



DG Light Haulage

Planning Noise Impact Assessment

dBx Acoustics Ltd
The Co-Operative Building,
23 Sam Road, Diggle, OL3 5PH

17009 DG Light Haulage

Report R01A

Client: Andrew Large Surveyors Ltd

Date: 9 February 2017

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Introduction

dBx Acoustics Ltd has been appointed by Andrew Large Surveyors to carry out a noise impact assessment to support a planning application for an extension of hours for vehicular movements at DG Light Haulage, Kings Newton, Derbyshire.

This report therefore details the results of a noise survey to establish the existing sound climate at the nearest noise sensitive receptors during the night time period, both during weekday and weekend periods. A noise impact assessment considering increased vehicle movement on and from the site is then presented, along with a discussion of the effect of the proposed extension of hours on residential amenity.

Site Proposals

The primary activity at the site is warehousing and associated vehicle movements (deliveries to and from site). It is understood that current consent for the site allows for vehicle movement between 5am and 8pm (Monday to Friday) and 8am to 1pm on Saturday. Warehouse operations are limited by the company to between 8am and 5.30pm. Vehicle loading occurs only during warehouse operational hours.

DG Light Haulage seeks to apply for an extension of hours to allow vehicles to arrive at and depart from the site at any time during the day or night time period, including during the weekend. No extension to warehouse or loading/unloading hours is sought at this time. The primary concern is understood to be the security of vehicles which must currently be parked off site if they arrive outside the permitted hours.

A glossary of acoustic terminology is presented in Appendix A.

Assessment Criteria

Local Authority Requirements

South Derbyshire District Council has published a *Developers Guide to Noise Mitigation* (2016). This is largely concerned with construction noise and gives no guidance on the Council's requirements with regard to control of commercial and industrial noise.

BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

This standard provides a methodology for rating and assessing sound of an industrial or commercial nature, including sound from industrial and manufacturing processes, fixed plant installations, loading and unloading of goods, and sound from mobile plant.

The standard can be used both to assess sound from proposed new industrial and commercial sources, and sound from these sources affecting proposed new dwellings, as well as to investigate complaints. It does not, however, determine whether noise amounts to a nuisance.

The standard leads to derivation of a 'rating level' for the industrial sound which is penalized for acoustically significant characteristics including tonality, impulsivity and intermittency. This is compared against the background noise level (L_{A90}) in the absence of the specific noise (the noise source arising from the industrial/commercial use), the difference between the two being used to give an indication of impact.

Typically, the greater the difference, the greater the magnitude of the impact;

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific noise source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

It should be noted that not all adverse impacts will lead to complaints, and not every complaint is proof of an adverse impact.

Acoustic Survey

Methodology

To establish the existing noise climate at and around the site, continuous noise measurements were made between Thursday 26th and Tuesday 31st January 2017.

All measurements were undertaken in accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*, with microphones located at approximately 3 metres above the local ground level and at least 3.5 metres away from the reflective surfaces other than the ground which can be considered as in free field condition. All measurements were of 15 minutes' duration.

The measurement location was on top of containers located at the DG Light Haulage boundary with the nearest residential property, as shown in the figure below.



Figure 1: Monitoring Location

The monitoring location is considered representative of background noise levels at the rear of the residential property adjacent to the site.

Noise Sources

The dominant noise source affecting the noise sensitive receptors is aircraft arriving and departing East Midlands Airport. The flight path appears to be directly above the site. There was also some road traffic noise from the surrounding road network. There were occasional vehicle movements and warehouse operation noted at the DG Light Haulage site but the surveyor noted that these were infrequent occurrences which would not be expected to contribute to the overall noise level.

Weather Conditions

Weather conditions during the measurement period were generally between -3 and 8°C and wind speeds were within suitable parameters for the measurement of environmental noise (i.e. generally under 5 ms⁻¹). All microphones were protected with a windshield for the duration of the survey. There was no precipitation during the survey.

Equipment

The equipment used during the environmental noise survey is detailed below.

Table 1 - Equipment used in the environmental noise survey

Equipment	Manufacturer & Part No.	Serial Number
Sound Level Meter	Casella C633C	1711050
Microphone	CEL 495	000842
Pre-amplifier	CEL 251	000841
Calibrator	CEL 120/1	2045151

The sound level meter was calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator which had been calibrated not more than one year prior to the survey.

Environmental Noise Survey Results Summary

The results of the environmental noise survey are presented in tabular form below.

Table 2 - Measurement Results

Date	Daytime (07:00-23:00)			Night time (23:00-07:00)	
	L _{Aeq}	L _{A90} (avg)	L _{A90} (min)	L _{Aeq}	L _{A90} (avg)
Thursday 26 Jan *	57	39	36	57	36
Friday 27 Jan	56	42	37	54	36
Saturday 28 Jan	50	40	34	49	32
Sunday 29 Jan	52	39	29	51	31
Monday 30 Jan	55	40	34	56	34
Tuesday 31 Jan **	49	45	41		

*measurements started at 5pm

** measurements ended at 12.30pm

It can be seen that the L_{Aeq} noise levels are consistent between the day and night time period, and between days. The average L_{A90} background noise level is typically between 3 dB and 6 dB lower at night than during the day, (8 dB lower at the weekend).

A statistical analysis of the overnight L_{A90} (23:00-07:00) throughout the survey period indicates that **the typical background noise level overnight is 36 dB L_{A90}**. Please refer to Appendix D for the full analysis.

The following graph shows the noise variation in noise profile across the measurement period.

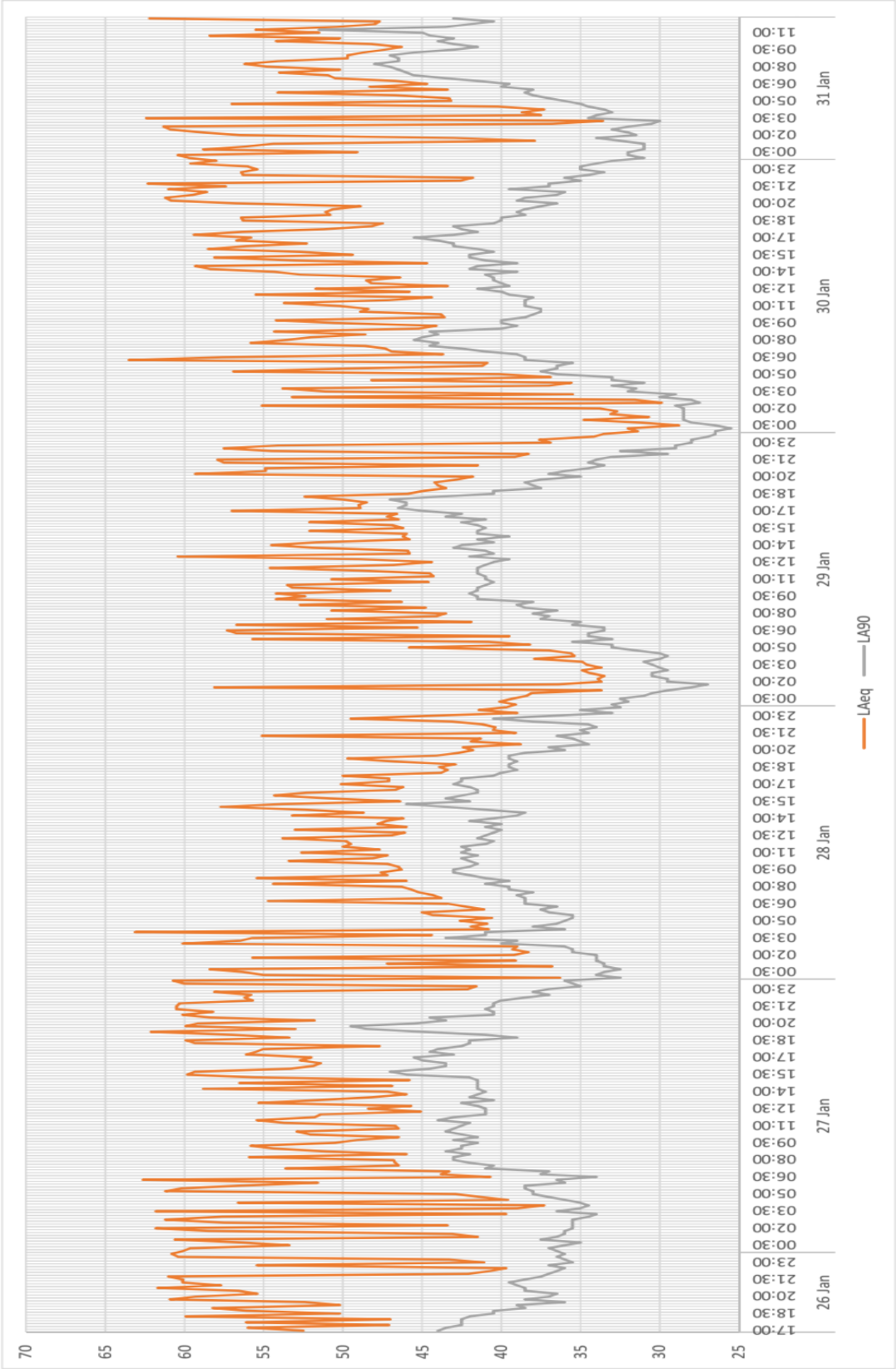


Figure 2: Time History

Analysis of Noise Sources

Aircraft

The noise monitoring equipment was set to log an audio recording of the loudest events occurring during the survey (when the instantaneous noise level exceeded 75 dBA). An analysis of the audio recordings revealed no incidents when activity at DG Light Haulage triggered the recording; one event was due to birdsong and all other events were aircraft movements from the nearby East Midlands Airport.

Observations from the data are that aircraft pass over the site several times overnight. The raw data from the survey along with a note of when planes triggered the recording is presented in Appendix B. We recorded 33 high noise events from aircraft overnight on Thursday 26th/Friday 27th January, and 25 events overnight on Monday 30th / Tuesday 31st January, with fewer noisy events on Saturday and Sunday night (4 and 2 arrivals respectively).

In order to establish with more accuracy the frequency and times of flights from East Midlands Airport over the site, we have attempted to obtain data from the airport to show the complete number and time of flights during the noise survey. We have been able to obtain the number of operations per hour during the survey period; this data is appended to this report. It should be noted that this data includes all aircraft passing through the airport's airspace.

The data on the number of operations indicates that there are typically several flight operations per hour throughout the night time period, with a reduction in overnight flight numbers in the early hours of Sunday and Monday.

The high noise events recorded as audio by the sound level meter correlate with aircraft landing at the airport, the flight path being west to east above the site and adjacent noise sensitive property.

HGV Noise Levels

The most significant noise source associated with extended hours of vehicle movement at the site will be engines idling. It is understood that this typically occurs for no more than 5 minutes when a vehicle is about to depart and is being checked.

A measurement of an idling vehicle engine was made at the north east of the site (where vehicles would wait) at 5m from the left side of the cab, as shown in the figure below;

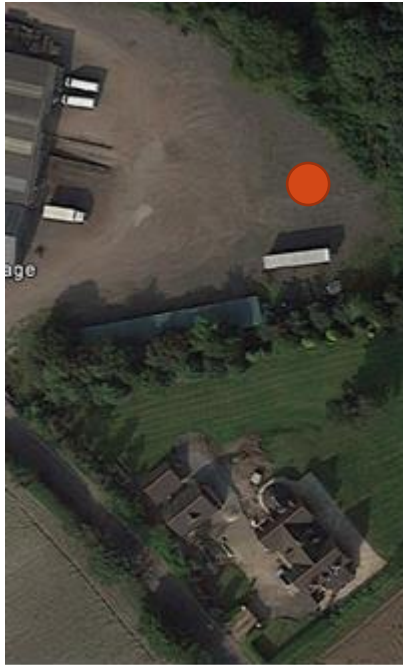


Figure 3: Measurement Location for Idling Vehicle Noise

The measured sound pressure level at 5m from the side of the vehicle cab was 72 dB L_{Aeq} . The distance to the closest part of the residential façade is approximately 55m from this point. Whilst there is a close boarded perimeter fence to the residential property, this assessment assumes that there is line of sight between upper floor windows and the HGV location.

The resultant noise level arising at the residential façade due to a lorry idling is therefore calculated as being $72 - 20 \log_{10} (55/5) = 51$ dB $L_{Aeq, 5 \text{ min}}$. Assuming only one vehicle within any 15 minute period, this would equate to a specific noise level of 46 dB $L_{Aeq, 15 \text{ min}}$.

This can be compared to a typical level of 60 dB $L_{Aeq, 15 \text{ min}}$ for an aircraft overflight measured during the survey.

Existing Night Time Operations

It is important to note that noise arising from vehicles at the DG Light Haulage site is already permitted during part of the night time period (5am-7am).

A review of the background noise data indicates that due to aircraft movements during the week there is no significant change in the background noise level when reviewed during the period 11pm-5am vs 5am-7am as presented in the table below.

It should be noted that for a perceptible increase in noise, a level difference of approximately 3 dB is required. The only difference likely to be perceptible to residents (greater than 3 dB) occurs early on Monday morning due to a reduction in flight numbers rather than due to any increase in site activity noise.

Given that vehicle movement is considered acceptable from 5am-7am, arguably, there should be no adverse noise impact arising due to vehicle movement during other periods of the night.

Date	L _{A90} , 11pm-5am (proposed additional hours)	L _{A90} , 5am-7am (permitted hours)
Thursday 26 th / Friday 27 th	36	37
Friday 27 th / Saturday 28 th	36	37
Saturday 28 th / Sunday 29 th	31	34
Sunday 29 th / Monday 30 th	29	37
Monday 30 th / Tuesday 31 st	33	35

Table 3: Background noise level analysis

This review also demonstrates that current activity at the DG Light Haulage in the 5am-7am period does not have any perceptible effect on noise levels, due to the predominance of aircraft noise.

BS4142:2014 Assessment

Results		Relevant Clause	Comments
Measured background sound level	36 dB L _{A90} , 15min	8.3	The typical background sound level measured during the night time period as derived statistically.
Specific sound level	46 dB L _{Aeq}	7.3.3	A worst case prediction made using the measurement of an idling HGV as detailed above.
Assessment made during the night time period so reference period is 15 minutes		7.2	-
Acoustic feature correction	0 dB	9.2	No tonality or impulsivity expected. Noise is not out of character for the site or area. Regular noise events (e.g. aircraft) occur at night.
Rating Level	46 dB L _{Aeq} , 15 min	9.2	
Background sound level	36 dB L _{A90} , 15 min	8	The typical background sound level measured during the night time period.
Excess of Rating Level over background sound level	10 dB	11	-
An indication of adverse impact, dependent upon context		11	The context of the site must be taken into account. Please see commentary below
Uncertainty of the assessment	Minor	10	Background sound level based on repeatable measurements made over a number of nights. The assessment has used conservative assumptions for the attenuation of noise.

Table 4: BS 4142 Assessment

Commentary – Site Context

The indications of adverse impact provided in Clause 11 of BS 4142:2014 require that when making assessments and arriving at decisions, it is essential to place the sound in context.

The following key points must be considered when assessing the potential noise impact of night time vehicle movements at DG Light Haulage;

- Residential receptors are subject to multiple high-noise events overnight due to aircraft movements
- Noise levels arising from vehicle events is typically 14 dB lower than that arising due to aircraft events.
- Given this, any sound insulation measures in place to protect residents from aircraft noise (e.g. glazing and ventilation) would be considered more than adequate to protect against vehicle noise.
- Vehicle events are currently permitted to occur during part of the night time period (5am-7am). The remainder of the night time period has a comparable background noise level to the period during which events are currently permitted, indicating that vehicle movements do not contribute to the overall noise levels.
- A BS 4142 assessment carried out during the period when events are currently permitted would show a similar result to the assessment carried out for the requested period.

Overall, therefore, there is no reason to consider that an increase in overnight vehicle movements at DG Light Haulage would have an adverse impact upon the residential amenity of neighbouring houses.

Conclusion

This report details an environmental noise survey carried out at a location representative of the closest noise sensitive receptor to DG Light Haulage, Melbourne.

The operator seeks permission for vehicles to arrive and depart site between 8pm and 5am (in addition to the hours already permitted), 7 days per week.

It is demonstrated that the noise climate at the residential premises is dominated by aircraft noise, which continues overnight. The predicted noise level arising as a result of vehicle activity is shown to be significantly less than that arising due to aircraft noise.

It is further demonstrated that on weeknights, there is no significant change in noise level between the period when vehicle movements are permitted (5am-7am) and when they are currently prohibited (11pm-5am).

Appendix A - Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is $2 \times 10^{-5} \text{ N/m}^2$. The sound pressure level existing when microphone measured pressure is $2 \times 10^{-5} \text{ N/m}^2$ is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.

Appendix B – Data from Noise Logger

Date	Time	LAFmax	LAeq	LA90	
Thurs 26th Jan	17:00	73.8	52.5	44	
	17:15	78.7	56	43.5	Plane
	17:30	56.1	47.1	42.5	
	17:45	77	56.1	42.5	Plane
	18:00	58.6	47	42.5	
	18:15	79.3	59.9	42	Plane
	18:30	73.1	50.2	40.5	
	18:45	78.9	56.1	40.5	Plane
	19:00	78.6	58.2	38.5	Plane
	19:15	69.6	50.2	39	
	19:30	69.8	52.4	36	
	19:45	80.2	60.9	38.5	Plane
	20:00	81.3	59.3	37	Plane
	20:15	75.1	55.4	36.5	Plane
	20:30	75.9	56.6	38.5	Plane
	20:45	78.5	61.7	38.5	Plane x3
	21:00	74.8	57.7	39	
	21:15	79.4	60.1	39.5	Plane x2
	21:30	80.5	60.1	38.5	Plane x3
	21:45	80.4	61	37.5	Plane x3
	22:00	63.3	42.1	37	
	22:15	53.1	40.7	36.5	
	22:30	50	39.7	36	
	22:45	76.8	55.4	37	Plane
	23:00	52.4	41.1	35.5	
	23:15	61.9	43.3	36	
	23:30	79	60.4	36.5	Plane x3
	23:45	79.4	60.8	36	Plane x3
Fri 27th Jan	00:00	79.6	60.1	36.5	Plane x2
	00:15	79.1	59.6	37	Plane x2
	00:30	79.8	53.4	36	Plane
	00:45	77.8	56.3	35	Plane
	01:00	76.9	60.6	37.5	Plane x3
	01:15	60.3	41.5	36.5	
	01:30	54.8	43.1	36	

Date	Time	LAFmax	LAeq	LA90	
	01:45	78	58.5	36	Plane x2
	02:00	83.6	61.8	35.5	Plane x2
	02:15	57.4	43.4	35.5	
	02:30	78.1	57.5	35.5	Plane
	02:45	79.9	61.2	35.5	Plane x2
	03:00	79.3	57.6	34.5	Plane
	03:15	59.5	39.7	34	
	03:30	79.3	61.8	36.5	Plane x2
	03:45	49.4	39	35	
	04:00	47.2	37.3	34.5	
	04:15	78.4	56.6	35	Plane
	04:30	49.6	39.6	36	
	04:45	51.9	41.3	37	
	05:00	52.1	42.9	38	
	05:15	77.9	61.2	38	Plane x2
	05:30	77.4	60.2	38.5	Plane x2
	05:45	75.3	56.6	38.5	Plane
	06:00	69.8	51.6	36	
	06:15	76.4	62.6	36.5	Plane
	06:30	52.8	40.7	34	
	06:45	53.9	43.8	37.5	
	07:00	58.5	43.3	37	
	07:15	73.5	53.6	41	
	07:30	61.8	46.5	40.5	
	07:45	66.2	46.7	42	
	08:00	61.5	46.8	43	
	08:15	74.6	55.9	43	
	08:30	57.9	46	42	
	08:45	69.7	51	43.5	
	09:00	74.8	54.4	42.5	
	09:15	75.6	55.8	42.5	Plane
	09:30	69.3	50.5	41.5	
	09:45	67.7	49.1	43	
	10:00	64.2	46.5	41.5	
	10:15	72.1	52.1	42.5	
	10:30	71.5	52.9	43.5	
	10:45	61.4	46.5	43	
	11:00	59.9	46.7	42.5	
	11:15	75.4	53.7	42	Plane
	11:30	72.2	55.4	44	

Date	Time	LAFmax	LAeq	LA90	
	11:45	72.4	51.8	43	
	12:00	71.8	51.4	41	
	12:15	53.7	45.1	41	
	12:30	71.8	48.4	41	
	12:45	57.6	45.7	41.5	
	13:00	74.5	55.3	42.5	
	13:15	73.3	51.8	40.5	
	13:30	62.4	48.2	42	
	13:45	55.4	46	41.5	
	14:00	60.1	47.2	41	
	14:15	77.3	58.8	41.5	Plane x2
	14:30	57.1	46.9	41.5	
	14:45	77	56.5	41.5	Plane
	15:00	71.7	45.8	41.5	
	15:15	75.9	55.6	42	Plane
	15:30	73.9	59.8	46	
	15:45	74.7	59.3	47	
	16:00	71.6	53.3	44.5	
	16:15	69.3	51.9	43.5	
	16:30	68.1	51.4	43.5	
	16:45	70.9	52.7	45	
	17:00	73.3	52	45.5	
	17:15	77.6	56.1	43	
	17:30	76.2	55.5	44.5	Plane x2
	17:45	78.6	55	44	
	18:00	59.8	47.7	42.5	
	18:15	81.2	59.3	42	Plane
	18:30	79	59.9	42	Plane
	18:45	71.8	53.4	39	
	19:00	77.7	57	41	Plane
	19:15	85.4	62.1	45	Plane x2
	19:30	71.2	53	48.5	
	19:45	80.1	59.9	49.5	Plane
	20:00	78.5	59.1	45.5	Plane x2
	20:15	73.2	51.8	43.5	
	20:30	77.3	58.4	44.5	Plane
	20:45	84.1	60.1	40.5	Plane x2
	21:00	76	58.2	40.5	Plane
	21:15	80.6	60.5	41	Plane x2

Date	Time	LAFmax	LAeq	LA90	
	21:30	81.1	60.5	40.5	Plane x2
	21:45	81.7	60.3	40.5	Plane x2
	22:00	77.4	55.7	40	Plane
	22:15	79.1	56.2	38.5	Plane
	22:30	77.2	55.8	37	Plane
	22:45	81.5	58.1	38	Plane
	23:00	53.2	42.1	37	
	23:15	55.3	41.6	35	
	23:30	81.7	60	35.5	Plane x3
	23:45	83.6	60.7	36	Planex2
Saturday 28th Jan	00:00	51.7	36.3	32.5	
	00:15	77.1	55	34	Plane
	00:30	77.3	56.3	33.5	Plane
	00:45	78.8	58.4	32.5	Plane
	01:00	48.5	36.8	33.5	
	01:15	70	47.2	33.5	
	01:30	54.2	39.1	34	
	01:45	76.9	55.7	34	Plane
	02:00	53.9	39.2	34	
	02:15	51.8	38.3	35.5	
	02:30	52.6	39.3	35.5	
	02:45	51.9	39	36	
	03:00	79.3	60.1	40	Plane x2
	03:15	79.5	56.5	39	Plane
	03:30	77.2	55.7	43.5	Plane
	03:45	50.9	44.4	41	
	04:00	81.8	63.1	41	Plane x3
	04:15	53.9	40.8	36	
	04:30	51.6	41.9	38	
	04:45	54.4	40.9	36.5	
	05:00	55.7	42.6	36	
	05:15	55.2	40.6	35.5	
	05:30	62.1	44.3	35.5	
	05:45	57.5	45	37	
	06:00	55.7	41.1	37.5	
	06:15	57.7	42.3	36.5	
	06:30	56.8	43.4	38.5	
	06:45	75.7	54.7	38.5	Plane
	07:00	55.2	43.8	38.5	
	07:15	58.9	44.3	39	

Date	Time	LAFmax	LAeq	LA90	
	07:30	62.8	45.2	38	
	07:45	58.9	45.7	39.5	
	08:00	63.4	46.3	39.5	
	08:15	76.8	54.4	41	Plane
	08:30	70.1	46	39.5	
	08:45	78.2	55.4	41	Plane
	09:00	66.8	47.2	42	
	09:15	62.3	47.6	43	
	09:30	60.1	46.3	43	
	09:45	58.1	46.5	42	
	10:00	62.6	47.2	41.5	
	10:15	71.7	53.4	42	
	10:30	68.7	48.1	42.5	
	10:45	63.6	47.2	41.5	
	11:00	72.1	52.6	42.5	
	11:15	64.9	47.7	42	
	11:30	65.1	50	42.5	
	11:45	65.2	49.5	41	
	12:00	76.9	49.8	40.5	
	12:15	72.4	53.8	41.5	
	12:30	58	46.9	41	
	12:45	61.4	46.1	40.5	
	13:00	72.1	53	40	
	13:15	60.7	46	41	
	13:30	69.1	47.8	40	
	13:45	59.9	47.3	42	
	14:00	67.6	46.2	40.5	
	14:15	70.5	53.2	39	
	14:30	69.6	48.7	38.5	
	14:45	70.1	52.4	41	
	15:00	77.8	57.7	43.5	Plane
	15:15	69.5	53.8	46	
	15:30	61.5	46.4	42	
	15:45	69.1	50.8	43.5	
	16:00	74.5	54.3	42.5	
	16:15	72.5	52.3	41.5	
	16:30	58.5	46.7	41.5	
	16:45	56.1	46.2	42	
	17:00	69.5	50.1	43	
	17:15	63.6	47.1	42.5	
	17:30	62.4	47.1	42.5	
	17:45	71.6	50	40.5	
	18:00	53.4	43.8	40	
	18:15	53.3	43.4	39	

Date	Time	LAFmax	LAeq	LA90	
	18:30	55	43.9	39.5	
	18:45	52.8	42.9	39.5	
	19:00	67.4	46.7	39	
	19:15	67.6	49.7	39.5	
	19:30	54.4	44.1	39.5	
	19:45	52.6	42.7	38.5	
	20:00	54.2	41.8	36	
	20:15	56.3	42.4	37	
	20:30	48.7	38.8	34.5	
	20:45	55.7	41.9	35	
	21:00	52.8	41.3	35.5	
	21:15	76.2	55.1	36.5	Plane
	21:30	53	39.1	34.5	
	21:45	52.9	40.5	35	
	22:00	53.6	40.4	34	
	22:15	53.3	41.2	34.5	
	22:30	55.8	43.1	38	
	22:45	59.3	49.5	40.5	
	23:00	52.7	44.8	37	
	23:15	50.1	39	33	
	23:30	52.8	41.4	35	
	23:45	53.6	39.7	32.5	
Sunday 29th Jan	00:00	51.6	39.1	33	
	00:15	53.4	40.1	32	
	00:30	50.5	39.3	32.5	
	00:45	59.8	38.4	31	
	01:00	54.1	38.1	30.5	
	01:15	49.2	33.7	29.5	
	01:30	77.4	58.1	28	Plane
	01:45	52.9	36.4	27	
	02:00	47.4	33.7	29.5	
	02:15	50.2	33.9	29.5	
	02:30	51.5	33.5	30.5	
	02:45	48.8	34.4	30.5	
	03:00	48	34.9	29.5	
	03:15	49	33.7	30	
	03:30	50	34.6	30.5	
	03:45	50.5	34.9	31	
	04:00	56.1	37.9	30	
	04:15	53.4	35.4	29.5	
	04:30	52.2	35.6	30	
	04:45	49.3	37	31.5	
	05:00	66	45.8	33	
	05:15	52.3	38.2	33	

Date	Time	LAFmax	LAeq	LA90	
	05:30	51.7	40.8	35.5	
	05:45	75.8	55.7	33	Plane
	06:00	50.3	39.5	34.5	
	06:15	76.6	56.7	34.5	Plane
	06:30	73.5	57.3	33.5	
	06:45	70.1	45.3	33.5	
	07:00	77.1	56.7	35.5	Plane
	07:15	66.1	41.9	35	
	07:30	70.7	51	37.5	
	07:45	62.6	44.1	37	
	08:00	60.9	43.5	38	
	08:15	68.2	50.7	36.5	
	08:30	65.9	44.8	38.5	
	08:45	71	52.7	39	
	09:00	63.5	46.3	38	
	09:15	70.3	54.2	41.5	
	09:30	71.2	52.4	41.5	
	09:45	73.6	54.2	42	
	10:00	68.9	47	41.5	
	10:15	73.1	53.2	41.5	
	10:30	73.3	53.5	41	
	10:45	63.7	44.6	40.5	
	11:00	67.3	50.7	41	
	11:15	61	44.3	41	
	11:30	54.2	44.5	41.5	
	11:45	68.9	48.8	41.5	
	12:00	73.6	54.6	41.5	
	12:15	67.7	46.8	41	
	12:30	65.8	44.4	40.5	
	12:45	67.3	48.9	39.5	
	13:00	71.9	60.4	42	
	13:15	67.3	45.8	40.5	
	13:30	58.7	45.9	41	
	13:45	69.1	51.9	43	
	14:00	69.7	54.5	42.5	
	14:15	71.4	51.7	40.5	
	14:30	56.1	45.8	41.5	
	14:45	62.9	46.2	39.5	
	15:00	56.2	46	41.5	
	15:15	71	52.1	41.5	
	15:30	54.2	46.2	41	
	15:45	63.9	46.9	41.5	
	16:00	72.7	52.1	42.5	
	16:15	54.6	46.5	41	

Date	Time	LAFmax	LAeq	LA90	
	16:30	63.4	47.2	43.5	
	16:45	60.4	46.6	42.5	
	17:00	78	57	45	Plane
	17:15	63.3	48.9	46.5	
	17:30	55.8	49	46	
	17:45	56.1	48.5	46	
	18:00	59.3	50	47	
	18:15	71.8	52.4	44	
	18:30	59.1	45.9	40.5	
	18:45	57.1	44.9	40.5	
	19:00	56	43.5	37.5	
	19:15	57.3	44	38	
	19:30	58.3	44.2	38.5	
	19:45	52.4	42.8	37.5	
	20:00	52.1	41.8	35	
	20:15	78.7	59.3	37	Plane x2
	20:30	75.2	54.9	36	Plane
	20:45	76.6	54.9	34.5	Plane
	21:00	53.6	41.5	33.5	
	21:15	78.4	57.5	34.5	Plane
	21:30	77.8	57.9	34	Plane
	21:45	51.7	39.1	33	
	22:00	52.4	38.3	29.5	
	22:15	75.3	54.5	32.5	Plane
	22:30	78	57.5	29	Plane
	22:45	75.9	54.1	29	Plane
	23:00	54.4	36.9	28	
	23:15	54.2	37.6	28	
	23:30	48	34.2	27	
	23:45	47.8	33.6	26.5	
Monday 30th Jan	00:00	48	31.4	26.5	
	00:15	45.6	32	25.5	
	00:30	40.8	28.8	26.5	
	00:45	46.9	31.1	28	
	01:00	48.6	34.8	28.5	
	01:15	44.5	30.7	28.5	
	01:30	47.1	33.1	28.5	
	01:45	47.9	32.7	28.5	
	02:00	47.1	33.8	28.5	
	02:15	75.7	55.1	29	plane
	02:30	42	29.9	27.5	
	02:45	46.7	31.6	28	
	03:00	73.1	53.2	30	

Date	Time	LAFmax	LAeq	LA90	
	03:15	49.2	35.5	29	
	03:30	68.9	51.1	32	
	03:45	73	53.8	31.5	
	04:00	48.6	37	33	
	04:15	48.7	35.6	31	
	04:30	66.7	48.2	33	
	04:45	50.1	36.9	33	
	05:00	48	40.1	36.5	
	05:15	75.6	56.9	37.5	Plane
	05:30	73.9	49.7	36.5	
	05:45	52.6	41.2	36.5	
	06:00	55.1	40.9	35.5	
	06:15	72.8	63.5	38.5	
	06:30	74	57.6	38.5	
	06:45	53.1	43.7	39	
	07:00	63.7	46.9	41	
	07:15	63.3	47.3	42.5	
	07:30	61.4	48.6	44.5	
	07:45	72.9	55.8	44	
	08:00	67.7	53.5	45.5	
	08:15	66.1	52	45	
	08:30	60.6	48.6	44	
	08:45	69.9	54.3	44.5	
	09:00	63.6	45.2	40	
	09:15	57.6	44.1	39	
	09:30	69	50.5	40	
	09:45	72.7	54.2	40	
	10:00	57.6	43.6	38.5	
	10:15	61.9	43.8	38	
	10:30	69.5	48.9	37.5	
	10:45	66.8	48.4	37.5	
	11:00	67.2	50.2	38.5	
	11:15	68.4	53.7	38.5	
	11:30	62.5	47.1	38.5	
	11:45	59.3	44.4	38	
	12:00	77.2	55.5	39.5	plane
	12:15	64.6	45.8	40	
	12:30	70.4	51.7	41.5	
	12:45	56.6	43.4	39.5	
	13:00	69.8	48.2	40	
	13:15	65.9	48.5	40.5	
	13:30	60.1	46.4	40.5	
	13:45	71.3	52.7	41	
	14:00	78.9	54.3	39	plane

Date	Time	LAFmax	LAeq	LA90	
	14:15	80.4	58.4	42	plane
	14:30	76.2	59.3	41.5	plane x2
	14:45	55.7	44.7	39	
	15:00	70.8	53	41	
	15:15	78.5	58.1	42	plane
	15:30	65.5	49.4	42	
	15:45	69.5	52.7	40.5	
	16:00	78.9	58.5	41.5	plane
	16:15	72.9	56.1	43	
	16:30	71.3	52.3	43	
	16:45	79.4	56.7	44	plane
	17:00	76.7	55.8	45.5	plane
	17:15	78	59.4	43	plane x2
	17:30	78.8	56.4	41.5	plane
	17:45	69.8	51.2	42.5	
	18:00	56.9	48.2	43	
	18:15	62.7	47.5	40.5	
	18:30	77.9	56.3	40	plane
	18:45	77.9	56.4	40	plane
	19:00	70.9	50.8	38.5	
	19:15	71.4	51.1	39	
	19:30	69.1	50.6	38.5	
	19:45	67.5	48.9	37.5	
	20:00	82.4	56.8	36.5	plane
	20:15	81	60.8	39	plane
	20:30	78	61.2	38.5	plane x3
	20:45	78.3	59.5	36.5	plane x2
	21:00	78.5	58.6	36	plane
	21:15	79.3	61	39.5	plane x3
	21:30	79.5	57.4	37	plane
	21:45	84.2	62.3	37	plane x3
	22:00	56.9	42.6	35	
	22:15	57	41.8	36	
	22:30	78.3	56.3	34.5	plane
	22:45	78.8	56.4	33.5	plane
	23:00	79.2	55.4	35	plane
	23:15	79	56	35	plane
	23:30	79.3	59.6	34	plane x2
	23:45	80.3	58	33	plane

Date	Time	LAFmax	LAeq	LA90	
Tuesday 31st Jan	00:00	79.3	59.7	31	plane x2
	00:15	83	60.4	32	plane x2
	00:30	71.5	49.1	32	
	00:45	77.7	58.8	31	plane
	01:00	78.6	56.2	31	plane
	01:15	77.8	54.4	31	plane
	01:30	50.8	37.9	32.5	
	01:45	59.7	43	34	
	02:00	78.7	56.5	31.5	plane
	02:15	82.2	58.8	32	plane
	02:30	79.5	60.9	33	plane x3
	02:45	79.3	61.3	32	plane x3
	03:00	53.6	36.8	30.5	
	03:15	50	33.6	30	
	03:30	81.9	62.4	34.5	Plane x4
	03:45	50	37.5	34	
	04:00	51	38.7	33	
	04:15	48.2	37.3	33.5	
	04:30	54.8	40.2	34.5	
	04:45	80.3	57	35	Plane
	05:00	63.1	43.2	36	
	05:15	57.1	43.3	37	
	05:30	59.5	46.7	38	
	05:45	73.9	54.1	38.5	
	06:00	56	43.4	38	
	06:15	63.3	48.3	40	
	06:30	54.8	44.7	39.5	
	06:45	56.9	46.7	41.5	
	07:00	68.7	50.5	43.5	
	07:15	64.5	50.9	45.5	
	07:30	75.1	54	46	Plane
	07:45	62.1	50.2	46.5	
	08:00	72.3	54.8	47	
	08:15	72.3	56.2	48	
	08:30	73.1	54.1	46.5	
	08:45	57	49.7	46.5	
	09:00	59.1	49.7	47	
	09:15	58.2	48.7	45.5	
	09:30	57.2	47.4	43	
	09:45	55.7	46.3	41.5	

Date	Time	LAFmax	LAeq	LA90	
	10:00	63.3	48.2	43	
	10:15	71.8	54.2	44	
	10:30	68.9	50.2	43	
	10:45	81.9	58.4	44.5	Plane x2
	11:00	63.8	51.5	45	
	11:15	76.8	55.5	51.5	Plane
	11:30	60.2	50.4	43.5	
	11:45	62.8	48	42	
	12:00	64.7	47.7	40.5	
	12:15	81.8	62.2	43	Plane x5

Appendix C – Number of Operations

Source;	http://webtrak5.bksv.com/ema2					
Hour	Thursday 26	Friday 27	Saturday 28	Sunday 29	Monday 30	Tuesday 31
00:00	15	13	11	6	6	13
01:00	19	17	11	5	6	15
02:00	14	16	3	0	2	19
03:00	19	14	16	0	6	7
04:00	14	11	11	6	7	15
05:00	32	29	17	13	16	28
06:00	37	36	31	24	34	38
07:00	74	76	65	50	86	70
08:00	79	69	71	41	70	71
09:00	90	83	71	62	82	78
10:00	89	114	96	90	82	77
11:00	81	100	106	91	89	62
12:00	87	86	148	98	84	68
13:00	89	82	116	111	98	53
14:00	103	107	119	95	99	70
15:00	88	115	116	73	119	81
16:00	93	94	70	80	102	79
17:00	77	79	56	69	79	66
18:00	98	88	54	67	95	69
19:00	86	65	33	61	70	59
20:00	100	86	22	78	83	0
21:00	93	80	23	64	69	75
22:00	28	38	22	34	35	35
23:00	28	24	10	16	22	23

Appendix D – Statistical Analysis of Night Time Background Noise Level

Level	No. of occurrences	% of time
27	3	2
28	3	2
29	0	0
30	17	13
31	17	13
32	9	7
33	20	15
34	17	13
35	17	13
36	24	18
37	14	10
38	8	6
39	6	4
40	3	2
41	2	1
42	1	1
43	0	0
44	1	1

