London Battersea Heliport Noise Monitoring

Wandsworth Council
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The work was undertaken as a collaborative partnership between LSBU Enterprises, Wandsworth Council, Hammersmith & Fulham Council and Kensington & Chelsea Council

Heliport Noise Monitoring Report

Executive Summary

London South Bank University Enterprise Ltd was contracted by Wandsworth Council to undertake noise monitoring around three boroughs surrounding Battersea Heliport. The Heliport Consultative Group provided a list of volunteers which was used to select the dwellings used in the monitoring. Monitoring was undertaken over the spring/summer of 2017 to establish baseline noise levels for the residents both internally and externally. Measurements were taken during heliport operating hours: 0700-2300.

Long term measurements were taken at four locations in three boroughs and these were compared to the latest noise criteria in English planning guidance including Professional Practice Guidance ProPG: Planning and Noise 2017 and British Standard 8233:2014 - Guidance on sound insulation and noise reduction for buildings. Reference is also made to other relevant current published standards and guidance. These references include:

- UK National Planning Policy Framework (NPPF)
- Noise Policy Statement for England (NPSE)
- UK Aviation Policy Framework (APF),

It was seen that noise levels, LAeq, 16 hours, along the heliport landing and take-off flight path were at levels that would cause medium risk of adverse health effects on affected residents due to long term noise exposure. There were also multiple occurrences of the maximum noise level exceeding the historic Greater London Council operating criteria of 81 dB(A). By way of contrast there were no exceedances of that criterion in a dwelling that was not on the landing/take-off flight path, and no danger of adverse health effects on the residents.

Contents

1. Introduction

This document presents the work undertaken to establish the noise impact from Battersea Heliport in 2017 at residential receptors in three local authorities: Wandsworth, Hammersmith & Fulham and Kensington & Chelsea.

The complete study consisted of two parts: firstly, objective long term measurements and secondly, a subjective survey open to the residents of the three boroughs is reported in a separate document. The measurements were taken over 6 months to represent multiple seasons using volunteers' homes from the three boroughs.

2. About Us

The Acoustics Group has a team with more than 40 years of experience in environmental noise measurements. Between us we have helped monitor, evaluate and redesign sites to reduce environmental noise for residents. We offer education and training to the latest standards and guidance to help developers manage risk from excessive noise.

3. Background Information on the London, Battersea Heliport

The London Heliport is located by the river Thames in Battersea, London, SW11 3BE. Operational restrictions were first imposed on the heliport by the former Greater London Council (GLC) during the 1970s. At this time the Greater London Council was the strategic planning authority for London and the GLC used agreements under what was then section 52 of the Town and Country Planning Act as a means of controlling heliport activity at both Battersea and Trigg Lane heliports. A part of these agreements included the classification of helicopters by way of a two list system. List A contained helicopter types that at the time were shown to be good noise performers and List B other types that were not able to demonstrate compliance with a specified noise limit value expressed in A weighted decibels.

The admission of a helicopter type into list A was dependent upon it being able to meet an operational noise emission standard of not exceeding 81 decibels[1] at a distance of 150metres from its flight path during a series of "flyover tests". Measurements were taken both on departure and arrival as well when flying directly overhead at a standard height of 150m. At the Battersea heliport movements of helicopters in the "B" list were severely restricted.

The principle of restricting operations at London's heliports by means of a movement quota based upon the noise levels of the helicopters was thus established over 40 years ago.

Five broad categories of noise performance were derived with classes (1 to 5). Category 1 being the least noisy and 5 being the noisiest. Classes 1 and 5 were effectively open ended whilst the middle

[1] 81dB(A)Lmaxf is the highest level recorded on a meter designed to measure sound pressure level in decibels during a single noise event. To account for the performance of the human ear the decibel scale is weighted (A weighting) and the meter response rate is set to "fast" setting.

classes 3 were given a 5dB bandwidth. As a 5dB difference between two similar sounds is generally considered to be noticeable on a subjective basis, it was intended that a noise category 2 helicopter would be noticeably quieter than a class three and so forth.

Consistency between the old and revised schemes was provided by allocating noise category status "A" to Noise categories 1, 2 and 3 whilst new noise categories 4 and 5 attracted "B" status. At Battersea heliport a restriction of not more than 1500 annual movements was placed upon class "B" helicopters.

Under Current Town Planning restrictions, The London Battersea heliport is operationally restricted to 12,000 movements per calendar year with a maximum limit of 80 movements per day. This allowance does not include emergency or military movements.

4. Latest Guidance, Standards and Regulations

A number of official Government publications and guidance notes are relevant to this study, these are:

- The National Planning Policy Framework (NPPF) 2012[2]
- Noise Policy Statement for England (NPSE)
- British Standard 8233:2014 - Guidance on sound insulation and noise reduction for buildings
- British Standard 4142:2104 – Method for rating and assessing industry and commercial sound
- The UK Aviation Policy Framework (APF)
- Department for Transport (DfT) Guidance to the CAA - Air Navigation Guidance 2017 [3]

4.1 Other Relevant Guidance - ProPG: Planning and Noise

In May 2017 a new guidance document was introduced by the Institute of Acoustics (IOA), Association of Noise consultants (ANC) and Chartered Institute of Environmental Health (CIEH) – "ProPG: Planning and Noise[4].

The document is designed to complement the generic and limited guidance provided in The National Planning Policy Framework (NPPF) and Noise Policy Statement for England. It provides guidance, within the context of sustainable development, on noise and the planning process through good acoustic design. This document provides the latest information on noise level criteria based on the principle of NOEL (No observable effect level), LOAEL (Lowest observable adverse effect level), and

[2] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653978/air-navigation-guidance-2017.pdf
[4] http://ioa.org.uk/sites/default/files/14720%20ProPG%20Main%20Document.pdf

SOAEL (Significant observable Adverse Effect Level) as introduced in the Noise Policy Statement for England (NPSE)[5]

The primary method of assessing a site is by considering the health risks to the residents using negligible risk, low risk, medium risk and high risk noise levels, see Table 3 below:

Table 3: Health Risk based on External Noise Levels (free field)

	Negligible Risk	Low Risk	Medium Risk	High Risk
Day: LAeq, 16 hours, (07:00-23:00)	<50 dBA	>60 dBA	>65 dBA	>70 dBA

4.2 British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

Based on the World Health Organisation recommendations[6] a relevant British Standard BS 8233:2014[7] has been recently produced which recommends internal noise levels in residential buildings.

Table 4: Recommended internal and external noise levels in residential spaces for different activities; extracted from BS 8233: 2014

Activity	Location	Daytime (07:00h-23:00h)
Resting	Living Room	35 dB LAeq, 16h
Dining	Dining Area	40 dB LAeq, 16h
Sleeping/ Day time rest	Bedroom	35 dB LAeq, 16h
Amenity	External area	50 - 55dB LAeq, 16h

4.3 Aviation Policy Framework

The Government's Aviation Policy Framework was published in 2013.[8] It confirmed the three noise level thresholds used to define low, medium and high annoyance to residents from aviation noise in terms of outdoor (free field) LAeq, 16 hours (07:00-23:00h). The levels specified are 57, 63 and 69 dB(A), respectively. Airport operators are expected to offer sound insulation locally to residents whose dwellings are impacted at levels of 63 dBLAeq16hr by way of compensation. The Government

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf

6 http://www.euro.who.int/en/health-topics/environment-and-health/noise/activities/development-of-who-environmental-noise-guidelines-for-the-european-region

7 https://shop.bsigroup.com/ProductDetail/?pid=000000000030241579

8 https://www.gov.uk/government/publications/aviation-policy-framework

expects airport operators to offer residents who suffer noise levels greater than 69 dBLAeq16hr sufficient monetary compensation to cover the cost of relocating.

4.4 Air Navigation Guidance

The Air Navigation Guidance (October 2017 - DfT)[9] sets out the Government's reason for adopting a Lowest Observable Effect Level of 51dB LAeq16hr, [External] but it has yet to adopt a Significant Observable Adverse Effect Level for overall policy purposes.

4.5 BS 4142:2014 Method for rating and assessing industry and commercial sound

BS 4142:2014 compares two environments with and without the operating sound source, rather than taking absolute noise criteria. It is unclear from the standard if the heliport can be considered an industrial or a commercial sound source. Hence the assessment is only tentative but it can give an idea of the difference the operation of the heliport makes to the residential environment. The standard takes the long term average noise level (LAeq 16hr) and subtracts the long term background noise level (LAf90,16hr). A penalty is then added to account for the character of the sound, +6dB in this case, for impulsivity and intermittency, based upon subjective observation.

5. Noise Monitoring

Long term noise monitoring was undertaken at four sites in the three boroughs between 11th April 2017 and the 1st September 2017, see Figure 1 below.

Measurements were taken on balconies (external free field corrected noise levels) and in unused rooms (internal noise levels) of residential dwellings. The residents were selected from a list of 25 volunteers provided by the London Battersea Heliport Consultative Group which is partly formed by the representatives of the three boroughs.

Table 5. Locations and measurements taken in the three London boroughs

Borough	**Approx. Location**	**Used**	**Internal Monitoring**	**External Monitoring**
Hammersmith & Fulham	Queen's Club 1st floor	YES	YES	YES
Hammersmith & Fulham	River Thames (Waterman's Quay) 3rd floor	YES	YES	YES
Hammersmith & Fulham	River Thames (Sailmaker's Court) 4th floor	NO	YES	NO
Kensington & Chelsea	World's End 8th floor	YES	YES	YES

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653978/air-navigation-guidance-2017.pdf

Wandsworth	River Thames Prices Court 1st floor	YES	YES	YES

5.1 Locations of the Noise Monitoring stations

Measurements were taken at the four locations giving a total of 120 days of valid data during April-September 2017. Each day of measurements were divided into 5 minute intervals as this is approximately the duration of helicopter movements. This gave a total data set of 14,400 measurements of which 9,600 measurements were analysed. (Some 4,400 data sets were discarded due to the timing of these events falling outside the normal period of daily operation of the heliport (07:00h – 23:00h)

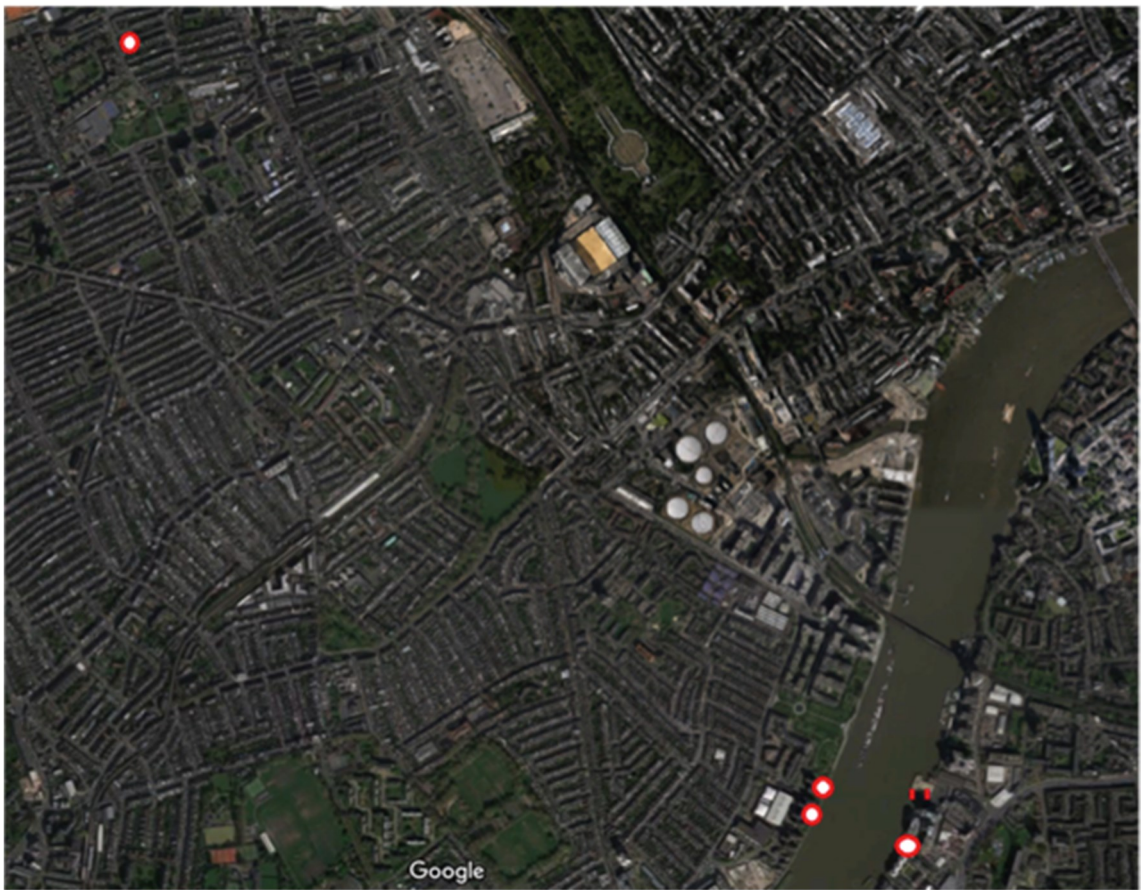

Figure 1. Aerial photo - showing the relevant area and the four monitoring locations, three along the river Thames[10].

5.2 Measurement Instrumentation

Measurements were taken with a calibrated Norsonic Nor140 Class 1 sound level meter (internal measurements) and a NTi XL2 Class 1 sound level meter, with outdoor environmental kit, for external measurements. Both meters were within external laboratory calibration period. Both Meters were also calibrated onsite before and after each measurement.

5.3 Measurement Parameters

The instrumentation was set to measure on a long term basis, many days or weeks. The acoustic parameters measured were LAeq 5 minutes, LAmaxf 5minutes and LAf90[11]. During the post process of the raw data measured, the LAeq5 minutes measurements were combined to obtain the relevant average day time noise level, a LAeq, 16 hours (07:00h-23:00h). This value was further averaged over the duration of the measurements typically from 10-45 days. The highest average noise level is the noisiest of the days monitored at each site.

It is to be noted that in this case there is alignment in both the day / night time definitions as set out in the published references above and the heliport operating hours (the heliport is only normally operational 07:00 to 23:00 – the "daytime period").

The external readings measured on the residents' balconies, needed to be corrected to give the free field equivalent noise level. This was undertaken by subtracting 3 dB(A) from the measured results.

The internal measurements are reported as measured.

Further data analysis was undertake: firstly, by observing the number of times the historic GLC 81dBLAmaxf criterion was exceeded at each location to give the highest occurrence of exceedance and the average number of exceedances.

Secondly, to obtain the average external background noise level at each location when no helicopter movements are registered. This was recorded using the LA90f parameter. This can be used to show the typical noise level at a location without helicopter noise.

[11] LAf90 is the level exceeded 90% of the time, widely employed as a measure of background sound level

6. Wandsworth Results

Only one site in Wandsworth was used for the study, Prices Court, 150m from the Heliport. Internal and external noise levels were measured. The results are shown in the following table (Table 6)

Table 6. Prices Court Long Term Noise Monitoring Measurements

	Long Term Average Noise Level (dB)	**Highest Average Noise Level (dB)**	**Maximum number of Exceedances Per Day based on LAmaxf 81 dB**	**Average number of Exceedances Per Day based on LAmaxf 81 dB**
Internal Level LAeq, 16 hours	56.9	63.1	45	11
Corrected[12] Day External Level LAeq, 16 hours	64.2	66.0	55	36
Background External LAf90,16hr	47.4	N/A	N/A	N/A

Table 7: Percentage of days where there was a risk of adverse health effects due to heliport noise at Prices Court

Risk Rating	**Percentage of Days where risk of Adverse Health Effects Occurred**
Negligible Risk	0%
Low Risk	66%
Medium Risk	33%
High Risk	0%

[12]A correction to the measured noise level is necessary to compensate for the facade reflection, -3 dBA was used

Health risks can now be assessed based on the long term average measurements in accordance to ProPG : Planning and Noise guidance.

From Table 7 above noise levels at this location have been assessed overall as having a low / medium risk of adverse health effects.

The large difference found between the average long term noise level attributable to helicopter noise and the background noise long term noise level [16.6dB()A], indicates according to the BS 4142:2014 method of assessment that helicopter operations are likely to have a significant adverse impact in terms of noise annoyance. On a strict application of BS 4142:2014 once an additional penalty of +6dB is added to the long terms measured level (to allow for impulsivity of the sound) an overall "rating level" of +23 dB is indicated.

The monitored long term noise levels when compared to the recommendations in BS 8233:2014, both inside and outside, were well in excess of the relevant criteria set out in Tables 3 and 4 above.

Finally when compared to the Aviation Policy Framework (APF), the long term noise levels are within those classified as representing "medium" levels of annoyance and thus meet the sound criteria for compensation by way of installation on sound insulation (acoustic double glazing).

7. Hammersmith and Fulham Results

Two sites were used in Hammersmith and Fulham for the study, Waterman's Quay 200m from the heliport and Queen's Club, 2700m from the heliport. Internal and external noise levels were measured. The use of the two sites allowed noise levels to be assessed both near to and far from the heliport, although both are regularly affected by helicopters according to local residents.

Table 8. Queen's Club Long Term Noise Monitoring Measurements

	Long Term Average Noise Level (dB)	**Highest Average Noise Level (dB)**	**Maximum number of Exceedances Per Day based on GLC Historic Operational Criterion LAmaxf 81 dB**	**Average number of Exceedances Per Day based on GLC Historic Operational Criterion (LAmaxf 81 dB)**
Internal Level	40.9	44.8	0	0
Corrected Day External Level LAeq 16 hours	52.1	53.3	2	0
Background External Level LAf90, 16hr	40.8	N/A	N/A	N/A

The monitoring position is located far away from the potential influence of the Heliport.

BS 8233:2014 states that 40 dB(A) should be the design criteria for internal noise levels. It can be seen that the measured level (long term) 40.9 dB(A) aligns with the BS recommended design criterion and as such is considered as being acceptable for an urban residential dwelling.

The difference between long term measured internal / external noise levels [12dB(A) was as expected for summer conditions with windows mainly being open or ajar. Only a minimal number of exceedances, see Table 8 were measured, again as expected for an urban residential dwelling.

Table 9: percentage of time where there was a risk of adverse health effects due to noise in the Queen's Club area.

	Percentage of Days where Risk of Adverse Health Effects Occurred	**Percentage of Nights where Risk of Adverse Health Effects Occurred**
Negligible Risk	100%	86%
Low Risk	0%	14%
Medium Risk	0%	0%
High Risk	0%	0%

From Table 9 it can be clearly seen that the health risks from excessive heliport noise at this location far away from the heliport operation were negligible

According to ProPG the external long term noise level of 52.1 dBA presents negligible health risk effects.

At Waterman's Quay only internal measurements were monitored due to technical difficulties.

Table 10: Waterman's Quay Long Term Noise Monitoring Measurements

	Long Term Average LAeq, 16 hours	**Highest LAeq, 16 hours**	**Maximum number of Exceedances Per Day based on LAmaxf 81 dB**	**Average number of Exceedances Per Day based on LAmaxf 81 dB**
Internal Level	57.2	64.0	31	7

In the absence of external monitoring data it is not possible to make an objective assessment of the health risks at this location as the health impact guidelines provided by reference to ProPG: Planning & Noise are referenced only to external noise levels.

However from Table 10 it can be seen that the internal noise levels measured are in line with those taken on the other side of the river at Prices Court [56.9 dBA] compared to 57.2 dBA at Waterman's

Quay. Similar numbers of exceedances of the historic GLC criterion of 81 dB(A)LAmaxf were also recorded. The recorded levels were in excess of the recommended internal levels specified by BS8233: 2014.

8. Kensington and Chelsea Results

Only one site in Kensington and Chelsea was used for the study, World's End, located at 1200m from the Heliport adjacent to the river Thames and on the approach to the heliport. Internal and external noise levels were measured.

Table 11. World's End Long Term Noise Monitoring Measurements

	Long Term Average Noise Level (dB)	**Highest Average Noise Level (dB)**	**Maximum number of Exceedances Per Day based on LAmaxf 81 dB**	**Average number of Exceedances Per Day based on LAmaxf 81 dB**
Internal Level LAeq, 16 hours	42.8	45.3	0	0
Corrected Day External Level LAeq, 16 hours	63.2	65.2	91	33
Background External Level LA90f, 16hr	57	N/A	N/A	N/A

There was a large difference in the long term average internal and external result due to windows and doors being shut in April when the internal measurements were taken.

The external long term averaged noise levels were taken in July and August and were found to be very similar to those at Prices Court [64.2 dBA] compared to 63.2dB(A) at Prices Court. At both locations aviation noise levels were recorded in excess of the annoyance criteria given in the Aviation Policy Framework for entitlement to sound insulation. The average number of exceedances of the historic GLC criterion was also similar [36 at Price's Court] compared to 33.

At this location the maximum number of day time exceedances of the historic GLC criterion was greater than the number of allowed heliport movements, hence other primary noise sources have to be considered. From onsite observations it is highly likely this is from road traffic along Chelsea Embankment. This is substantiated by the high background noise level [57dB(A)] caused by continuous traffic flow.

Despite the background noise level being high at this location [6.2dBLA90f less than the long term average measured noise] an assessment using BS 4142:2014 methodology indicates a significant risk of adverse impact. A "rating level" of 12.2dB(A) is indicated once a 6dB penalty for impulsivity is applied to the main noise source (helicopters). BS 4142: 2014 advises that a difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

Health risks can now be assessed based on the measurements in accordance to ProPG : Planning and Noise guidance.

Table 12: Percentage of Time where there was a Risk of Adverse Health Effects due to noise at World's End

	Percentage of Days where Risk of Adverse Health Effects Occurred
Negligible Risk	0%
Low Risk	94%
Medium Risk	6%
High Risk	0%

As can be seen from Table 12 there was low risk of adverse health effects at World's End.

9. Summary of Results

The following table has been produced which shows the results for each location measured against the criteria of the five documents referenced

Table 13. Summary of compliance with UK/English guidance on recommended acoustic conditions

Borough	**Location**	**ProPG Health Risk**	**BS 4142: Assessment**	**BS 8233 Criteria [Internal /External]**	**Aviation Policy [Annoyance /Remedial Action]**	**GLC Historic Planning Criterion**
Hammersmith & Fulham	Queen's Club 1st floor	Negligible	Adverse Impact	Met Met	None/None	Not Exceeded
Hammersmith & Fulham	River Thames (Waterman's Quay) 3rd floor	N/A*	N/A*	Exceeded N/A*	N/A*	N/A*
Kensington & Chelsea	World's End 8th floor	Low	Adverse Impact	Exceeded Exceeded	Medium Annoyance /Sound Insulation	Regularly Exceeded
Wandsworth	River Thames Prices Court 1st floor	Low/Medium	Adverse Impact	Exceeded Exceeded	Medium Annoyance /Sound Insulation	Regularly Exceeded

(* The lack of external noise readings prevents an assessment of compliance with guidance)

9. Conclusion and Recommendations

Based on long term measurements undertaken over five months during spring / summer of 2017 and on applicable criteria the residents living under or very near to the heliport flight paths were at risk from environmental noise.

The historic GLC planning criteria [81dBL(A)maxf] for helicopter noise performance was regularly exceeded at residences along the river.

It is recommended that any new planning applications for residential use in all three subject boroughs consider the noise impact of the heliport and in this regard designers should be required to demonstrate how their proposals will meet the recommendations of the relevant guidance and policies identified in this study. Particular attention should be focussed on the design of building facades and the inclusion of any balconies in future residential developments.

When the original planning criteria for List 'A" helicopters were set by the GLC [based on 81 dBA LAMaxf the heliport was located in an industry complex, where there were only a few noise sensitive locations likely to be impacted by noise at or above the chosen threshold. This study has shown that despite the introduction of a new, less noisy, helicopter fleet at Battersea there are, now hundreds if not thousands of sensitive receptors (residents) regularly impacted by noise events at or above the 81dB(A) threshold. As such it is recommended that Local Planning services review the current operational planning controls in place at the heliport.

Residential dwellings along the river experienced measured noise levels that would cause "moderate" levels of annoyance when referenced against current UK aviation policy. The levels found are at or above the criterion set by the Government at which it believes compensation should be paid by airport operators to provide sound insulation. These noise levels in the long term would have a low to medium risk of affecting the health of residents according to the ProPG: Planning and Noise guidance.

It was found that the operation of the heliport would cause significant adverse impact on the residents of all the subject properties (where external monitoring was carried out and could be verified) in this study based on a BS4142: 2014 type assessment

Although current Government aviation policy expects airport operators to provide compensation to affected residents as highlighted in this study, no scheme is currently in operation for Battersea. The study team are not aware of any specific exclusions to this advice in the APF regarding General Aviation and / or Helicopters[13]

The APF states ; "*The Government recognises that aviation noise is not confined to large commercial airports and that annoyance can also be caused by smaller aerodromes used for business and general aviation (GA) purposes, especially at times of intensive activity"*[14].

[13] For example Biggin Hill Aerodrome currently operates a voluntary "night noise" insulation scheme
[14] See section **3.42** of the APF

The APF further advises (section 3.38 – Noise Insulation and Compensation) .....*If no such schemes already exist, airport operators should consider financial assistance towards acoustic insulation for households.*

We recommend that the heliport operator should engage constructively with the Heliport Consultative Group on the options for compensating residents who are adversely impacted in noise terms by the heliport's operations. This is discussed further in the following section of this report.

Noise Action Plans (NAPs):

The Environmental Noise Directive requires certain civil airports in England to produce noise maps (noise contours) and Noise Action Plans.

The process operates in 5 yearly cycles and the process uses the mapping results to produce a plan designed to manage noise issues and effects arising from aircraft departing from and arriving at specific airports.

Defra has previously advised the Battersea Heliport Monitoring Group that there is no statutory requirement for Battersea heliport to prepare a NAP. The primary reasons given have been that:

- insufficient data on helicopter noise performance is available
- No robust noise prediction models exist to facilitate production of helicopter noise contour maps.

We believe the results of this study may provide (subject to further work as set out below) the opportunity to develop a UK model for a heliport NAP.

10. Future Work

Follow up work to extend the reach and value that this initial study has produced could include:

1. Extend the helicopter noise monitoring study by incorporating more noise monitoring sites
2. The development of a heliport noise prediction model to estimate the extent of the populations affected by noise from helicopter operations, based on the current measurement data, in order to fulfil the requirements of the Environmental Noise Directive
3. To verify the accuracy of the prediction model through additional measurements. This would involve using more of the volunteers from the three boroughs.
4. To model possible management and noise control scenarios to predict the reduction in noise from the heliport and the subsequent effect on the local population.
5. To use the noise monitoring data and prediction model to develop a specific local plan for future planning applications in the three boroughs

6. To undertake noise measurements on specific phases of helicopter flight patterns e.g. bypass, take off and landing events to establish a baseline for helicopter movements specifically at the heliport.
7. In conjunction with the heliport operator, devise a heliport movement monitoring system to produce accurate movement data for use in further helicopter noise monitoring.
8. Undertake in conjunction with the heliport operator and the CAA a review of the current complaints mechanism to explore options for improving access and clarity for those persons wishing to make complaints (recommendation from the subjective survey).