Mitigated)**

NSR ID	Description	$L_{max}$ , dB(A)	Compliance? (Y/N)
NSR 1	Planned NSR 1	83	Y
NSR 2	Radcliffe	84	Y
NSR 3	Royalton	85	Y
NSR 4	Ebenezer School	83	Y
NSR 5	Royalton II	85	Y
NSR 6	13 - 15 Northcote Close	84	Y
NSR 7	9 - 11 Northcote Close	84	Y
NSR 8	Patrick Manson Building	79	Y
NSR 9	R.C. Lee Hall	82	Y
NSR 10	Wei Lun Hall	81	Y
NSR 11	Lee Hysan Hall	82	Y
NSR 12	Madam S.H. HO Residence for Medical Students	79	Y
NSR 13	23 Bisney Road	85	Y
NSR 14	21 Bisney Road	80	Y
NSR 15	18 - 24 Bisney Road	80	Y
NSR 16	Glamour Court Blocks A-B	81	Y
NSR 17	Glamour Court Blocks C-E	81	Y
NSR 18	Victoria Garden, Block 1	83	Y
NSR 19	Victoria Garden, Block 2	83	Y
NSR 20	Cherry Court	83	Y
NSR 21	3 Consort Rise, Blocks 7 - 8	83	Y
NSR 22	TWGHs Jockey Club Care & Attention Home for the Elderly - Nurse's Quarters	81	Y
NSR 23	TWGHs Jockey Club Care & Attention Home for the Elderly	81	Y
NSR 24	English School Foundation - West Island School	82	Y
NSR 25	Greenvale, Block 5	82	Y
NSR 26	Greenvale, Block 4	82	Y
NSR 27	Greenvale, Block 3	83	Y
NSR 28	Greenvale, Block 2	83	Y
NSR 29	Greenvale, Block 1	83	Y
NSR 30	Mount Davis Village, House A7	83	Y

NSR ID	Description	L <sub>max</sub> dB(A)	Compliance? (Y/N)
NSR 31	The High House	82	Y
NSR 32	7 Mount Davis Road	84	Y
NSR 33	Four Winds Apartments	84	Y
NSR 34	Mount Davis Garden	85	Y
NSR 35	Greenery Garden	84	Y
NSR 36	On Lee, Blocks A-B	83	Y
NSR 37	On Lee, Blocks C-E	84	Y
NSR 38	Kai Ming Temple	85	Y
NSR 39	Fook Wai Mansion	83	Y
NSR 40	Yue Yan Mansion, Block C	83	Y
NSR 41	Yue Yan Mansion, Block D	84	Y
NSR 42	Pokfulam Court	83	Y
NSR 43	Pokfulam Mansion	83	Y
NSR 44	92E Pok Fu Lam Road	82	Y
NSR 45	La Clare Mansion, Block A	82	Y
NSR 46	La Clare Mansion, Block B	81	Y
NSR 47	La Clare Mansion, Block C	81	Y
NSR 48	La Clare Mansion, Block D	81	Y

4.6.4.11 With appropriate noise mitigation measures, the predicted helicopter noise levels of the worst operation mode at the representative NSRs range from L<sub>max</sub> 79 - 85dB(A) as indicated in [Table 4.14](#). No NSR will be subject to excessive helicopter noise impact and adverse helicopter noise impact on the NSRs in daytime is not anticipated.

4.6.4.12 Noise contours, in terms of L<sub>max</sub>, at four different mPD levels including the lowest and the highest representative NSRs are presented in [Figure 4.7a](#) to [Figure 4.7d](#), which show the distribution of the worst-case predicted helicopter noise levels among all helicopter operation modes associated with the Proposed Helipad.

*Noise Impact (Evening and Night-time)*

4.6.4.13 The Proposed Helipad at QMH will be operated 24 hours a day for emergency uses with no scheduled helicopter operation. According to GFS's record from 2011 to 2015 (refer to [Table 4.8](#)), the emergency helicopter operation at the helipad in PYNEH was one flight in more than nine days and six days during evening and night-time respectively on average. The longest duration among different operation modes is 5 minutes. The nearest NSR (i.e. Wei Lun Hall) is located 273m away from the Proposed Helipad which is less affected comparing to that of the existing helipad in PYNEH (i.e. 90m away from the nearest NSR) from a noise angle. As confirmed by the HA and the CAD, the noise complaints about the helipad operation in TMH and in PYNEH were rarely received and total 7 noise complaints were received in the past five years (refer to [Table 4.15](#)). It showed the general understanding to such critical services and tolerance to the emergency helicopter operation within the community.

**Table 4.15 Information and Helicopter Noise Complaints of TMH and PYNEH  
(2011 – 2015)**

Hospital	TMH	PYNEH	QMH
Commencement Year	1992	2004	2024
Shortest Horizontal Distance to the Nearest NSR (m)	70 (Greenery Villa)	90 (Meng Tak Catholic School)	273 (Wei Lun Hall)
No. of Noise Complaints Received by HA	0	1	Not Applicable
No. of Noise Complaints Received by CAD	0	6	Not Applicable

4.6.4.14

All practicable noise mitigation measures have been exhausted and adopted in the Proposed Helipad to minimise the helicopter noise impact. The design and selection of flight sectors have been optimized to avoid flying over the high population density area. The operation of new GFS's helicopters (Airbus H175) which will be used in the Proposed Helipad is quieter than the existing Super Puma AS332 L2. Since there is no relevant noise criteria in the TM-EIAO and overseas / international guidelines applicable to emergency helicopter operation in evening and night-time periods, the helicopter noise impact during such time periods would not be quantitatively assessed. Moreover, referring to overseas practices as shown in [Appendix 4.1](#), emergency helicopter operations in evening and night-time are exempted from flight noise restrictions.

**4.7****Evaluation of Residual Helicopter Noise Impact**

4.7.1.1

By adopting the noise mitigation measures and the replacement of new helicopters fleet with quieter operational noise, the predicted helicopter noise levels arising from the HEMS at NSRs are not higher than 85dB(A)  $L_{max}$  and comply with the noise criteria in [Table 4.2](#).

4.7.1.2

Typical flight height of the GFS's helicopter during flyover is 1500ft above mean sea level and the duration of the flyover noise event is about 2-3 seconds. Under normal circumstances, the duration of helicopter idling at the Proposed Helipad will not be more than 5 minutes for casualty handover. Noise event of hovering at a height around 2.5m above the helipad will be within 5 seconds before touchdown or after lift-off.

4.7.1.3

The operation for HEMS occurs randomly over the year. With reference to the past helicopter flight records, the average daily emergency helicopter operation was less than one and the operation during daytime period is about once every two days on average. Apart from the above, the emergency helicopter operation is expected not more than one flight in nine days and six days during evening and night-time respectively on average.

- 4.7.1.4 All practicable noise mitigation measures have been exhausted and adopted in the design of the Proposed Helipad. Noise impacts on NSRs have been minimised and exceedance of the helicopter noise criteria in [Table 4.2](#) is not anticipated.

## 4.8 Conclusion and Recommendation

### Construction Phase

- 4.8.1.1 The potential noise levels arising from daytime construction activities of the Proposed Helipad at the nearby NSRs have been evaluated. Based on the latest information obtained, the predicted unmitigated cumulative construction noise level at the representative NSR complies with the relevant noise criterion stated in [Table 4.1](#). No specific mitigation measures will be required. To further reduce the potential noise impacts on NSRs, the adoption of good site practices and use of quieter PMEs have been recommended for the construction.

### Operation Phase

- 4.8.1.2 Detailed helicopter noise impact assessment under the worst-case scenario was conducted for representative NSRs located in the vicinity of the Proposed Helipad. A conservative approach was adopted in the assessment such as the nearest flight path distance, nearest touch down and lift-off location at the helipad. The helicopter noise data from the manufacturer was measured in full load condition and the highest helicopter noise level was obtained. However, helicopter operating in full load condition will unlikely happen in real situation and the actual helicopter noise impact is expected to be lower.
- 4.8.1.3 As advised by the GFS, the existing GFS's helicopter fleet will be replaced by seven medium-sized single-model helicopters (Airbus H175). The new helicopter will be equipped with more advanced engines and provide a quieter flight compare with Super Puma AS332 L2. All the newly procured helicopters will be available before the commencement of operation of the Proposed Helipad in 2024. Hence, quieter flights are expected.
- 4.8.1.4 With the implementation of direct noise mitigation measures including quieter approaching/departure procedures, noise barriers, noise reducers and the replacement of new helicopter fleet, the predicted helicopter noise levels at the representative NSRs are within the criteria in [Table 4.2](#).
- 4.8.1.5 To minimise the noise impact arising from HEMS associated with the Proposed Helipad, the GFS's pilots shall follow the proposed quiet flight techniques for HEMS as discussed in this EIA report whenever practicable. However, the actual flight path adopted by the helicopter subject to the actual weather conditions and the site situation.

4.8.1.6 Arrival and departure flights shall be from north to south and vice versa for any emergency helicopter operations associated with the Proposed Helipad. One-way-direction for helicopter operation is recommended to minimise the noise exposure at each affected NSR.

4.8.1.7 The Proposed Helipad in QMH will share the HEMS currently provided by the existing helipad facilities at public hospitals. The Project enables point-to-point direct and speedy transfers of patients / survivors from outlying islands and remote areas that require special care by the hospital, especially for those areas located at west and south-west of Hong Kong. It is critical to lifesaving and significant for provision of timely treatment to patients. It is also an essential infrastructure development in Hong Kong to cater for the change in population and to maintain a high quality of medical services which shall be generally agreed by the public. In view of the above, it is expected that the actual noise situation shall be better than the predicted one in this report.

## 4.9 Reference

Paul Nelson (1987). *Transportation Noise Reference Book*. England: Butterworths.

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