

APPENDIX 4.5 Helicopter Noise Survey

1 INTRODUCTION

1.1 Background

1.1.1 To supplement the helicopter noise data, on-site field survey has been conducted to determine the operational noise levels of the Government Flying Service's (GFS) 'EC155 B1' and 'Super Puma AS332 L2' helicopter model when manoeuvring on and over the helipad without lateral movement.

1.2 Site Information and Survey Date

1.2.1 This noise survey was undertaken at the GFS helipad at No. 18, South Perimeter Road, Chek Lap Kok. The GFS helipad is generally flat concrete, with no substantial obstacles in the vicinity. The South Runway of the Hong Kong International Airport was in active use during the survey period.

1.2.2 *Figure 1* displays the locations of helipad, measurement locations and its surrounds. The survey was conducted between 10:00 and 16:00 hours on 24th June 2003.

1.3 Weather Conditions

1.3.1 The day of the survey was hot and sunny with light breeze. An isolated shower at around 13:00 hours lasted for about 10 minutes.

1.4 Instrumentation

1.4.1 The following instruments were used:

Table 1 Equipment List

Item	Manufacturer and Model	Description
Precision Sound Level Analysers	Bruel and Kjaer Type 2238	IEC 651-1979 Type 1 / IEC 804-1985 Type 1
Acoustical Calibrator	Bruel and Kjaer Type 4231	IEC 942-1988 Class 1
GPS Device	MLR Electronique	-
Anemometer	Kestrel 1000 Pocket Wind Meter	-

2 NOISE MEASUREMENT PROCEDURE

2.1.1 Measurements of the maximum noise levels (L_{max}) emitted during each of four helicopter manoeuvring modes on and over the helipad: (i) hovering over the helipad; (ii) touchdown on the helipad; (iii) idling on the ground (with rotors on); and (iv) lift-off from the helipad surface to achieve a hover. Far-field measurements were taken at three locations that were each over 100 metres from the centre of the helipad, such that helicopter noise can be considered as a point source. The three measurement locations (M1, M2 and M3) and the helipad location are detailed in *Table 2*.

Table 2 Noise Measurement Location Details

Location	Latitude	Longitude	Distance from centre of helipad (m)
Centre of Helipad	22 N 17.784	113 E 54.341	N/A
Measurement location M1	22 N 17.745	113 E 54.428	166
Measurement location M2	22 N 17.736	113 E 54.391	124
Measurement location M3	22 N 17.783	113 E 54.443	175

2.1.2 All three sound level meters were calibrated and 5-minute background noise measurements were conducted prior to and after the noise survey. The L_{\max} for each helicopter mode was recorded.

2.1.3 Other noise events such as aircraft activities and vehicle pass-by were also recorded so that any affected readings can be edited.

3 MEASUREMENT RESULTS

3.1.1 The sound level meters were calibrated prior to and after the noise survey. The calibration noise levels obtained before and after the measurement were both 94.0 dB(A). The data obtained in this survey is therefore considered to be acceptable.

3.1.2 The measured background noise levels and instant wind speeds are summarized in *Table 3*.

Table 3 Measured Background Noise Levels ($L_{\text{eq}(5\text{-minute})}$) in dB(A)

Location	Prior to Noise Survey		After Noise Survey	
	$L_{\text{eq}}(5\text{-min})$	Wind Speed (m/s)	$L_{\text{eq}}(5\text{-min})$	Wind Speed (m/s)
M1	45.8	1.5	46.6	1
M2	42.3	1	42.6	1
M3	46.9	4.6	47.9	1.3

3.1.3 The measured L_{\max} of helicopter manoeuvring on the ground and over the helipad are tabulated in *Table 4* and *Table 5*, respectively. The normalised L_{\max} at 150m were calculated based on standard acoustic principle, using the formula:

$$L_{\max} \text{ at } r_1 = L_{\max} \text{ at } r_2 + 20 \log_{10} \left(\frac{r_2}{r_1} \right) \quad \text{where } r_1 \text{ and } r_2 \text{ are the distances from the centre of helipad.}$$

Table 4 Measured L_{max} when Helicopter is “On the Ground”

Helicopter No.	Operation	M1 @ 166m	M2 @ 124m	M3 @ 175m	Normalised at 150m			
					M1	M2	M3	Maximum
“EC155 B1” Model								
Helicopter 1	Idling	x	x	73.5	x	x	74.8	74.8
Helicopter 2	Idling	x	x	76.3	x	x	77.6	77.6
Helicopter 5	Idling	74.7	77.6	78.7	75.6	75.9	80.0	80.0*
“Super Puma AS332 L2” Model								
Helicopter 10	Idling	79.3	82.4	80.7	80.2	80.7	82.0	82.0*

Note: “x” indicates data not available at that location.

* L_{max} use for helicopter noise calculation in EIA

Table 5 Measured L_{max} when Helicopter is “In the Air”

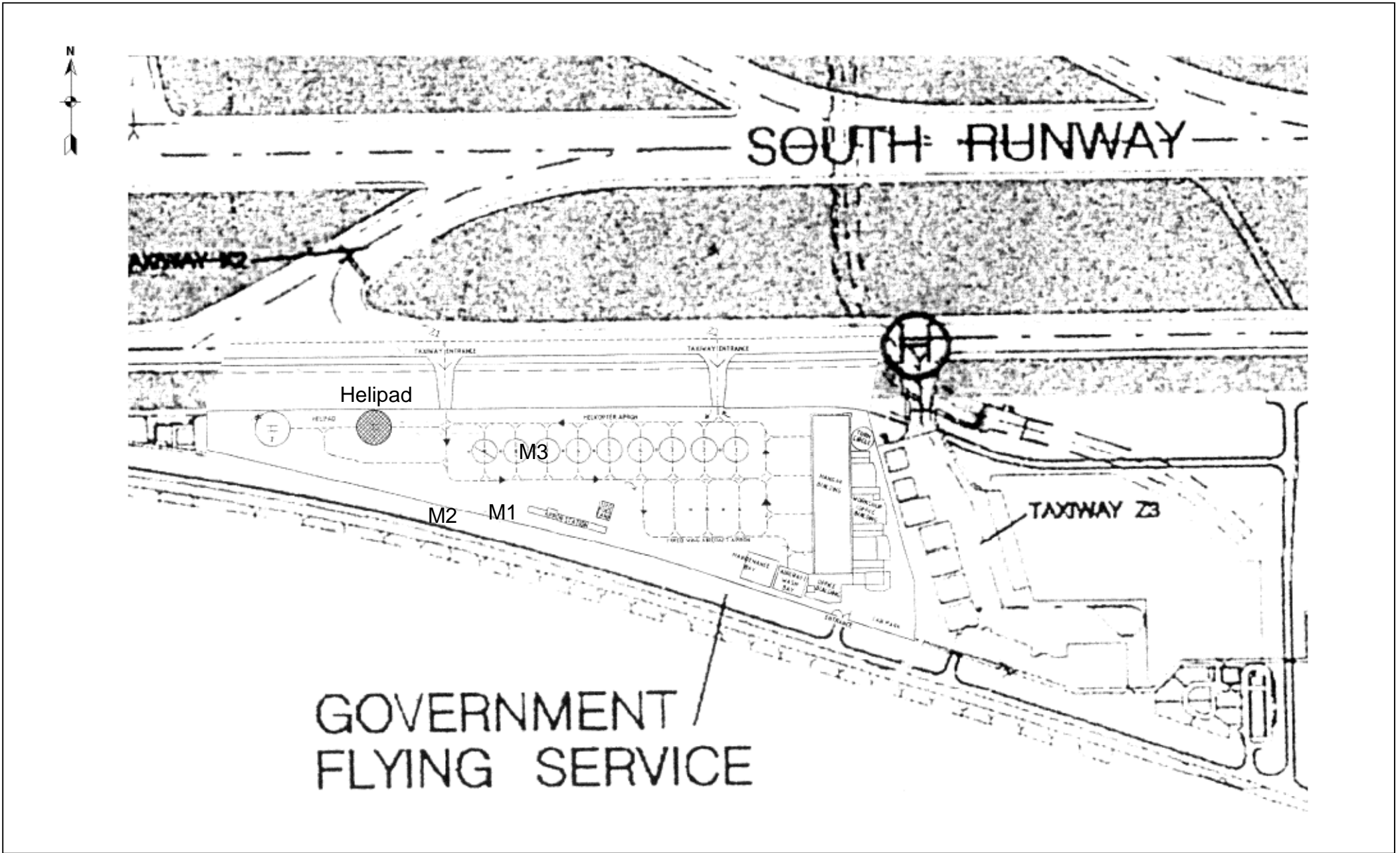
Helicopter No.	Operation	M1 @ 166m	M2 @ 124m	M3 @ 175m	Normalised at 150m			
					M1	M2	M3	Maximum
“EC155 B1” Model								
Helicopter 1	Hovering	x	x	78.7	x	x	80.0	80.0
Helicopter 2	Hovering	x	x	75.3	x	x	76.6	76.6
Helicopter 3	Touch-down	79.3	77.7	73.0	80.2	76.0	74.3	80.2
Helicopter 4	Lift-Off	86.8	86.7	84.3	87.7	85.0	85.6	87.7*
Helicopter 5	Hovering	79.7	82.0	85.0	80.6	80.3	86.3	86.3
Helicopter 5	Touch-down	75.5	74.6	70.6	76.4	72.9	71.9	76.4
“Super Puma AS332 L2” Model								
Helicopter 10	Lift-Off	88.1	85.9	83.6	89.0	84.2	84.9	89.0
Helicopter 10	Hovering	89.7	91.6	86.3	90.6	89.9	87.6	90.6*
Helicopter 10	Hovering	81.8	83.5	82.9	82.7	81.8	84.2	84.2
Helicopter 10	Lift-Off	85.6	85.7	80.7	86.5	84.0	82.0	86.5

Note: “x” indicates data not available at that location.

* L_{max} use for helicopter noise calculation in EIA

4 SUMMARY

- 4.1.1 The measured background noise levels were around 45 dB(A). The difference between the background noise level and the measured results for all modes exceeded 10 dB(A). Therefore, no correction needs to be applied to the measured results.
- 4.1.2 Measurement results that were affected by aircraft noise and pass-by vehicles at the airport were discarded.
- 4.1.3 The worst-case L_{\max} levels of “EC155 B1” helicopter idling and above the helipad were measured to be 80.0 dB(A) and 87.7 dB(A) at 150 metres, respectively. For the ‘Super Puma AS332 L2’ model, L_{\max} levels of helicopter ‘idling’ and above the helipad were measured to be 82.0 dB(A) and 90.6 dB(A) at 150 metres, respectively.



EIA Study for Helipad at Yung Shue Wan, Lamma Island
 HELICOPTER NOISE MEASUREMENT LOCATIONS

Appendix 4.5 - Figure 1

Drawn	DEH	Checked	RBR
Scale	NTS	Date	March 2004