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Kilmartin, Plowman and Partners

Hoyland Road, Hoyland

Planning Noise Assessment

DC2106-R1

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1.0 INTRODUCTION

Kilmartin, Plowman and Partners has appointed Dragonfly Consulting to carry out a Planning Noise Assessment for a planning application for a proposed residential development on land off Hoyland Road, Hoyland.

The noise assessment has been conducted in accordance with the National Planning Policy Framework.

This report therefore describes a noise survey of the site and the subsequent analysis to determine the noise environment of the proposed development. It then compares the results with the adopted criteria. Recommendations are also made with respect to the design of the development.

Measurement of external noise levels have been completed for the proposed development to allow demonstration by calculation that suitable internal noise levels will be achieved within the most noise exposed rooms.

Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature; to assist the reader, a glossary of terminology is included in Appendix A.

2.0 SITE DESCRIPTION

2.1 Existing Site Conditions

The existing site is grazing farmland off Hoyland Road, Hoyland, to the South East of the A6195 dual carriageway road.

To the South, West and East of the site are a series of residential developments and Kirk Balk Academy (school).

There are further open fields to the North of the proposed site, between the area for development and the A6195 road.

2.2 Proposed Site Conditions

It is proposed to create a residential development on the site. The application is currently in outline form only; no illustrative master plan has been provided at this stage.

3.0 GUIDANCE

3.1 Consultation with Barnsley Metropolitan Borough Council

Barnsley Metropolitan Borough Council (BMBC) has not been directly consulted regarding this site. Dragonfly Consulting has consulted with BMBC on a number of other sites and is aware of the objectives of BMBC when seeking to control noise impact on new residential developments.

The National Planning Policy Framework (NPPF) does not provide any specific or quantified guidance with respect to noise and has withdrawn all previous guidance documents on the assessment of noise for planning purposes, which was detailed in Planning and Policy Guidance 24 (PPG24). Instead, the NPPF places the onus on a local authority to develop a suitable local development plan within which noise is addressed, taking account of the guidance within the NPPF. BMBC does not currently have a Local Plan with any relevant guidance on noise. BMBC does not currently publish a guidance document on noise supported by local planning policy, its previously published guidance having been withdrawn alongside the withdrawal of PPG24.

It is considered that the primary noise impact at this site will likely be due to road traffic. Therefore, the assessment of noise impact for this development has been undertaken by comparing predicted internal noise levels within properties against the criteria within BS8233:2014.

3.2 Noise Policy Statement for England

The document 'Noise Policy Statement for England' sets out the following vision for ongoing noise policy:

"Promote good health and a quality of life through the effective management of noise within the context of Government policy on sustainable development."

This vision should be achieved through the following Noise Policy Aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

To achieve this vision, the Noise Policy Statement sets 3 noise levels to be defined by the assessor:

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.

SOAEL – Significant Observed Adverse Effect Level

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

The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL Noise levels, the Policy Statement 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..... This does not mean that such adverse effects cannot occur.”

Where noise levels are below the LOAEL, it is considered there will be no adverse effect. Once noise levels are below the NOEL, there will be no observable change.

Summaries of the relevant standards are given below.

3.3 British Standard 8233

The scope of British Standard 8223:2014: *Sound insulation and noise reduction for buildings* is the provision of guidance for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations; the primary intention of these is to guide the design of new buildings or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate. The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3.1.

Table 3.1
Indoor Ambient Noise Levels in Spaces When They Are Unoccupied

Activity	Typical Situations	Design Range $L_{Aeq,T}$ dB	
		0700h to 2300h	2300h to 0700h
Resting	Living rooms	35	--
Dining	Dining Room / Area	40	--
Sleeping	Bedrooms	35	30

BS8233 states in Note 4 that:

“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.”

As such it has been considered appropriate to define a limit for regular maximum noise levels of 45dB(A) with sporadic events not exceeding 50dB(A). BS8233 also suggests noise limits for external areas or a property such as gardens or balconies. It states 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.”

4.0 ENVIRONMENTAL NOISE SURVEY

Daytime and night time measurements were undertaken from 3rd to 4th November 2016. The noise measurements established typical external ambient and background noise levels at the site.

4.1 Survey Methodology

The equipment used during the survey is detailed in Appendix B. The sound level meters were calibrated before and after the measurements and no significant calibration drifts were found to have occurred (>0.2dB). All of the noise monitoring equipment had been calibrated to a traceable standard within the twelve months preceding the survey. Calibration certificates are available on request.

Two measurement locations were surveyed in order to establish the typical ambient and background noise levels at the proposed development site. The measurement locations are hereby referred to in this report as follows:

- 'Location 1' – sound level meter positioned approximately 1.5m from the ground along the northern boundary of the proposed development site.
- 'Location 2' – sound level meter positioned approximately 1.5m from the ground on the eastern side of the proposed development site as close to Hoyland Road as was practicable.

The measurement locations are shown at Appendix C.

4.2 Survey Results

The weather during the unattended survey was suitable for the majority of noise measurements, it being dry with low wind speeds.

Records of the prevailing weather conditions were collated throughout the duration of the survey and, when significant precipitation had occurred, the results during those periods and the periods immediately before and after were excluded from the assessment. Summaries of the measured noise levels are given in Table 4.1 below and these are set out in full in Appendix D.

Table 4.1
Summary of Measured Noise Levels – 03/11/16 to 04/11/16– free field, dB

Location	Date	Period	Time (h)	L _{Aeq, T}	L _{A10}	L _{A90}	L _{Amax}
1	03/11/16	Daytime	1605-2300	52.6	52.8	49.6	75.5
	03/11/16 to 04/11/16	Night Time	2300-0700	49.1	48.9	44.5	59.4
	04/11/16	Daytime	0700-1430	53.9	55.0	52.0	70.6
2	03/11/16	Daytime	1620-2300	52.8	53.8	48.9	82.4
	03/11/16 to 04/11/16	Night Time	2300-0700	48.7	48.5	43.6	66.0
	04/11/16	Daytime	0700-1440	54.3	55.8	51.8	77.9

4.3 Observations and Comments

The noise environment at 'Location 1' is characterised as being predominantly road traffic noise from the A6195 road to the North and some road traffic noise coming from the M1 motorway to the West. Traffic noise from Hoyland Road to the South is also audible.

The noise environment at 'Location 2' is characterised as being predominantly road traffic noise from Hoyland Road to the South with some road traffic noise coming from the A6195 road to the North the M1 motorway to the West.

For both measurement locations, for both the daytime and night time assessments, it is considered that the noise levels measured are representative of the typical noise environments at the survey locations.

5.0 ASSESSMENT

5.1 Selection of Noise Criteria

As the site is subject to mixed sources of noise and commercial or industrial noise is not dominant, an assessment method has been chosen which considers diverse noise sources. Therefore, the assessment considers the site against the criteria in BS8233:2014.

For this assessment the values of the NOEL, LOAEL and SOAEL are drawn from the criteria and values detailed in BS8233:2014. These criteria are set as internal noise levels and are based on the criteria detailed in the above table.

NOEL – No Observed Effect Level – Internal noise levels within rooms achieve the BS8233:2014 standard calculated with windows open and assuming a 15dB(A) noise reduction for an open window.

LOAEL – Lowest Observed Adverse Effect Level – Internal noise levels achieve the requirements of the BS 8233:2014 standard assuming windows are closed and an additional source of ventilation is provided.

SOAEL – Significant Observed Adverse Effect Level – Internal noise levels fail to achieve the BS8233:2014 standard calculated assuming windows are closed and an additional source of ventilation is provided.

5.2 Internal Noise Levels within Dwellings

Calculations of internal noise levels have been completed for the proposed development to demonstrate that suitable internal noise levels can be achieved within the most noise exposed rooms.

As this stage of the development, detailed floor plans or layouts have not yet been produced. Two locations have been selected as likely to be the most exposed to noise from the local road network and the A6195 road.

The internal noise levels have been calculated for two example dwellings at the most exposed façades of the site.

- Example Dwelling A – at ‘Location 1’.
- Example Dwelling B – at ‘Location 2’.

For these dwellings, it has been assumed that the Daytime and Night Time data obtained at the noise measurement locations will be representative of the noise environment.

The following noise levels were considered as being incident on the façades:

Table 5.1
Noise Levels Incident on Façade – free-field, dB

Dwelling	Noise Period/Type	Frequency in Hz				
		125	250	500	1000	2000
A	Daytime - Leq	49.7	40.2	49.4	52.8	42.6
	Night Time - Leq	45.1	43.3	46.9	47.3	35.2
	Night Time - Typical/Max	54.7	47.7	56.1	58.2	46.2
B	Daytime - Leq	52.8	46.2	49.2	52.1	45.3
	Night Time - Leq	46.2	41.6	45.6	46.7	37.0
	Night Time - Typical/Max	65.4	68.4	60.1	63.4	56.0

Given a typical modern wall construction comprising an internal leaf of concrete block, lined externally with brick and a cavity between of at least 75mm, the following performance would be expected from the external façade construction:

Table 5.2
SRI of Façade, dB (R_w)

Frequency in Hz	125	250	500	1000	2000
R_w of Façade	41	45	45	54	58

The area of external façade that is glazed and unglazed has been calculated using the following assumptions:

- Living Room dimensions of 5m (length) x 4m (width) x 2.3m (height)
- Bedroom dimensions of 3m (length) x 4m (width) x 2.3m (height)
- Double glazed window dimensions of 1m (width) x 1.8m (height).

These assumptions have been based upon typical room sizes of modern family houses. It has been assumed that the most exposed façade would be 4m x 2.3m (9.2m²), unglazed, and 7.4m² with the aforementioned glazing, for both the Living Room and Bedroom.

Acceptable internal noise levels within dwellings are taken from the guidance provided within BS8233:2014, detailed in Section 3.

To achieve acceptable internal noise levels for each of the example dwellings, it is recommended that the Living Rooms and Bedrooms should be installed with sealed double glazing units and provided with a suitable ventilator.

The glazing and ventilation to be used should provide the following minimum noise attenuation:

Table 5.3
SRI of Glazing, dB (R_w)

Glazing type	Frequency in Hz	125	250	500	1000	2000
4/12/4	R_w of Glazing Unit	24	20	25	34	37

4/12/4 denotes a glazing unit with two 4mm panes of glass separated by a 12mm cavity

Table 5.4
 $D_{n,e}$ of Ventilator, dB (4000mm²)

Ventilator type	Frequency in Hz	125	250	500	1000	2000
'Hit and Miss' Trickle	Minimum $D_{n,e}$ of Ventilator Unit	34	27	37	35	34

Table 5.5
Internal Noise Levels in Rooms in dB(A)

Dwelling	Room Type	Glazing	Ventilation
A	Living Room	4/12/4	'Hit and Miss' Trickle
	Bedrooms	4/12/4	'Hit and Miss' Trickle
B	Living Room	4/12/4	'Hit and Miss' Trickle
	Bedrooms	4/12/4	'Hit and Miss' Trickle

It has been calculated that, given the above façade constructions with the stated specifications of double glazing and ventilation, the internal noise levels would be as follows:

Table 5.6
Internal Noise Levels in Rooms in dB(A)

Dwelling	Period	Level	BS8233 Classification
A	Daytime	22.3	Below Limit
	Night Time	20.5	Below Limit
	Night Time – Typical/Maxima	30.2	Within Adopted Criteria
C	Daytime	22.7	Below Limit
	Night Time	19.7	Below Limit
	Night Time – Typical/Maxima	40.2	Within Adopted Criteria

Table 5.6 shows that, when assessed against BS8233:2014, the $L_{Aeq, 16hr}$ (Daytime) internal noise levels are within the suggested design range. Table 5.6 also shows that, when assessed against BS8233:2014, the $L_{Aeq, 8hr}$ (Night Time) internal noise levels are within the suggested design range and meet the standard proposed by Dragonfly Consulting for Night Time maximum noise levels.

It is therefore considered that the calculated internal noise levels are below the LOAEL set for this project. The LOAEL is defined as:

LOAEL– Lowest Observed Adverse Effect Level – Internal noise levels achieve the requirements of the BS8233:2014 standard assuming windows are closed and an additional source of ventilation is provided.

These noise levels are below the LOAEL level set for this assessment and as such these noise levels are considered to be acceptable and meet the requirements of the NPPF and the Noise Policy Statement for England.

5.3 External Noise Levels

BS8233 suggests noise limits for external areas or a property such as gardens or balconies. It states 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.”

The measured noise levels at all the measurement locations were below 55dB(A) and therefore currently fulfil the BS8233 criteria. It is likely that those gardens not on the outer edges of the development would benefit from further noise reduction due to the presence of the new housing around them, such that noise levels in those gardens would be below 50dB(A).

It is also worthy of note that BS8233 does provide an exception for noise levels in external areas as follows:

“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.”

The standard does recognise that:

“...these guideline values are not achievable in all circumstances where development might be desirable.”

The standard further makes clear that, where development is desirable but is in proximity to the strategic road network, the lowest practicable noise levels should be achieved in external amenity spaces but development should not be prohibited.

5.4 Alternate Mitigation Measures

Given that the site is at an outline stage and that the proposed glazing and ventilation strategy is not onerous, it is recommended that consideration be given to considering how site layout could be used to benefit the noise impact on properties and reduce the need for the extensive use of a glazing and ventilation strategy.

By considering noise when selecting site layout, it would be possible to position properties on the outer edges of the site such that those properties towards the centre of the site will be exposed to much lower noise levels and a specific glazing and ventilation strategy may not be necessary for these properties.

Mitigation through optimised site layout is considered to be preferential to the use of a specific glazing and ventilation strategies and as such would be viewed positively by planning authorities when considering the site.

6.0 CONCLUSIONS

Kilmartin, Plowman and Partners has appointed Dragonfly Consulting to carry out a Planning Noise Assessment for a planning application for a proposed residential development on land off Hoyland Road, Hoyland.

The noise assessment has been conducted in accordance with the National Planning Policy Framework.

This report therefore describes a noise survey of the site and the subsequent analysis to determine the noise environment of the proposed development. It then compares the results with the adopted criteria. Recommendations are also made with respect to the design of the development.

Measurement of external noise levels have been completed for the proposed development to allow demonstration by calculation that suitable internal noise levels will be achieved within the most noise exposed rooms.

6.1 Internal Noise Levels Conclusions

The assessment shows that, when assessed against BS8233:2014, the $L_{Aeq, 16hr}$ (Daytime) internal noise levels are within the suggested design range. The assessment also demonstrates that, when assessed against BS8233:2014, the $L_{Aeq, 8hr}$ (Night Time) internal noise levels are within the suggested design range and meet the standard proposed by Dragonfly Consulting for Night Time maximum noise levels.

It is therefore considered that the calculated internal noise levels are below the LOAEL set for this project. The LOAEL is defined as:

LOAEL– Lowest Observed Adverse Effect Level – Internal noise levels achieve the requirements of the BS8233:2014 standard assuming windows are closed and an additional source of ventilation is provided.

These noise levels are below the LOAEL level set for this assessment and as such these noise levels are considered to be acceptable and meet the requirements of the NPPF and the Noise Policy Statement for England.

6.2 External Noise Levels Conclusions

The measured noise levels at all the measurement locations were below 55dB(A) and therefore currently fulfil the BS8233 criteria.

7.0 CLOSURE

This report has been prepared by Dragonfly Consulting with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client.

Copyright in this report (including the data it incorporates) is owned by Dragonfly Consulting. It is provided for the exclusive use of Kilmartin, Plowman and Partners; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Dragonfly Consulting.

Dragonfly Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Appendix A – Glossary of Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} This is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment.

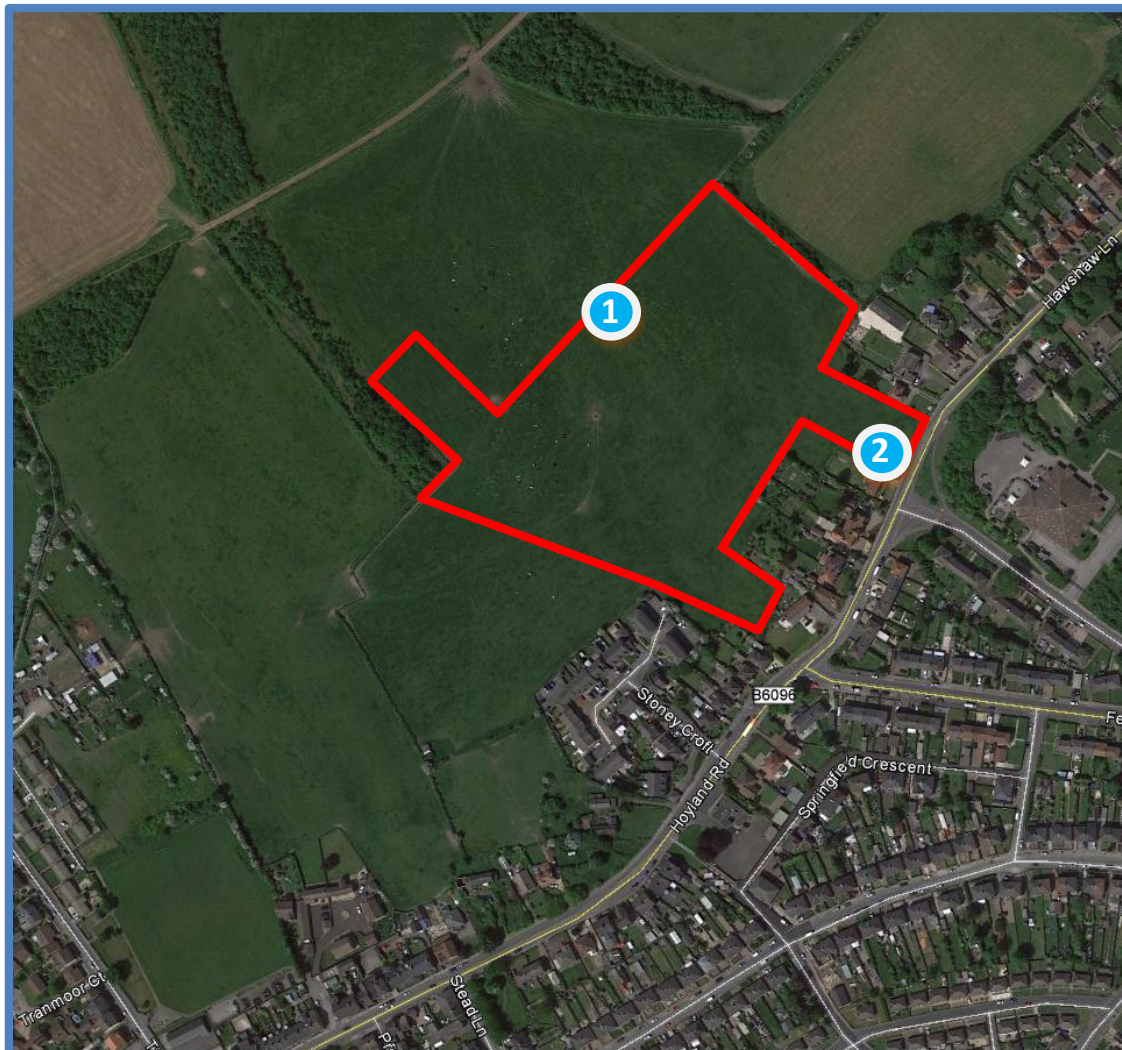
Appendix B – Noise Monitoring Equipment

Table B-1
Noise Monitoring Equipment

Equipment	Serial Number
01dB Solo sound level meter	65782
MCE212 Microphone	134719
Norsonic Nor140 sound level meter	1403879
Norsonic Nor1209 Microphone	13359
Castle GA607 Acoustic Calibrator	039063

Appendix C – Noise Measurement Locations

Figure C-1
Measurement Location Plan



Noise Measurement Location



Proposed Development Site

APPENDIX D

Appendix D - Full Survey Results

Table D-1
Measured Noise Levels, Location 1 (North), 03/11/16 to 04/11/16 – free field, dB

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
16:05	5 Minutes	52.7	53.8	51.3	59.4
16:10	5 Minutes	52.4	53.6	50.7	55.4
16:15	5 Minutes	53.7	55.3	51.7	58.5
16:20	5 Minutes	52.5	53.5	51.3	55.6
16:25	5 Minutes	53.1	54.3	51.8	56.9
16:30	5 Minutes	52.8	53.4	51.9	55.0
16:35	5 Minutes	52.6	53.3	51.7	54.7
16:40	5 Minutes	53.1	54.1	51.7	62.0
16:45	5 Minutes	52.6	53.5	51.4	55.5
16:50	5 Minutes	52.5	53.8	51.1	55.4
16:55	5 Minutes	52.3	53.2	51.2	56.1
17:00	5 Minutes	52.3	53.1	51.1	55.0
17:05	5 Minutes	52.5	53.5	51.3	56.5
17:10	5 Minutes	53.2	54.0	52.0	56.5
17:15	5 Minutes	52.4	53.3	51.1	54.6
17:20	5 Minutes	52.7	53.8	51.4	56.9
17:25	5 Minutes	52.9	53.9	51.7	56.0
17:30	5 Minutes	52.5	53.5	51.0	59.1
17:35	5 Minutes	53.0	54.2	51.7	56.3
17:40	5 Minutes	53.2	54.3	51.8	56.1
17:45	5 Minutes	53.7	54.5	52.4	61.9
17:50	5 Minutes	54.0	54.8	52.7	62.6
17:55	5 Minutes	54.4	55.4	53.1	57.6
18:00	5 Minutes	56.9	59.8	53.7	67.4
18:05	5 Minutes	54.2	55.4	52.4	57.7
18:10	5 Minutes	54.4	55.4	52.9	58.3
18:15	5 Minutes	55.7	55.0	52.3	74.9
18:20	5 Minutes	53.8	54.8	52.6	57.1
18:25	5 Minutes	54.1	55.1	52.7	57.9
18:30	5 Minutes	54.1	55.0	52.8	57.2
18:35	5 Minutes	54.3	54.7	52.3	70.1
18:40	5 Minutes	54.2	54.2	51.8	69.0
18:45	5 Minutes	52.7	53.7	50.9	55.7
18:50	5 Minutes	52.8	53.8	51.6	55.1
18:55	5 Minutes	53.2	54.2	52.1	56.7
19:00	5 Minutes	52.4	53.4	51.2	55.7
19:05	5 Minutes	52.3	53.1	51.1	55.3
19:10	5 Minutes	51.3	52.4	49.8	58.9
19:15	5 Minutes	52.0	52.7	50.1	61.7
19:20	5 Minutes	52.3	53.5	50.8	57.7

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
19:25	5 Minutes	51.7	53.2	49.9	58.3
19:30	5 Minutes	51.4	52.4	50.2	53.7
19:35	5 Minutes	51.2	52.3	49.8	54.0
19:40	5 Minutes	50.3	51.5	48.7	53.5
19:45	5 Minutes	49.8	50.9	48.1	53.1
19:50	5 Minutes	49.4	50.6	47.9	53.3
19:55	5 Minutes	50.0	51.5	48.0	57.0
20:00	5 Minutes	50.1	51.1	48.4	59.7
20:05	5 Minutes	55.5	57.5	48.3	70.8
20:10	5 Minutes	55.6	55.7	48.3	70.8
20:15	5 Minutes	57.3	54.9	48.4	72.0
20:20	5 Minutes	56.3	52.6	48.1	75.5
20:25	5 Minutes	53.9	52.6	47.6	71.6
20:30	5 Minutes	56.6	54.4	47.8	71.3
20:35	5 Minutes	53.8	52.5	48.0	68.0
20:40	5 Minutes	56.9	54.6	47.7	75.1
20:45	5 Minutes	54.0	52.5	47.5	68.2
20:50	5 Minutes	51.9	51.9	47.8	71.9
20:55	5 Minutes	50.1	52.0	47.1	56.3
21:00	5 Minutes	49.5	51.5	46.8	55.7
21:05	5 Minutes	51.1	53.0	47.6	60.7
21:10	5 Minutes	49.9	51.9	47.4	54.5
21:15	5 Minutes	49.1	50.3	46.9	54.8
21:20	5 Minutes	50.0	51.4	48.1	53.5
21:25	5 Minutes	50.0	51.4	48.4	54.4
21:30	5 Minutes	50.0	51.3	48.3	55.3
21:35	5 Minutes	51.3	53.2	48.5	60.4
21:40	5 Minutes	49.2	50.8	46.8	54.0
21:45	5 Minutes	48.3	49.7	46.4	51.9
21:50	5 Minutes	49.6	51.0	48.1	53.2
21:55	5 Minutes	49.3	50.5	47.8	52.8
22:00	5 Minutes	48.4	49.6	46.7	53.6
22:05	5 Minutes	48.7	50.1	46.6	52.7
22:10	5 Minutes	50.2	51.3	48.0	61.1
22:15	5 Minutes	50.0	51.3	48.3	54.5
22:20	5 Minutes	50.2	51.4	48.7	54.2
22:25	5 Minutes	48.7	50.0	47.1	53.7
22:30	5 Minutes	47.0	48.0	45.5	50.5
22:35	5 Minutes	46.1	47.8	43.9	49.4
22:40	5 Minutes	47.6	49.0	45.7	51.2
22:45	5 Minutes	47.9	49.0	46.1	51.6
22:50	5 Minutes	47.5	49.1	45.6	52.6
22:55	5 Minutes	48.9	50.3	47.1	53.9

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
23:00	5 Minutes	47.5	49.0	45.5	52.7
23:05	5 Minutes	47.1	49.1	44.4	54.1
23:10	5 Minutes	46.4	48.1	43.7	53.4
23:15	5 Minutes	45.9	48.0	43.0	50.4
23:20	5 Minutes	44.8	46.0	41.4	58.6
23:25	5 Minutes	46.9	49.9	41.9	58.0
23:30	5 Minutes	44.0	45.5	41.5	49.2
23:35	5 Minutes	43.9	45.2	41.6	50.2
23:40	5 Minutes	44.3	45.8	41.6	50.4
23:45	5 Minutes	45.2	46.4	43.1	49.6
23:50	5 Minutes	44.7	46.3	43.0	47.6
23:55	5 Minutes	45.5	47.3	43.0	51.3
00:00	5 Minutes	46.2	48.7	41.0	52.3
00:05	5 Minutes	44.9	46.8	41.7	50.0
00:10	5 Minutes	45.4	46.8	43.3	49.6
00:15	5 Minutes	44.9	46.9	41.2	50.1
00:20	5 Minutes	44.6	46.5	42.3	50.9
00:25	5 Minutes	43.5	44.9	40.9	49.0
00:30	5 Minutes	44.9	47.2	41.4	50.8
00:35	5 Minutes	44.1	46.3	41.2	49.6
00:40	5 Minutes	43.4	44.9	40.7	51.2
00:45	5 Minutes	44.3	45.9	42.1	48.4
00:50	5 Minutes	44.7	46.9	41.6	50.1
00:55	5 Minutes	44.3	46.2	41.2	50.2
01:00	5 Minutes	43.8	45.5	41.6	49.2
01:05	5 Minutes	42.6	44.2	39.9	48.9
01:10	5 Minutes	43.9	45.8	41.2	53.8
01:15	5 Minutes	42.4	44.1	40.0	48.5
01:20	5 Minutes	43.6	45.0	41.4	49.6
01:25	5 Minutes	42.9	44.9	39.3	50.5
01:30	5 Minutes	44.3	46.0	41.4	50.4
01:35	5 Minutes	42.3	44.7	39.3	47.9
01:40	5 Minutes	44.0	46.2	40.7	48.6
01:45	5 Minutes	42.1	44.7	38.7	48.1
01:50	5 Minutes	42.1	44.2	38.2	49.3
01:55	5 Minutes	41.1	42.6	38.8	45.0
02:00	5 Minutes	42.5	44.0	40.2	48.8
02:05	5 Minutes	43.2	44.9	40.8	48.5
02:10	5 Minutes	44.2	45.7	41.5	48.1
02:15	5 Minutes	44.0	45.7	41.3	48.5
02:20	5 Minutes	42.9	44.4	40.9	46.6
02:25	5 Minutes	44.5	46.4	42.3	48.8
02:30	5 Minutes	46.8	48.4	44.0	54.0

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
02:35	5 Minutes	46.6	48.6	43.3	54.8
02:40	5 Minutes	44.9	46.9	41.6	51.3
02:45	5 Minutes	46.6	48.4	43.2	52.5
02:50	5 Minutes	45.5	47.1	43.2	50.9
02:55	5 Minutes	46.1	47.8	43.3	52.2
03:00	5 Minutes	45.1	47.5	41.2	53.0
03:05	5 Minutes	45.4	47.3	42.7	49.8
03:10	5 Minutes	47.3	48.8	45.1	52.9
03:15	5 Minutes	46.8	48.8	44.1	50.7
03:20	5 Minutes	44.7	46.8	41.7	51.2
03:25	5 Minutes	46.1	47.9	43.6	51.9
03:30	5 Minutes	45.0	46.7	42.4	51.8
03:35	5 Minutes	44.7	46.9	41.6	51.9
03:40	5 Minutes	46.2	48.3	43.2	52.7
03:45	5 Minutes	44.8	46.6	42.2	49.7
03:50	5 Minutes	45.4	47.4	42.4	51.3
03:55	5 Minutes	47.2	49.7	43.3	55.3
04:00	5 Minutes	45.9	47.6	43.3	51.4
04:05	5 Minutes	46.8	48.6	43.7	51.9
04:10	5 Minutes	47.8	50.1	44.8	53.2
04:15	5 Minutes	48.2	50.1	45.3	54.5
04:20	5 Minutes	46.7	48.5	44.0	52.4
04:25	5 Minutes	47.9	50.1	45.3	53.5
04:30	5 Minutes	49.0	51.3	45.1	55.9
04:35	5 Minutes	48.0	50.1	44.3	54.8
04:40	5 Minutes	48.6	50.4	46.1	53.6
04:45	5 Minutes	48.6	50.5	45.9	55.3
04:50	5 Minutes	47.4	48.9	45.1	53.8
04:55	5 Minutes	48.6	50.4	45.7	54.9
05:00	5 Minutes	49.0	51.2	46.3	54.8
05:05	5 Minutes	49.0	51.0	45.8	53.7
05:10	5 Minutes	49.8	51.5	47.7	53.9
05:15	5 Minutes	51.3	52.7	49.1	58.3
05:20	5 Minutes	51.3	52.8	49.1	56.4
05:25	5 Minutes	52.4	53.7	50.3	57.4
05:30	5 Minutes	51.6	53.1	49.6	56.4
05:35	5 Minutes	52.3	54.1	49.5	58.4
05:40	5 Minutes	52.4	54.3	50.0	57.1
05:45	5 Minutes	52.3	54.0	49.6	56.6
05:50	5 Minutes	52.8	54.5	50.9	56.5
05:55	5 Minutes	53.1	54.7	51.0	58.7
06:00	5 Minutes	53.3	54.7	51.5	57.3
06:05	5 Minutes	52.8	54.4	51.1	58.6

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
06:10	5 Minutes	53.6	55.0	51.4	58.2
06:15	5 Minutes	53.3	54.6	51.8	56.4
06:20	5 Minutes	53.7	54.7	52.4	57.6
06:25	5 Minutes	53.6	54.7	52.2	57.0
06:30	5 Minutes	53.8	54.9	52.8	57.8
06:35	5 Minutes	54.6	55.8	53.0	58.2
06:40	5 Minutes	55.5	56.9	53.6	59.0
06:45	5 Minutes	55.9	57.1	54.5	59.4
06:50	5 Minutes	55.8	57.1	53.7	59.1
06:55	5 Minutes	56.1	57.3	54.5	59.3
07:00	5 Minutes	56.4	57.5	54.4	63.2
07:05	5 Minutes	56.6	57.1	54.5	67.6
07:10	5 Minutes	56.0	57.3	54.6	59.5
07:15	5 Minutes	56.3	57.1	55.2	60.0
07:20	5 Minutes	55.8	56.6	54.7	57.7
07:25	5 Minutes	54.9	55.8	53.7	57.3
07:30	5 Minutes	55.0	56.0	53.6	57.6
07:35	5 Minutes	55.4	56.5	53.9	58.6
07:40	5 Minutes	55.3	56.6	53.9	58.5
07:45	5 Minutes	54.7	55.4	53.8	56.4
07:50	5 Minutes	55.5	56.6	54.3	58.6
07:55	5 Minutes	54.8	56.0	53.4	59.1
08:00	5 Minutes	54.6	55.5	53.3	57.0
08:05	5 Minutes	53.9	54.7	52.8	56.4
08:10	5 Minutes	53.0	54.0	51.6	55.5
08:15	5 Minutes	53.1	54.6	51.4	57.4
08:20	5 Minutes	51.6	52.3	50.6	53.4
08:25	5 Minutes	52.1	53.3	50.5	58.1
08:30	5 Minutes	52.8	54.0	51.2	56.3
08:35	5 Minutes	52.8	54.0	51.0	57.6
08:40	5 Minutes	52.3	53.1	51.0	55.2
08:45	5 Minutes	53.0	54.5	51.4	56.6
08:50	5 Minutes	53.0	54.1	51.6	55.7
08:55	5 Minutes	53.9	55.1	52.5	56.7
09:00	5 Minutes	53.4	54.5	52.1	56.7
09:05	5 Minutes	52.5	53.5	51.1	57.9
09:10	5 Minutes	52.9	54.3	51.4	57.6
09:15	5 Minutes	52.0	53.2	50.3	55.4
09:20	5 Minutes	52.7	53.8	51.4	56.3
09:25	5 Minutes	52.4	53.7	50.9	55.6
09:30	5 Minutes	51.7	52.9	50.3	55.5
09:35	5 Minutes	52.4	53.9	50.6	57.8
09:40	5 Minutes	52.3	53.8	50.5	56.8

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
09:45	5 Minutes	53.0	54.5	51.0	58.2
09:50	5 Minutes	53.5	54.8	51.4	57.5
09:55	5 Minutes	54.2	55.6	52.6	57.3
10:00	5 Minutes	53.4	54.8	51.4	57.0
10:05	5 Minutes	[53.9]	[55.1]	[52.1]	[58.0]
10:10	5 Minutes	[53.8]	[54.8]	[52.2]	[59.1]
10:15	5 Minutes	[53.1]	[54.3]	[51.7]	[56.1]
10:20	5 Minutes	[54.5]	[55.3]	[51.2]	[70.6]
10:25	5 Minutes	53.0	54.1	51.3	60.6
10:30	5 Minutes	52.8	53.7	51.5	56.6
10:35	5 Minutes	53.5	54.5	52.1	57.7
10:40	5 Minutes	53.3	54.5	51.5	56.6
10:45	5 Minutes	53.2	54.4	51.5	57.2
10:50	5 Minutes	53.3	54.6	51.5	59.3
10:55	5 Minutes	53.3	54.5	51.4	59.1
11:00	5 Minutes	53.3	54.4	51.8	56.6
11:05	5 Minutes	52.9	54.3	51.3	56.6
11:10	5 Minutes	54.0	55.4	51.7	58.1
11:15	5 Minutes	53.6	55.3	51.7	58.7
11:20	5 Minutes	54.1	55.9	51.5	63.9
11:25	5 Minutes	54.9	57.5	51.5	64.8
11:30	5 Minutes	54.3	55.6	52.7	57.7
11:35	5 Minutes	54.1	55.2	52.4	59.2
11:40	5 Minutes	54.1	55.4	52.3	62.4
11:45	5 Minutes	55.1	57.0	52.2	60.5
11:50	5 Minutes	54.1	55.5	52.5	57.2
11:55	5 Minutes	54.3	55.8	52.0	58.2
12:00	5 Minutes	53.8	54.6	52.3	56.9
12:05	5 Minutes	53.9	55.1	52.2	59.4
12:10	5 Minutes	54.2	55.5	52.5	57.7
12:15	5 Minutes	53.6	54.9	51.7	57.4
12:20	5 Minutes	52.6	53.8	50.7	56.5
12:25	5 Minutes	53.9	55.3	52.0	57.2
12:30	5 Minutes	52.9	54.5	50.6	57.6
12:35	5 Minutes	52.6	54.3	50.6	56.9
12:40	5 Minutes	53.5	54.9	51.7	59.2
12:45	5 Minutes	53.7	55.2	51.8	58.3
12:50	5 Minutes	53.5	55.4	51.4	58.6
12:55	5 Minutes	53.3	54.9	51.5	59.2
13:00	5 Minutes	54.1	55.5	52.5	57.1
13:05	5 Minutes	54.9	56.3	53.1	63.3
13:10	5 Minutes	53.9	55.0	52.2	57.7
13:15	5 Minutes	53.6	55.1	51.8	57.6

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
13:20	5 Minutes	53.4	54.8	51.3	59.1
13:25	5 Minutes	53.9	55.8	51.6	58.7
13:30	5 Minutes	53.2	54.5	51.5	56.7
13:35	5 Minutes	54.4	55.8	52.5	58.1
13:40	5 Minutes	53.5	54.9	51.7	57.1
13:45	5 Minutes	54.5	56.2	52.1	59.5
13:50	5 Minutes	54.1	55.4	52.4	60.4
13:55	5 Minutes	54.8	56.3	52.6	59.8
14:00	5 Minutes	54.9	56.1	53.3	58.2
14:05	5 Minutes	54.2	55.2	52.7	57.7
14:10	5 Minutes	53.4	54.8	51.9	56.5
14:15	5 Minutes	53.2	54.6	51.4	57.1
14:20	5 Minutes	52.6	54.0	50.7	57.4
14:25	5 Minutes	52.8	54.0	51.4	57.8

Records enclosed in square brackets [] denote excluded data points due to rainfall.

APPENDIX D

Appendix D - Full Survey Results

Table D-2
Measured Noise Levels, Location 2 (East), 03/11/16 to 04/11/16 – free field, dB

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
16:20	5 Minutes	53.5	55.1	51.3	61.6
16:25	5 Minutes	53.0	54.6	50.5	66.0
16:30	5 Minutes	59.3	59.5	51.3	82.4
16:35	5 Minutes	53.5	55.5	51.0	58.4
16:40	5 Minutes	53.5	55.8	50.7	60.2
16:45	5 Minutes	53.7	55.6	50.8	64.6
16:50	5 Minutes	53.1	55.1	50.5	58.9
16:55	5 Minutes	52.7	54.4	50.4	56.9
17:00	5 Minutes	53.2	55.0	50.8	59.0
17:05	5 Minutes	53.3	55.0	50.8	59.0
17:10	5 Minutes	53.6	55.1	51.0	70.9
17:15	5 Minutes	53.5	55.4	50.9	61.4
17:20	5 Minutes	53.1	55.0	50.6	57.1
17:25	5 Minutes	52.9	54.7	50.8	58.5
17:30	5 Minutes	53.8	55.6	51.2	61.5
17:35	5 Minutes	52.6	54.3	50.6	56.8
17:40	5 Minutes	53.8	55.5	51.5	58.7
17:45	5 Minutes	53.7	55.7	51.3	59.2
17:50	5 Minutes	53.9	55.6	52.0	57.5
17:55	5 Minutes	54.1	55.6	52.1	61.0
18:00	5 Minutes	54.2	56.0	52.3	59.7
18:05	5 Minutes	55.8	58.0	52.4	67.8
18:10	5 Minutes	54.0	55.7	51.5	57.6
18:15	5 Minutes	54.1	55.7	51.6	65.6
18:20	5 Minutes	53.6	55.1	51.7	59.3
18:25	5 Minutes	53.9	55.6	51.9	59.8
18:30	5 Minutes	54.4	56.0	52.5	60.7
18:35	5 Minutes	53.1	54.8	51.3	58.0
18:40	5 Minutes	53.8	55.1	52.0	66.5
18:45	5 Minutes	53.3	54.8	51.6	58.1
18:50	5 Minutes	55.7	55.7	51.3	72.0
18:55	5 Minutes	53.3	55.1	51.1	58.8
19:00	5 Minutes	53.6	55.4	51.6	58.3
19:05	5 Minutes	52.6	54.4	50.6	59.4
19:10	5 Minutes	52.6	54.3	50.5	57.7
19:15	5 Minutes	53.2	54.6	49.3	68.7
19:20	5 Minutes	51.7	53.8	49.6	61.1
19:25	5 Minutes	53.0	54.6	49.6	66.4
19:30	5 Minutes	52.4	54.8	49.7	58.8
19:35	5 Minutes	51.8	53.8	49.0	57.7

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
19:40	5 Minutes	52.4	54.4	49.5	69.9
19:45	5 Minutes	51.9	54.1	48.5	63.8
19:50	5 Minutes	50.7	53.2	47.8	59.8
19:55	5 Minutes	50.0	52.4	47.2	57.6
20:00	5 Minutes	50.3	52.3	47.8	57.3
20:05	5 Minutes	51.8	53.3	47.6	76.0
20:10	5 Minutes	54.9	55.1	47.0	76.5
20:15	5 Minutes	56.7	55.1	48.4	78.2
20:20	5 Minutes	54.5	54.2	47.5	78.2
20:25	5 Minutes	55.5	54.8	46.7	76.9
20:30	5 Minutes	53.1	53.2	47.0	72.9
20:35	5 Minutes	55.4	54.4	48.0	77.2
20:40	5 Minutes	55.1	53.9	47.3	75.7
20:45	5 Minutes	54.3	54.0	46.5	76.1
20:50	5 Minutes	54.6	53.7	47.1	79.6
20:55	5 Minutes	50.7	53.7	46.8	60.1
21:00	5 Minutes	48.5	50.5	45.8	56.4
21:05	5 Minutes	50.2	52.8	47.0	57.0
21:10	5 Minutes	51.0	53.6	47.0	63.5
21:15	5 Minutes	49.3	51.9	46.1	56.7
21:20	5 Minutes	50.0	53.0	46.7	59.7
21:25	5 Minutes	50.2	52.4	47.8	56.8
21:30	5 Minutes	49.7	51.6	47.2	56.9
21:35	5 Minutes	50.5	52.4	47.6	61.2
21:40	5 Minutes	50.2	52.8	47.2	56.1
21:45	5 Minutes	48.7	50.9	46.0	57.4
21:50	5 Minutes	48.4	50.9	46.0	56.5
21:55	5 Minutes	49.6	52.6	46.7	57.6
22:00	5 Minutes	49.5	51.8	46.8	58.5
22:05	5 Minutes	48.9	50.9	45.7	62.3
22:10	5 Minutes	49.2	51.5	46.2	59.2
22:15	5 Minutes	50.0	52.0	47.8	58.5
22:20	5 Minutes	49.7	51.0	47.7	57.7
22:25	5 Minutes	49.3	51.1	46.6	58.7
22:30	5 Minutes	48.2	50.5	45.4	57.7
22:35	5 Minutes	46.8	48.6	44.1	56.2
22:40	5 Minutes	46.0	48.1	43.1	56.0
22:45	5 Minutes	47.6	50.3	44.8	57.1
22:50	5 Minutes	47.2	49.0	45.2	53.8
22:55	5 Minutes	47.7	49.4	45.3	55.5
23:00	5 Minutes	48.7	50.6	46.2	57.1
23:05	5 Minutes	48.5	51.6	44.4	56.7
23:10	5 Minutes	46.5	48.3	43.7	56.8

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
23:15	5 Minutes	46.2	49.3	42.5	55.3
23:20	5 Minutes	47.6	49.3	41.8	66.0
23:25	5 Minutes	43.4	45.6	40.3	52.2
23:30	5 Minutes	46.8	50.3	40.7	60.2
23:35	5 Minutes	45.0	47.1	40.8	58.2
23:40	5 Minutes	43.0	44.7	40.2	52.8
23:45	5 Minutes	43.6	45.4	41.1	52.0
23:50	5 Minutes	44.1	45.7	42.0	49.0
23:55	5 Minutes	44.1	45.7	41.3	53.2
00:00	5 Minutes	44.3	46.2	41.8	53.2
00:05	5 Minutes	43.7	46.0	39.7	48.5
00:10	5 Minutes	44.2	45.8	41.0	54.5
00:15	5 Minutes	44.8	46.2	41.7	58.0
00:20	5 Minutes	45.3	47.0	39.4	62.8
00:25	5 Minutes	43.5	44.9	40.7	55.8
00:30	5 Minutes	43.6	46.1	39.4	57.2
00:35	5 Minutes	45.6	47.1	39.7	61.7
00:40	5 Minutes	43.0	44.2	40.4	54.4
00:45	5 Minutes	44.1	43.9	39.4	60.7
00:50	5 Minutes	43.7	45.1	41.0	54.6
00:55	5 Minutes	42.5	44.1	40.6	48.2
01:00	5 Minutes	43.0	44.5	40.5	52.8
01:05	5 Minutes	42.6	44.0	40.9	45.9
01:10	5 Minutes	41.6	43.1	38.6	53.6
01:15	5 Minutes	41.7	43.6	39.2	50.0
01:20	5 Minutes	42.6	43.7	39.1	56.9
01:25	5 Minutes	41.7	43.4	39.5	47.0
01:30	5 Minutes	41.6	43.5	38.7	48.1
01:35	5 Minutes	43.4	45.1	39.6	53.2
01:40	5 Minutes	43.6	45.4	38.6	57.1
01:45	5 Minutes	42.7	45.1	39.5	48.5
01:50	5 Minutes	38.9	40.7	35.9	48.8
01:55	5 Minutes	40.2	42.2	37.8	47.0
02:00	5 Minutes	40.1	42.0	37.5	50.5
02:05	5 Minutes	41.4	43.0	39.2	46.0
02:10	5 Minutes	41.6	43.5	39.5	48.1
02:15	5 Minutes	44.8	47.2	41.4	53.8
02:20	5 Minutes	41.6	43.4	39.3	50.2
02:25	5 Minutes	42.8	44.7	39.7	51.7
02:30	5 Minutes	44.0	46.1	41.3	49.3
02:35	5 Minutes	44.9	46.7	42.5	52.2
02:40	5 Minutes	46.3	48.0	43.4	55.7
02:45	5 Minutes	43.8	45.4	41.2	52.2

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
02:50	5 Minutes	46.9	48.5	44.2	57.1
02:55	5 Minutes	44.8	46.3	42.4	54.2
03:00	5 Minutes	45.9	47.5	43.4	56.0
03:05	5 Minutes	43.7	45.9	40.7	52.3
03:10	5 Minutes	46.3	48.4	43.1	52.6
03:15	5 Minutes	47.3	49.0	44.8	56.6
03:20	5 Minutes	45.5	47.9	42.5	54.1
03:25	5 Minutes	44.2	46.2	41.5	52.8
03:30	5 Minutes	45.7	48.0	42.2	57.0
03:35	5 Minutes	44.0	45.5	41.3	54.5
03:40	5 Minutes	44.5	46.7	41.5	51.8
03:45	5 Minutes	45.2	47.6	41.7	55.0
03:50	5 Minutes	43.9	45.8	40.0	55.3
03:55	5 Minutes	45.7	48.4	42.0	56.8
04:00	5 Minutes	46.0	49.0	41.5	56.8
04:05	5 Minutes	44.8	47.0	41.4	50.8
04:10	5 Minutes	46.1	48.6	42.8	55.1
04:15	5 Minutes	47.5	49.8	44.8	56.0
04:20	5 Minutes	47.2	49.4	44.3	56.9
04:25	5 Minutes	46.3	48.1	43.4	53.1
04:30	5 Minutes	47.2	49.6	44.4	55.8
04:35	5 Minutes	48.8	50.9	44.5	56.8
04:40	5 Minutes	46.7	49.3	42.5	56.3
04:45	5 Minutes	48.6	51.0	45.5	56.3
04:50	5 Minutes	47.1	49.7	43.7	56.2
04:55	5 Minutes	47.3	49.6	44.7	55.2
05:00	5 Minutes	48.3	50.8	45.0	56.9
05:05	5 Minutes	48.4	50.9	45.2	56.0
05:10	5 Minutes	48.8	50.7	46.2	55.0
05:15	5 Minutes	49.6	51.8	47.1	57.9
05:20	5 Minutes	51.0	52.7	48.9	59.8
05:25	5 Minutes	50.6	52.3	48.2	57.4
05:30	5 Minutes	51.5	53.3	49.3	57.2
05:35	5 Minutes	51.3	53.4	48.7	57.6
05:40	5 Minutes	52.0	54.2	49.2	59.0
05:45	5 Minutes	51.6	53.6	49.3	59.6
05:50	5 Minutes	52.4	54.7	49.6	58.5
05:55	5 Minutes	51.6	53.3	49.8	59.6
06:00	5 Minutes	53.8	56.2	50.7	61.7
06:05	5 Minutes	53.2	55.3	50.6	62.1
06:10	5 Minutes	53.3	55.2	50.9	61.1
06:15	5 Minutes	53.8	55.9	51.3	60.1
06:20	5 Minutes	54.0	56.1	51.8	59.5

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
06:25	5 Minutes	54.1	56.0	52.0	62.5
06:30	5 Minutes	54.3	56.1	52.4	58.9
06:35	5 Minutes	54.2	55.7	52.2	60.9
06:40	5 Minutes	54.7	56.2	52.8	61.8
06:45	5 Minutes	55.6	56.9	54.1	63.7
06:50	5 Minutes	56.2	57.6	54.5	64.0
06:55	5 Minutes	55.7	57.2	53.9	63.3
07:00	5 Minutes	55.6	57.1	53.8	60.2
07:05	5 Minutes	56.2	57.9	54.3	61.3
07:10	5 Minutes	56.3	58.1	54.4	62.1
07:15	5 Minutes	56.1	57.5	54.6	60.7
07:20	5 Minutes	56.5	58.2	54.9	62.5
07:25	5 Minutes	56.6	58.0	54.8	62.6
07:30	5 Minutes	55.2	56.8	53.5	60.7
07:35	5 Minutes	55.8	57.7	53.5	60.7
07:40	5 Minutes	56.4	58.1	54.6	60.5
07:45	5 Minutes	56.3	58.1	54.1	60.5
07:50	5 Minutes	56.5	58.3	54.1	62.9
07:55	5 Minutes	55.7	57.2	54.0	60.5
08:00	5 Minutes	55.5	57.6	53.1	60.9
08:05	5 Minutes	55.1	56.8	53.1	58.9
08:10	5 Minutes	55.1	56.9	52.9	59.3
08:15	5 Minutes	54.2	56.1	51.8	59.3
08:20	5 Minutes	54.7	56.7	51.8	61.2
08:25	5 Minutes	54.3	56.2	51.7	63.2
08:30	5 Minutes	53.4	55.1	51.4	57.6
08:35	5 Minutes	53.8	55.4	51.7	63.7
08:40	5 Minutes	53.8	55.9	51.0	59.7
08:45	5 Minutes	53.6	55.5	51.0	61.8
08:50	5 Minutes	53.1	54.8	51.0	60.5
08:55	5 Minutes	53.7	55.6	51.3	59.2
09:00	5 Minutes	54.6	56.4	52.3	60.1
09:05	5 Minutes	54.0	55.8	51.8	58.8
09:10	5 Minutes	53.0	55.1	50.7	62.5
09:15	5 Minutes	54.0	55.6	50.7	67.3
09:20	5 Minutes	53.7	55.7	50.7	63.8
09:25	5 Minutes	53.6	55.6	51.1	63.2
09:30	5 Minutes	52.6	54.6	49.7	60.0
09:35	5 Minutes	52.4	54.3	50.2	59.3
09:40	5 Minutes	52.9	55.0	49.8	61.1
09:45	5 Minutes	52.8	54.6	50.7	57.9
09:50	5 Minutes	53.7	55.3	51.2	60.8
09:55	5 Minutes	53.6	55.2	51.7	58.6

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
10:00	5 Minutes	53.6	55.1	51.7	57.5
10:05	5 Minutes	[54.7]	[56.5]	[51.6]	[62.4]
10:10	5 Minutes	[54.3]	[56.0]	[52.3]	[59.4]
10:15	5 Minutes	[54.0]	[55.9]	[51.8]	[59.5]
10:20	5 Minutes	[57.9]	[56.0]	[51.1]	[77.9]
10:25	5 Minutes	53.3	55.2	50.7	59.5
10:30	5 Minutes	53.2	54.8	50.9	61.7
10:35	5 Minutes	53.8	55.4	51.8	59.9
10:40	5 Minutes	53.8	55.3	52.0	59.3
10:45	5 Minutes	53.6	55.2	51.5	59.7
10:50	5 Minutes	53.4	55.2	51.2	58.5
10:55	5 Minutes	53.3	54.8	51.4	59.8
11:00	5 Minutes	53.4	55.3	51.0	59.7
11:05	5 Minutes	54.9	56.1	51.4	69.5
11:10	5 Minutes	53.3	55.1	50.7	60.9
11:15	5 Minutes	53.2	54.9	50.8	58.8
11:20	5 Minutes	53.7	55.4	51.4	63.7
11:25	5 Minutes	53.9	56.1	51.1	61.6
11:30	5 Minutes	54.5	57.1	51.5	62.7
11:35	5 Minutes	53.7	55.4	51.8	59.7
11:40	5 Minutes	54.0	55.5	52.2	58.8
11:45	5 Minutes	54.5	56.4	52.0	62.8
11:50	5 Minutes	53.4	55.1	51.3	59.6
11:55	5 Minutes	54.1	55.8	51.9	58.7
12:00	5 Minutes	54.2	56.0	51.7	63.9
12:05	5 Minutes	53.8	55.4	51.7	62.5
12:10	5 Minutes	54.0	55.5	52.1	62.3
12:15	5 Minutes	53.8	55.4	51.8	61.0
12:20	5 Minutes	53.5	55.2	51.4	58.9
12:25	5 Minutes	53.2	54.9	50.8	58.6
12:30	5 Minutes	53.9	55.5	51.9	64.6
12:35	5 Minutes	52.9	54.8	50.5	60.3
12:40	5 Minutes	53.2	54.8	51.4	57.7
12:45	5 Minutes	54.4	56.2	52.1	60.1
12:50	5 Minutes	53.1	54.6	51.2	58.1
12:55	5 Minutes	53.4	55.3	50.9	59.5
13:00	5 Minutes	53.7	55.7	51.3	59.3
13:05	5 Minutes	54.3	55.7	51.7	67.0
13:10	5 Minutes	54.4	56.1	51.8	63.7
13:15	5 Minutes	54.1	55.6	51.9	63.7
13:20	5 Minutes	53.3	54.8	51.7	58.5
13:25	5 Minutes	53.7	55.4	51.3	59.6
13:30	5 Minutes	53.6	55.2	51.3	61.4

APPENDIX D

Start Time (hh:mm)	Duration	L _{Aeq}	L _{A10}	L _{A90}	L _{AFmax}
13:35	5 Minutes	54.3	55.7	51.3	69.1
13:40	5 Minutes	53.8	55.2	51.9	59.4
13:45	5 Minutes	53.8	55.1	52.0	58.6
13:50	5 Minutes	55.1	55.8	52.0	69.1
13:55	5 Minutes	53.7	55.2	51.9	61.2
14:00	5 Minutes	53.2	54.5	51.5	57.9
14:05	5 Minutes	54.4	55.6	53.0	61.5
14:10	5 Minutes	53.8	55.1	52.2	62.7
14:15	5 Minutes	52.9	54.3	51.2	57.0
14:20	5 Minutes	53.0	54.4	50.8	59.8
14:25	5 Minutes	52.9	54.7	50.9	57.3
14:30	5 Minutes	53.8	55.0	51.3	64.6
14:35	5 Minutes	52.9	54.7	50.5	59.3

Records enclosed in square brackets [] denote excluded data points due to rainfall.