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ACOUSTIC
CONSULTANTS

PROPOSED RESIDENTIAL DEVELOPMENT, ELDON GROVE SITE, LIVERPOOL

NOISE IMPACT ASSESSMENT

architectural

environmental

occupational

industrial

noise control at source

project management

planning

legal services

expert witness

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CONTENTS

1.0 SUMMARY 2
2.0 DEVELOPMENT DESCRIPTION 3
3.0 NOISE ASSESSMENT CRITERIA 4
3.1 National Planning Policy Framework 4
3.2 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings 5
3.3 WHO Guidelines for Community Noise 1999 5
4.0 SURVEY DETAILS 6
4.1 Survey Times and Dates 6
4.2 Weather 6
4.3 Measurement Location 6
4.4 Measurement Equipment 7
4.5 Description of Noise Sources 7
4.6 Measured Results 7
4.7 Discussion of Results 8
5.0 NOISE MITIGATION MEASURES 9
5.1 External Element Construction Details Recommendations 9
5.2 Design Assumptions 11
5.3 Glazing Specification 11
5.4 Ventilation Requirements 11
6.0 CONCLUSION 11

Appendix A. Definition of acoustic terms
Appendix B. Measured Levels

1.0 SUMMARY

PDA Ltd have been commissioned by Elodian Group Ltd to carry out an environmental noise assessment and acoustic envelope design report for the proposed Eldon Grove new build and conversion development at land between Bevington Street, Limekiln Lane, Bond Street and Titchfield Street in Liverpool.

It is proposed to redevelop the site for 139 no. residential units with 95 no. new build units and 44 no. converted units.

The proposed site has been assessed in accordance with the Natonal Planning Policy Framework (NPPF). The assessment has shown that the site is suitable for the proposed residential use with the inclusion of the proposed mitigation measures detailed within this report.

The results of the survey were used to evaluate the sound insulation of the proposed building envelopes of the residential accommodation and to assess compliance with the guidance contained within WHO Guidelines for Community Noise and BS8233:2014. These assessments have demonstrated that utilising the window and ventilation specification recommended within this report the internal ambient noise levels comply with the design criterion.

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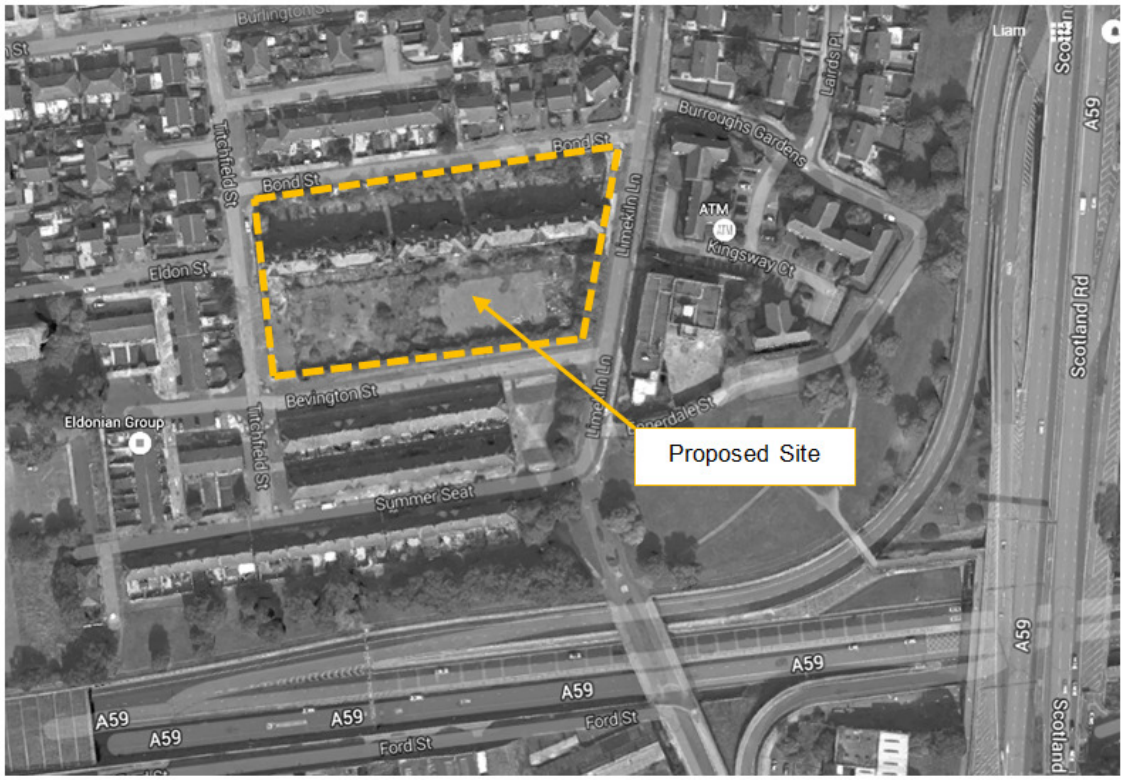
2.0 DEVELOPMENT DESCRIPTION

The proposed development site is situated at land between Bevington Street, Limekiln Lane, Bond Street and Titchfield Street in Liverpool. The site is presently urban wasteland with a row of derelict terrace dwellings occupying a section of the site.

The surrounding local area is predominantly residential. The site is bounded by Bond Street to the north, Limekiln Lane to the east, Bevington Street to the south and Titchfield Street to the west. Scotland Road (A59) runs approximately 160m to the east of the site with the A59 slip road for the Kingsway Tunnel located approximately 100m to the south of the site. Vauxhall Road (A5038) is located some 220m to the west of the site.

The proposed development site is to consist of circa 139 no. residential units with 95 no. new build units and 44 no. converted units. A site plan showing the location of the site and surrounding local area is shown in Figure 1 below.

Figure 1: *Site plan showing proposed site and surrounding area*



3.0 NOISE ASSESSMENT CRITERIA

3.1 National Planning Policy Framework

National Planning Policy is guided by the National Planning Policy Framework. With regard to Noise the Framework states the following;

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The notes also offer an explanation of the term 'other adverse impacts' as follows;

… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been specifically defined, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

3.2 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

Dwelling houses, flats and rooms in residential use

British Standard 8233:2014, *Guidance on Sound Insulation and noise reduction for buildings*, gives guidance on internal noise levels within dwellings, flats and rooms in residential use when unoccupied. The following criteria are for Living and Dining Rooms for daytime use and Bedrooms for night time.

Table 2: *BS8233 recommended indoor ambient noise levels*

Activity	***Location***	***07:00 to 23:00***	***23:00 to 07:00***
Resting	Living room	35 $L_{Aeq,16hour}$	–
Dining	Dining room/area	40 $L_{Aeq,16hour}$	–
Sleeping (daytime resting)	Bedrooms	35 $L_{Aeq,16hour}$	30 $L_{Aeq,8hour}$

It should however be stressed that the above criterion relates to steady noise, in this case from road traffic etc., excluding unusual noise events departing from the typical noise character of the area.

In addition BS 8233 suggests, '*regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values'.*

BS8233 would also suggest that, *'for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'*

3.3 WHO Guidelines for Community Noise 1999

In order to protect the noise into the proposed residential accommodation the building envelope will be assessed with reference to the obtained noise levels from the survey, to ensure that the internal noise environment will comply with the following criteria:

Table 1: *Guideline values for community noise in specific environments*

Specific environment	***Critical health effect(s)***	***L_{Aeq} [dB]***	***Time base [hours]***	***L_{Amax}, fast [dB]***
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45*

* - WHO guidelines state that for a good sleep, the indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10 – 15 times a night.

4.0 SURVEY DETAILS

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the proposed site and to establish the relative local background and traffic noise levels.

4.1 Survey Times and Dates

Measurements were conducted between 10:06 – 12:54 hours on Tuesday 12th January 2016, 07:03 – 10:33 hours on Friday 15th January 2016 and between 23:00 and 01:00 on Monday/Tuesday 18th /19th January 2016. It should be noted that measurements from the surveys have been grouped into "day" and "night" categories in accordance with the following times:-

Daytime:	Between 0700 and 2300 hours
Night-time	Between 2300 and 0700 hours

15 minute sample durations were taken over the daytime measurement periods and 5 minute sample durations were taken over the night time measurement periods. The noise level surveys were chosen to be representative of the worst case night time and daytime periods. The measurements were made and attended by Mr Wesley Charlton of PDA Ltd.

4.2 Weather

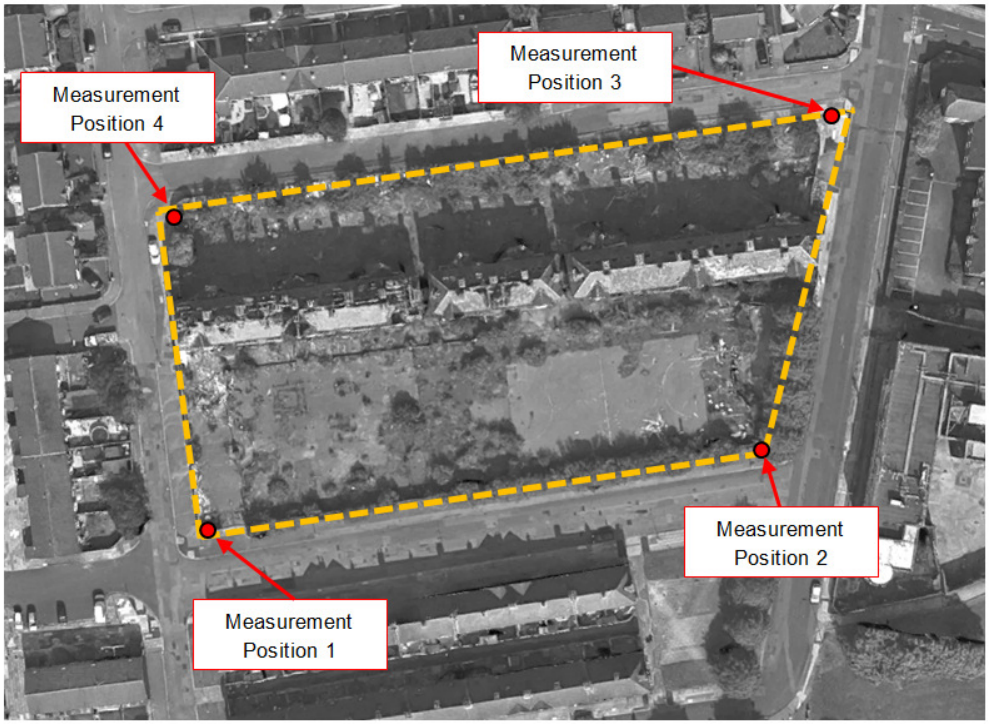
The weather during the daytime surveys were dry with winds of up to 6 mph and cloud cover ranging from 80-100%; the temperature ranged from 2 - 4 degrees centigrade.

The weather during the night time and morning rush hour survey was dry with winds of up to 2 mph with 60% cloud cover; the temperature was between 4 – 5 degrees centigrade.

4.3 Measurement Locations

Measurements were taken at 4 no. positions to describe the noise level at the proposed site. Measurements were taken at least 3.5m from building façades and can therefore be assumed to be free-field measurements. All measurements were taken at a height of 1.5m above the relative ground level. All measurements were undertaken with a fast time-weighting and broadband statistics were measured throughout along with octave band spectra. The measurement positions are detailed in Figure 2 as follows:

Figure 2: *Measurement Locations*



4.4 Measurement Equipment

Measurements were conducted using NTi XL2 sound level meters, for which calibration certificates are held. The measurement equipment is Class 1 accuracy in accordance with BS EN 61672-1:2003. The meters were calibrated directly before any measurement took place and immediately afterwards and no significant drift was observed.

4.5 Description of Noise Sources

The local noise climate is dominated by road traffic noise from Scotland Road (A59) to the east and the A59 slip road for the Kingsway Tunnel to the south. Occasional traffic on the nearby local roads contributed to the noise levels.

4.6 Measured Results

The noise measurements from the survey conducted by PDA are summarised in the table below. Average levels are the logarithmic average of all the measured noise levels. Full details of the measured results can be seen in Appendix B included at the end of this report.

Table 3: *Summary of Daytime on-site Environmental Noise Measurements*

Position	***Time Periods (hh:mm)***	***Duration (hh:mm)***	***$L_{Aeq,T}$ (dB)***	***Range of L_{Amax} (dB)***	***Range of L_{A90} (dB)***
1	07:03 – 07:13 08:01 – 08:16 09:05 – 09:20 10:06 – 10:21 11:17 – 11:32 12:16 – 12:31	01:25	55	62 – 85	49 – 53
2	07:15 – 07:30 08:17 – 08:32 09:20 – 09:35 10:23 – 10:38 11:24 – 12:54	02:30	55	62 – 84	48 – 53
3	07:34 – 07:44 08:38 – 08:53 09:36 – 09:51 10:40 – 10:55 11:37 – 11:52	01:10	57	70 – 78	48 – 54
4	07:47 – 07:57 08:54 – 09:09 09:48 – 10:03 10:57 – 11:12 11:54 – 12:24	02:10	57	70 – 75	50 – 54

Table 4: *Summary of Night time on-site Environmental Noise Measurements*

Position	***Time Periods (hh:mm)***	***Duration (hh:mm)***	***$L_{Aeq,T}$ (dB)***	***Range of L_{Amax} (dB)***	***Range of L_{A90} (dB)***
1	05:11 – 05:21 06:00 – 06:15 22:50 – 23:10 00:02 – 00:17	01:00	46	49 – 64	39 – 46
2	05:24 – 05:34 06:16 – 06:31 23:13 – 23:33 00:19 -00:34	01:00	50	54 – 62	43 – 49
3	05:35 – 05:45 06:34 – 06:49 23:35 – 23:45 00:36 – 00:46	00:45	50	55 – 64	39 – 52
4	05:47 – 05:57 06:52 – 06:57 23:47 – 23:57 00:47 – 00:57	00:35	47	56 – 70	36 – 48

4.7 Discussion of Results

It is noted that the insertion loss performance of a partially open window is generally considered to be in the region of 15dB(A). Reviewing the noise levels above it can be seen that the development would exceed the internal noise limits detailed within Section 3.3 based upon the attenuation of an open window. We have therefore undertaken an assessment of the building envelope to determine the noise ingress and what mitigation measures may be necessary.

5.0 NOISE MITIGATION MEASURES

The sound insulation provided by the building envelope is a combination of the sound reduction indices of the individual façade elements and the area of the façade they cover. The result is a composite sound insulation value for the whole façade.

It is likely, however, that the acoustically weak areas that will dominate the sound insulation performance of the building envelope will be the windows and any ventilation inlets directly into the living spaces.

Based upon the measured noise levels, calculations have been undertaken to determine acoustic specification requirements for the proposed residential dwellings. Calculations have been undertaken in octave bands from 63 Hz to 8kHz inclusive, for the Night time L_{eq}, Daytime L_{eq} and Night time L_{max} levels. The calculated internal noise levels are dependent on the size of room, location and relative glazing area. An outline site sketch layout plan showing the location of the proposed residential dwellings has been supplied however no detailed proposed drawings have been supplied so the window and room dimensions have been assumed for Living Rooms and Bedrooms as follows:

Assumed Living Room

- Volume - $50m^3$
- Façade Area - $6.3m^2$ (excluding glazing)
- Window Area - $6.2m^2$ (approximately 50% of façade area)

Assumed Bedroom

- Volume - $30m^3$
- Façade Area - $5.0m^2$ (excluding glazing)
- Window Area - $2.5m^2$ (approximately 33% of façade area)

5.1 External Element Construction Details Recommendations

In order to meet the internal noise criteria detailed within Section 3.3 above we would recommend the following external element construction details:

5.1.1 External Walls

For calculation purposes the proposed building envelope has been assumed to be a traditional cavity brick/blockwork construction, consisting of 100mm brick/block outer leaf, minimum 75mm cavity and 100mm blockwork inner leaf with internal finish.

Any alternate external wall system will be acceptable assuming that the following minimum sound insulation values are achieved.

Table 3. External Wall Acoustic Properties

Façade Element	***Octave Band (Hz) Sound Insulation, R (dB)***							***R_w***
	63	***125***	***250***	***500***	***1000***	***2000***	***4000***	
External Wall	35	41	45	48	56	58	60	54

5.1.2 Glazing and Ventilation Inlets

The dominant paths for noise transfer to the interior of buildings are generally the glazing and ventilation elements of the façade constructions. The noise level incident on the façade will determine the type of window glazing used. Our calculations have indicated that the minimum requirements for each façade are as follows:

Figure 3: *Façade specifications for the proposed residential development*

The description of the glazing requirements detailed within the figures is as follows:

Table 5. Window Acoustic Properties

Location	Octave Band (Hz) Sound Insulation, R (dB)							R_w	Typical Construction
	63	125	250	500	1000	2000	4000		
▬	18	24	19	26	37	39	31	30	4mm glass, 12mm space, 4mm glass

The description of the vent inlet requirements detailed within the figure is as follows:

Table 6. Vent Acoustic Properties

Location	Octave Band (Hz) Sound Insulation, Dn,e (dB)							$D_{n,e,w}$	Typical Unit
	63	125	250	500	1000	2000	4000		
▬	23	28	26	26	29	29	29	29	RW Simon Airstrip 300

In addition to the above, calculations have been undertaken to determine L_{Amax} noise levels within the bedrooms at night time. Using the highest L_{Amax} noise level measured during the night time, with the glazing and ventilation specifications above, calculations suggest the internal noise level of 45 dB L_{Amax} would not be exceeded.

5.2 Design Assumptions

Assessment and specification of the acoustic performance of the building envelope, has been undertaken based on achieving the internal ambient acoustic conditions, highlighted in Section 3 above.

Information on the sound insulation properties for specific element details has either been sourced from manufacturer's literature or from Insul® Sound insulation prediction software.

In accordance with the reverberation time standardisation detailed within ISO 140-4 the reverberation time within residential habitable rooms have been assumed as 0.5 seconds.

Calculations have been conducted based on the DAY Architectural Ltd outline site sketch layout plan dated 7th December 2015.

5.3 Glazing Specification

It must be ensured that the acoustic performance of the window frames matches the performance of the glazing that is fitted within them. Glazing framing systems must be fully sealed with any small gaps (<10mm nominal) around perimeter to be stuffed with dense mineral wool to full frame depth and sealed both sides with acoustic non-setting mastic. No gaps should be left unsealed, and in no instance should lightweight foams be used as a sealant behind weathering protection.

5.4 Ventilation Requirements

The ventilator requirements described above are predicted to have adequate sound insulation to maintain the required internal noise level. It should be noted however that the inclusion of ventilators alone does not ensure compliance with Building Regulations requirements for ventilation. The ventilation strategy will need to be checked by others. Each habitable room needing façade ventilation inlets will need to incorporate no more than two of such inlets per window to achieve acceptable internal noise levels.

6.0 CONCLUSION

PDA Ltd have been commissioned by Elodian Groups Ltd to carry out an environmental noise assessment and acoustic envelope design report for the proposed Eldon Grove new build and conversion development at land between Bevington Street, Limekiln Lane, Bond Street and Titchfield Street in Liverpool.

The results of the survey were used to evaluate the sound insulation of the respective building envelopes and to assess compliance with the guidance contained within WHO Guidelines for Community Noise and BS8233:2014. These assessments have demonstrated that utilising the window and ventilation specification recommended within this report the internal ambient noise levels comply with the design criterion.

Appendix A. Definition of Acoustic Terms

The decibel
This is the basic unit of noise, denoted dB.

A-Weighting
This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq}. Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$
This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n
This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB $_{LAn.}$ It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}
This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max}, dB L_{Amax}, etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis
Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

Appendix B: Measured Levels

Environmental Noise measurements – Position 1

Date	Time (hh:mm)	L_{eq} Octave Band Centre Frequency								L_{Aeq}	L_{Amax}	L_{A90}
		63	125	250	500	1000	2000	4000	8000			
12/01/16	10:06	59.8	55.7	51.1	49.5	50.3	45.3	39.5	33	54	71	51
12/01/16	11:17	61.6	57.4	53.8	51.3	49.6	44.7	38.6	32.2	54	84	49
12/01/16	12:16	63	55.8	51.6	51	51.9	48.2	44.2	37.1	56	85	51
15/01/16	05:11	53.4	49.9	44.7	42.9	40.5	34.1	29.8	27.4	45	53	43
15/01/16	05:16	54	49.5	43.6	42.7	41.5	36.3	33.7	30.5	46	63	44
15/01/16	05:59	55.5	57	50	44.8	42.5	35.5	26.3	22.3	48	63	45
15/01/16	06:04	56.2	50.6	48.1	44.8	43.4	36.2	24.7	16.6	47	56	45
15/01/16	06:09	57.3	49.8	46.3	45.5	44.2	37.6	28.8	21.6	48	54	46
15/01/16	07:03	60.3	54.9	49.5	48.1	47.9	44.8	35.3	25.1	52	65	49
15/01/16	07:08	60.7	53.3	47.6	47.6	48.6	43.3	31	21.1	52	62	49
15/01/16	08:01	63	56.6	54.7	52.6	53.2	51.2	50.8	41.1	58	80	53
15/01/16	09:05	60.4	53.8	49.3	47.8	51.6	47.8	38.6	23.8	55	74	51
18/01/16	22:50	56.4	50	43.5	39.7	42.6	35.4	21	17.6	45	51	44
18/01/16	22:55	56.5	49.6	42.4	39.4	42.2	35.5	20.5	16.6	45	54	42
18/01/16	23:00	56.5	48.7	41.4	38.6	41.2	34	18.7	16.5	44	49	42
18/01/16	23:05	55.8	49.5	44.8	41.4	43.5	37.7	26.4	19.8	46	61	43
19/01/16	00:02	53.5	48.7	43.1	39.2	39.2	32.3	20.8	18.1	43	64	40
19/01/16	00:07	50.9	47.3	40.3	37.2	38.3	31.1	17.5	16.5	41	51	40
19/01/16	00:12	53.9	49	41.8	41.9	41.2	36.5	28.8	24.6	45	63	39

Environmental Noise measurements – Position 2

Date	Time (hh:mm)	L_{eq} Octave Band Centre Frequency								L_{Aeq}	L_{Amax}	L_{A90}
		63	125	250	500	1000	2000	4000	8000			
12/01/16	10:23	65.7	56.6	53.1	51.2	53.7	47.9	39.6	34.1	56	84	51
12/01/16	11:24	60.8	52.6	47.3	47.5	47.7	42	33.1	24.8	51	71	48
12/01/16	11:39	62.1	54.8	49	47.1	47.1	41.4	38	28.4	51	68	48
12/01/16	11:54	62.5	56.6	51.6	47.4	47.5	41.9	31.9	22.5	51	65	49
12/01/16	12:09	62	54.8	48.3	46.7	47.5	42.6	32.4	29.1	51	63	49
12/01/16	12:24	62.7	53.5	47.4	46.6	47.6	42.1	33.2	22.9	51	63	49
12/01/16	12:39	63.5	53.5	47.6	47.1	48.2	43.1	35.4	28.1	51	62	49
15/01/16	05:24	57.9	52.3	47.5	43.6	45.2	41.6	33.2	23.5	49	60	44
15/01/16	05:29	59	51.6	47.7	42.8	44.8	41.8	32.9	27.4	49	58	46
15/01/16	06:16	60.2	53.2	47.4	44.4	46.7	43.1	31.9	22.9	50	62	48
15/01/16	06:21	60.1	54.6	47.1	44	46.9	43.4	31.4	25.2	50	54	48
15/01/16	06:26	60.2	53.1	48.2	44.7	46.9	43.2	36.2	25.7	50	59	48
15/01/16	07:15	66.2	57	51.4	49.3	52	48.2	42.3	31.4	55	72	52
15/01/16	07:20	63.8	58.4	53.8	52.6	52.8	48.5	42.2	35.7	57	71	52
15/01/16	07:25	63.7	60.3	55.1	53.1	51.9	47.9	40.1	31.4	56	70	52
15/01/16	08:17	63.9	57	51.3	49.4	52	50.1	48.9	48	57	72	53
15/01/16	09:20	63.4	57.7	51.4	48.9	51.3	47.3	39.1	32.2	55	74	51
18/01/16	23:13	59	54.7	46.1	44.6	47.9	42.5	27.8	18	51	57	48
18/01/16	23:18	58.6	54.4	46.9	45.3	49.8	44.8	28.3	17	52	61	49
18/01/16	23:23	58.9	54.5	46.2	45.4	49.1	43.7	28.5	17.4	52	58	48
18/01/16	23:28	59.6	54.7	46.5	45.2	48.9	43.7	29.1	18.8	51	62	48
19/01/16	00:19	56.8	52.8	45	42.7	45.6	40.8	26.8	17.5	49	55	45
19/01/16	00:24	56.5	51.8	43.7	41.2	44.1	38.9	23.5	16.6	47	54	44

19/01/16	00:29	57.1	52.4	43.7	40.7	43.2	38.2	28	24.1	46	59	43

Environmental Noise measurements – Position 3

Date	Time (hh:mm)	L_{eq} Octave Band Centre Frequency								L_{Aeq}	L_{Amax}	L_{A90}
		63	125	250	500	1000	2000	4000	8000			
12/01/16	10:40	67.1	59.3	55.4	54.2	56.6	50.4	40.3	35	59	78	54
12/01/16	11:37	62.2	54.8	48.2	46.5	48	42.4	39	25.7	51	70	48
15/01/16	05:35	55.1	49	46.5	44.7	47.8	40.9	26	17.6	50	55	48
15/01/16	05:40	55.3	48.8	46.6	45	47.1	40.1	28.5	19.4	50	57	47
15/01/16	06:34	57.9	51.9	48.7	47.6	50.7	43.5	30.3	33	53	59	51
15/01/16	06:39	58	52	50	47.8	50.9	43.4	36.3	26	53	59	51
15/01/16	06:44	58.4	52.6	50.1	48.7	52.2	44.8	38.7	30.6	54	64	52
15/01/16	07:34	62	56.6	54.2	53.7	56.8	50.8	38.8	31.9	59	75	53
15/01/16	07:39	62.1	57.2	51.8	51	53.8	47.1	33.9	25.2	56	73	54
15/01/16	08:38	61	55.2	52.9	52.6	55.5	52.2	47.3	43	59	77	54
15/01/16	09:36	60.7	56.6	52.9	51.6	53.9	47.6	35.6	27.9	56	71	53
18/01/16	23:35	55.3	48.6	43.5	41.3	43.9	37.8	25.2	18.8	47	61	42
18/01/16	23:40	54.5	49.4	43.2	41.7	42.7	37.9	29	20.8	46	62	41
19/01/16	00:36	52	50	41.6	37.6	37.9	31.4	21.9	18.7	42	59	39
19/01/16	00:41	53	49.9	41.4	37.8	39.2	33.5	24.8	20.5	43	56	40

Environmental Noise measurements – Position 4

Date	Time (hh:mm)	L_{eq} Octave Band Centre Frequency								L_{Aeq}	L_{Amax}	L_{A90}
		63	125	250	500	1000	2000	4000	8000			
12/01/16	10:57	60.2	55	51.3	51.1	52	48.9	43.4	29.1	56	74	52
12/01/16	11:54	67.1	59.2	53.3	50.1	49.2	48	47.1	42.2	55	73	50
12/01/16	12:09	66.5	57.2	50.6	48.7	48.7	47.8	47.6	42.8	55	71	50
15/01/16	05:47	52.4	52.6	44.7	44.3	43.3	35.5	23.8	19.7	47	57	45
15/01/16	05:52	53	49.9	46.6	46.2	46.6	41.5	32	26.1	50	70	45
15/01/16	06:52	55.7	51.5	48.1	47.3	47.9	40.8	26.8	17.6	51	66	48
15/01/16	07:47	63.6	60.1	53.7	51.7	53	50.6	45.5	40.8	57	71	52
15/01/16	07:52	64.6	60.7	54.7	53.4	54.2	51.6	45.5	40.2	58	70	53
15/01/16	08:54	64.9	57.8	53.7	53.8	55.8	54.4	50.3	39.7	60	75	54
15/01/16	09:48	60.1	55.7	52.6	52.2	50.4	45.8	36.3	29	54	70	50
18/01/16	23:47	52.3	47.8	42.3	43	39.5	34.3	27.4	22.8	44	67	39
18/01/16	23:52	52.4	49.6	41.2	38.3	38.4	33.8	29.5	24.9	43	57	38
19/01/16	00:47	50.6	58	43.1	36.6	34.4	27.4	20.8	18.3	43	56	36
19/01/16	00:52	50.1	52.9	42.1	36.9	33.8	28.3	24.8	22.2	40	63	36