

**COMPLIANCE NOISE SURVEY RE. 4 NO. NEW CHIMNEYS
AT THE MAGELLAN AEROSPACE FACTORY, LLAY, WREXHAM
(OCTOBER 2019)**

**On behalf of:
Magellan Aerospace (UK) Ltd**

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AT THE MAGELLAN AEROSPACE FACTORY, LLAY, WREXHAM**

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1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Magellan Aerospace (UK) Ltd to carry out a compliance noise survey in connection with new chimney stacks, and associated air handling plant, that have been installed and commissioned recently at the Rackery Lane factory in Llay.
- 1.2 Condition 2 of the planning approval for the new items of plant (Ref. LLA P/2019/0083) requires that the rating level of any noise generated by the new items of plant, assessed at nearby noise sensitive premises in accordance with British Standard 4142:2014, is controlled such that it does not exceed the background noise level by more than 5 dB(A). (Note – the title of BS 4142:2014 stated in the planning condition is incorrect, the correct title is BS 4142:2014 'Methods for rating and assessing industrial and commercial sound').
- 1.3 Condition 3 of the planning consent for the new items of plant requires an assessment to be carried out to check compliance with the requirement of Condition 2. This report describes such an assessment.
- 1.4 The nearest residential area to the new chimneys is Birch Court, located to the south of the factory site on the other side of Llay Road. Llay Road is a busy road in the daytime, with associated road traffic noise, but is less busy at night. Therefore, the noise assessment has focussed on the middle of the night when the background noise climate of the area can be expected to be at its lowest, and any potential noise impact of the new equipment will be at its greatest.
- 1.5 The qualifications and experience of the author of this report are as follows:
- BSc (Hons.) in Environmental Science;
 - Institute of Acoustic's 'Diploma in Acoustics & Noise Control';
 - MSc in Environmental Acoustics;
 - 30 years of experience in monitoring and assessment of environmental noise;
 - Author of papers on environmental noise issues;
 - Fellow of the Institute of Acoustics.
- 1.6 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have generally been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 OCTOBER 2019 NOISE SURVEY & ASSESSMENT

- 2.1 An environmental noise survey has been undertaken late at night in the early hours of 23rd October 2019 in the vicinity of the nearest residential area to the proposed chimneys i.e. houses in Birch Court. The survey was carried out at the most noise-sensitive time of day i.e. in the middle of the night when there was less extraneous noise from road traffic in Llay Road.
- 2.2 The noise survey was carried out in the same location as previous surveys that we have undertaken – in the roadway between Nos 3 and 6 Birch Court. This location is slightly back from Llay Road to avoid the noise survey results being dominated by any vehicles passing in Llay Road.
- 2.3 The noise measurements were carried out using a Rion NA-27 'Type 1' integrating sound level meter. The sound level meter complies with BS EN 60804:2001 and has current independent calibration certification. Also, acoustic calibration of the sound level meter was checked before and after the noise survey using an acoustic field calibrator and no significant variation in the calibrated noise level occurred.
- 2.4 The noise measurements were carried out in general compliance with BS 7445: 2003 and BS 4142:2014. The noise measurements were taken in 'free-field' conditions and at a microphone height of approximately 1.5m above the ground.

Background Noise Level

- 2.5 Hepworth Acoustics Ltd has carried out background noise monitoring in Birch Court earlier this year and previously in 2011 and 2013 in connection with this, and other, plant installations at Magellan Aerospace. However, up to date measurements of background noise were taken immediately before start-up of the new air handling plant in the early hours of 23rd October 2019. The prevailing noise levels were measured in terms of a number of consecutive 5-minute periods between 02:42 and 02:59 hours and the average L_{A90} value was found to be very steady at 36 dB L_{A90} . This representative late-night background noise level has been used in the assessment of noise impact later in this report.
- 2.6 The ambient L_{Aeq} results varied according to whether any, and how many, vehicles passed in Llay Road during the measurement period. The lowest value measured was 39 dB L_{Aeq} during one 5-minute period when there was no passing traffic. This lowest 'residual sound level' has been used in the assessment of noise impact later in this report.

- 2.7 The results of the October 2019 background noise survey results are presented in Appendix II together with other 2019 survey results. The historical data from our previous night-time noise surveys in 2011 and 2013 are also tabled in Appendix II.

Compliance Noise Survey

- 2.8 We understand that the new air handling plant has now been fully balanced and that a number of noise control measures have been implemented. The new plant was switched on for our noise survey at 03:00 hours on 23rd October 2019.
- 2.9 As the purpose of the compliance noise measurements was to try and ascertain the 'specific sound level' from the new equipment (i.e. without any extraneous noise from traffic, distant aircraft, etc) a series of short term (30 secs-1 minute) noise measurements were taken when there was no, or minimal, extraneous noise.
- 2.10 The results of the late-night noise survey with the new equipment running are presented in Appendix III and are described below.
- 2.11 A series of short-term noise readings were taken between 03:02 and 03:18 with all the new equipment running (i.e. with both fan installations running simultaneously). During this period the measured L_{Aeq} noise levels averaged 40 dB(A), and the L_{A90} levels averaged 39 dB(A). However, these measured noise levels also include the underlying residual and background noise that was measured immediately prior to the new plant being operated. Therefore, some data analysis is necessary to ascertain the contribution to the measured noise levels that is actually from (i.e. the specific sound level of) the new plant. This data analysis is carried out (to one decimal place') below.

Data Analysis to Obtain Specific Sound Level from New Plant

- 2.12 Comparing the average 'plant on' L_{Aeq} noise level of 40.4 dB with the lowest residual level of 38.8 dB L_{Aeq} and carrying out a decibel subtraction gives a specific level of 35.3 dB L_{Aeq} from the new plant. However, for steady sources of noise, which the new plant is, using the L_{A90} values often provide a more accurate measure of specific sound. Thus, comparing the average 'plant on' L_{A90} noise level of 39.7 dB with the average measured background level of 36.1 dB L_{A90} and carrying out a decibel subtraction gives a specific level of 37.2 dB from the new plant. As this is the higher value the 37 dB figure has been taken to be the specific sound level of noise from the new plant for use in the BS 4142 assessment below.

Assessment to BS 4142

- 2.13 From the analysis above, it is considered that the 'specific sound level' of the new plant operating is 37 dB(A).
- 2.14 With all the new plant running the resulting noise was of a steady character with no distinct tonal components. Nor did the sound have any impulsive or intermittent characteristics. Because the noise survey was carried out in the middle of the night, the surveyor was outside in the street and was deliberately listening out for it, he could just discern the air movement sound of the new plant. However, it is unlikely that this would be discernible by residents in their houses. Therefore, it is considered that no acoustic feature penalties are warranted.
- 2.15 This means that the BS 4142 noise 'rating level' of the new plant, in the middle of the night in worst case operating conditions, is the same as the specific sound level of 37 dB.
- 2.16 The BS 4142 rating level of 37 dB therefore exceeds the representative late night background noise level of 36 dB L_{A90} by 1 dB. This is within the 5dB allowed by the planning condition.

Conclusions on Noise Impact

- 2.17 Therefore, noise from operation of the new plant has been found to be within the Council's noise control requirement of being no more than 5dB(A) above the background sound. The noise from operation of the new plant thus complies with Condition 2 of the planning permission.

Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The main indices used in this report are described below.

L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Background Noise Survey Results

2019 Survey 3	Date:	Early Hours of Wednesday 23 October 2019
	Equipment:	Rion NA27 Sound Level Meter (sn: 10632001), calibrator.
	Weather:	Dry, calm to slight S breeze 0-1m/s, clear sky, cold (6°C)
2019 Survey 2	Date:	Early Hours of Friday 10 May 2019
	Equipment:	Rion NA27 Sound Level Meter (sn: 10632001), calibrator.
	Weather:	Dry (roads damp from earlier rain), overcast, calm, cool (6°C)
2019 Survey 1	Date:	Early Hours of Wednesday 10 April 2019
	Equipment:	Rion NA27 Sound Level Meter (sn: 10632001), calibrator.
	Weather:	Dry, clear sky, cold (2°C) and calm.
2013 Survey	Date:	Early Hours of Wednesday 31 July 2013
	Equipment:	Rion NA27 Sound Level Meter (sn: 00590966), calibrator.
	Weather:	Dry, mild (15°C) and calm.
2011 Survey	Date:	Early Hours of Tuesday 8 March 2011
	Equipment:	Rion NA27 Sound Level Meter (sn: 00590966), calibrator.
	Weather:	Dry, cold (-2°C) and calm.

Location : In Birch Court (in roadway near No. 6)**2019 Data**

Date	Time (hours)	Noise levels (dB)			Comments
		L _{Amax}	L _{Aeq}	L _{A90}	
23/10/19	02:42 – 02:47	68.4	47.6	36.1	Distant traffic, faint steady plant, 2 passing cars in Llay Road & 1 artic. lorry.
"	02:48 – 02:53	45.0	38.8	36.4	Distant traffic, faint steady plant, distant owl. No passing cars.
"	02:54 – 02:59	66.1	44.8	35.7	Distant traffic, faint steady plant, 2 passing cars in Llay Road.
"	Average Latest L _{A90} Value			36.1	
10/5/19	02:42 – 02:55	64.9	41.0	33.6	Occasional distant traffic, faint steady plant, 1 van & 1 car passed in Llay Road, distant aircraft.
"	03:27 – 03:32	43.7	35.9	35.1	Faint steady plant, occasional distant traffic. (No passing cars in Llay Road)

10/4/19	02:27 – 02:42	64.1	41.6	35.4	Distant traffic, occasional passing vehicles in Llay Road, distant robin, faint steady plant sound.
“	02:42 – 02:57	64.2	40.6	36.0	Distant traffic, occasional passing vehicles in Llay Road, distant robin, faint steady plant sound, resident putting recycling out.
“	02:58 – 03:13	58.6	38.9	36.6	Distant traffic, distant robin, faint steady plant sound, v. distant aircraft, resident.
Average 2019 L _{A90} Value				35.6	

Historical Data

Date	Time (hours)	Noise levels (dB)			Comments
		L _{Amax}	L _{Aeq}	L _{A90}	
31/7/13	02:45 – 02:50	62.0	42.2	36.7	Distant steady noise from Industrial Estate. 1 car & 1 van passed in Llay Road
“	02:51 – 02:56	69.5	46.6	37.3	Distant steady noise from Industrial Estate. 1 lorry tractor unit & 1 car passed in Llay Road. Distant aircraft.
“	02:57 – 03:02	52.3	38.4	37.8	Distant steady noise from Industrial Estate. Distant vehicle.
“	03:03 – 03:08	65.1	42.0	37.7	Distant steady noise from Industrial Estate. 1 van passed in Llay Road
“	03:08 – 03:13	76.3	50.9	37.7	Distant steady noise from Industrial Estate. 1 articulated lorry & 1 car passed in Llay Road. V faint distant rivetting few secs at a time (?).
“	03:14 – 03:19	61.6	41.5	36.7	Distant steady noise from Industrial Estate. 1 car & 1 van passed in Llay Road.
8/3/11	02:55 – 03:00	58.6	40.9	38.2	Distant steady noise from Industrial Estate. 1 car passed in Llay Road
“	03:00 – 03:05	66.7	47.6	38.0	Distant steady noise from Industrial Estate. 1 car, 1 lorry & 1 van passed in Llay Road
“	03:05 – 03:10	52.2	38.6	37.8	Distant steady noise from Industrial Estate. No passing cars. Occasional distant traffic.
“	03:10 – 03:15	67.9	45.7	38.4	Distant steady noise from Industrial Estate. 1 milk truck passed in Llay Road. Birds.

Appendix III: Noise Survey With New Plant Operating

Date: Early Hours of Wednesday 23 October 2019
Equipment: Rion NA27 Sound Level Meter (sn: 10632001), calibrator.
Weather: Dry, calm to slight S breeze 0-1m/s, clear sky, cold (6°C)

Location : In Birch Court (in roadway near No. 6)

Date	Time	L _{Aeq}	L _{A90}	Comments
23/10/19	03:02 - 03:03	39.5	38.6	Distant traffic, distant steady plant.
"	03:05 - 03:06	39.6	38.8	As above
"	03:07 - 03:08	40.2	39.3	Mainly distant traffic, distant steady plant.
"	03:08 - 03:09	39.8	39.2	Distant traffic, distant steady plant
"	03:11 - 03:12	40.4	39.7	Distant traffic, distant steady plant, bird
"	03:13 - 03:14	41.3	40.8	Distant traffic, distant steady plant incl. air movement.
"	03:15 - 03:16	41.3	40.8	As above
"	03:17 - 03:18	40.7	39.9	As above