FOYLE MEATS
MELTON RD
SIX HILLS
MELTON MOWBRAY
LE14 3PR

Environmental Permit Application

Environmental Noise Assessment

Document Ref: Attachment B.3.9

TABLE OF CONTENTS

1.0 INTRODUCTION & SCOPE OF WORK

Foyle Food Group operates a slaughtering facility on a 24,000 M^2 site located at Melton Rd, Six Hills, Melton Mowbray LE14 3PR, United Kingdom.

Activities at the site include the slaughter of cattle and the dressing, chilling and quartering of beef, and the harvesting of offal and cod fat, the packing of beef offal and cod fat into vacuum pouches and lined cardboard boxes.

All quarters of beef are transported to other Foyle Meat sites for further processing (i.e. cutting and de-boning).

The northeast of the site is bounded by agricultural fields. The south of the site is bounded by a local access road and the Melton Rd/Six Hills Ln (B676), beyond which are further agricultural fields. The west of the site is bounded by an industrial unit, storage area and a service station, beyond which is the A46 that runs on the north to south direction.

Panther Environmental Solutions Ltd was commissioned by Foyle Meats to carry out a noise audit and noise impact assessment of their cattle slaughtering facility at Six Hills, Melton, Mowbray, UK, in support of an application for an Environmental Permit.

The area is rural in character with residences in the area predominantly linearly aligned along the existing road network.

A map of the site boundary, surrounding noise sensitive receptors and monitoring locations is provided in Appendix A.

The report presents and interprets the results of the survey with reference to:

- H3–Part 2: Noise Assessment and Control
- BS4142:2014 – *Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* as published by The British Standards Institution.
- ISO 9613 – *Acoustics: Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*
- ISO 1996 – *Acoustics: Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.*

This Environmental Noise Assessment includes:

- Description of noise and the noise meter to be used.
- Detailing the locations for noise monitoring stations.
- Detailing the noise measurements obtained.
- Identifying all sources noise within the facility.
- Discussion & Recommendations.

2.0 LEGISLATION AND GUIDANCE

National Planning Policy Framework

The Planning Policy Guidance 24 Note (PPG24) 'Planning and Noise' published in 1994 outlined the considerations to be taken into account by local authorities in determining planning applications both for noise sensitive developments and for those activities which will generate noise.

The Guidance acknowledged that noise can have a significant effect on the environment and on the quality of life enjoyed by individuals and communities. However, it advises that while the planning system should be used to minimise the adverse impact of noise, planning authorities should not place unreasonable restrictions on development, or add unduly to the costs and administrative burdens of business.

This Planning Policy Guidance Note has been replaced by the National Planning Policy Framework, published in February 2019.

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Throughout the NPPF is the presumption in favour of sustainable development.
The presumption is subject to two exceptions. First it will not apply where any adverse impacts of allowing development would "significantly and demonstrably" outweigh the benefits when assessed against the policies in the NPPF as a whole. Secondly, the presumption will not apply where specific policies in the NPPF – such as those relating to green belt or national parks – indicate that development should be restricted.

With regards to noise, the NPPF notes that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability".

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 tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Environmental Protection Act 1990

Chapter 43 of the Environmental Protection Act 1990 (EPA) makes provision for the improved control of pollution, including noise, arising from any industrial, commercial or activities of any other nature whatsoever.

Specifically, the Act re-enacts the provisions of the Control of Pollution Act 1974; it restates the law defining statutory nuisances and improves the summary procedures for dealing with them.

Section 80 of the Act empowers local authorities to deal with statutory nuisances when they occur. The level at which a noise is deemed to be a statutory noise nuisance is not defined in the Act; this is left to the judgement of individual local authorities. The Act also grants the right to private citizens to bring a court case against the owner/operator of a noise source.

With regards to the term 'nuisance' there is no specific definition in the Act, so the tests as at common law apply. A definition often used in Court is "*A nuisance is a material interference with a person's use or enjoyment of their land or property*".

Case law supports the view that factors such as nature of noise, time of day or night it occurs, day of the week on which it occurs, how long it occurs for, how often it occurs and the character of the area in which it occurs should be taken into account when deciding whether the inference is material, as well as whether those affected are overly sensitive or whether they represent the "Man on the Clapham Omnibus".

In court proceedings for an offence, it is a defence to prove that 'best practicable means' were used to prevent or counteract the effects of noise. Under 79(9), 'best practicable means' is to be interpreted by reference to the following provisions:

- "practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- the test is to apply only so far as compatible with any duty imposed by law;
- the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

World Health Organisation Document "Guidelines for Community Noise"

The World Health Organisation (WHO) published the document "*Guidelines for Community Noise"* in 2000. This states that general outdoor noise levels of below 50dB LAeq during the day are desirable to prevent 'moderate' community annoyance. The guidance also recommends the LAeq should not exceed 30dB indoors if negative effects on sleep are to be avoided.

The World Health Organisation (WHO) published an extension document *"Environmental Noise Directive 2002/49/EC – Night Noise Guidelines for Europe"* in 2002. This states that outdoor noise levels should not exceed 40dB LAeq during the night to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly.

The Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) March 2010 intends to promote the 'Noise Policy Vision' as follows

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

NPSE makes a distinction between 'quality of life' and 'health'. It recognises that noise exposure can *cause* annoyance and sleep disturbance both of which impact on quality of life and that there is emerging evidence that long-term exposure to some types of transport noise can additionally cause an increased risk of direct health effects.

Whilst NPSE appears to refer to guidance on community and night-time noise published by the WHO, it states: "*The Government intends to keep research on the health effects of long term exposure to noise under review in accordance with the principles of the NPSE.*"

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

- 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.

The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations. The NPSE states that '*This does not mean that such adverse effects cannot occur.*'

Environmental Permitting Regulations (England and Wales) 2016

The purpose of the Environmental Permitting system is "*protect the environment and human health*". The Environmental Permitting Regulations (EPR) came into force in England and Wales in April 2008, replacing and revoking the Pollution Prevention and Control (PPC) (England and Wales) Regulations 2000 and Waste Management Licensing (WML) Regulations 1994.

The Environmental Permitting Regulations were revised in April 2010, extending the scope of the 2008 legislation to include discharge consents, abstraction licences and radioactive substance licences. Under the Environmental Permitting Regulations (2010) for England and Wales, facilities are required to submit an Environmental Noise Assessment Report in support of its application for an Environmental Permit.

The new Regulation revoke the Environmental Permitting (England and Wales) 2007 (and amendments) as well as the Environmental Permitting (England and Wales) Regulations 2010. They also amend a wide number of acts including Control of Pollution Act 1974, Water Industry Act 1991, Clean Air Act 1993 and Goods Vehicles (Licensing of Operators) Act 1995. One hundred and twenty-one Statutory Instruments also have amendments made under these Regulations

The EA technical guidance note "*How to comply with your environmental permit*" (EPR 1.00) *version 8.0*, describes the standards and measures the EA expects businesses to take in order to control the risk of pollution to the environment.

EPR 1.00 states that if a development is likely to cause any significant noise beyond the site boundary then the operator should have a written noise management plan. EPR 1.00 contains suggestions for the control and/or reduction of noise and refers the reader to guidance note H3 and activity-specific guidance notes for further guidance on noise assessment, control and requirements of a noise management plan. In particular, EPR 1.00 provides the following guidance:

"*As a guide, annoyance becomes more likely where the resulting field rating level ($L_{AR,\ TR}$) exceeds 50 dB by day and a facade rating level exceeds 45 dB by night (23:00pm to 07:00am)."*

"Where very low background levels prevail, site noise levels should not be significantly above the background and, if practicable, should be well below. If you are in an area covered by the Environmental Noise Regulations 2006, site noise levels should, as far as practicable, be less than an L_{den} value of 55 dB(A) or an L_{night} value of 50 dB(A)."

The UK Environment Agency has published Horizontal Guidance Note H3 for Noise, which outlines advice on drafting conditions and enforcement in Part 1 and more technical guidance in *Part 2 – Noise Assessment and Control.*

Horizontal Guidance (H3) does not contain recommendations for noise limits or criteria. The guidance extensively draws on BS 4142 *"Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas*" and "*Guidelines for Community Noise*" - a study carried out for the WHO.

In late 1999, the *World Health Organisation* proposed *Guidelines for Community Noise*. If the daytime and evening LAeq for general steady, continuous noise in an outdoor living area exceeds 55 dB, then there is likely to be serious annoyance. If this value drops to 50 dB, then the annoyance factor becomes moderate. The guidelines also considered noise levels at which sleep disturbance would not take place. The guidelines suggest that an internal LAeq, 8hr not greater than 30 dB for continuous noise is needed to prevent negative effects on sleep. This is equivalent to a façade level of 45 dB LAeq, assuming open windows or a free-field level of approximately 42 dB LAeq

Typically, noise limits for industrial activities in England and Wales are set on the principal that the noise attributable solely to on-site activities, expressed as a free field value at any noise sensitive or boundary location, should not generally exceed the values given below:

Table 2.1: Typical Limit Values for Noise from Permitted Sites

Period	Times / hrs	Leq Limits / dB(A)
Day-time	07:00 to 23:00	55
Night-time	23:00 to 07:00	45

BS 4142:2014

British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes;
b) sound from fixed installations which comprise mechanical and electrical plant and equipment;
c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

BS4142 defines the following terms for describing existing and future noise levels:

Ambient Sound Level, La = $L_{Aeq,T}$
Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far, at the assessment location over a given time interval, T.

Specific Sound Level, Ls = $L_{Aeq,Tr}$
Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, Tr.

Residual Sound Level, Lr = $L_{Aeq,T}$
Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

Background Noise Level, $L_{A90,T}$
A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Rating Level, $L_{Ar,Tr}$
Specific sound level plus any adjustment for the characteristic features of the sound.

The standard states that, when possible, the background sound level should be measured at the assessment location. It should be ensured that the measurement time interval is of sufficient duration to obtain a representative value of the background sound level.

BS4142 notes that where it is not possible to determine the specific sound level directly by measurement, it may be appropriate to determine the specific sound level by a combination of measurement and calculation.

Certain acoustic features can increase the significance of impact over the basic comparison between the specific sound level and the background sound level.

Subjectively and where appropriate, such as for instances where a new, proposed sound cannot be measured, the specific sound level should be corrected if a tonal or impulsive characteristic is expected to be present.

Tonality

Just perceptible, apply a penalty of 2dB
Clearly perceptible, apply a penalty of 4dB
Highly perceptible, apply a penalty of 6dB

Impulsivity

Just perceptible, apply a penalty of 3dB
Clearly perceptible, apply a penalty of 6dB
Highly perceptible, apply a penalty of 9dB

For other sound characteristics which are not tonal or impulsive but readily distinguishable, a penalty of 3dB can be applied.

Where a specific sound is intermittent and readily distinctive, a penalty of 3dB can be applied.

If the subjective method is not sufficient for assessing the audibility or prominence of tones or impulsive sounds, identification can be made using the one-third octave method.

When making an assessment on the impact of a specific sound, an initial estimation is made by subtracting the measured background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of impact:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact.
- A difference of around +5dB is likely to be an indication of an adverse impact.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a 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.

ISO 9613-2:1996

The noise prediction methodology used in this report is based upon the international standard ISO 9613-2 "*Attenuation of Sound during Propagation Outdoors*".

This standard outlines a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

The central formula for this calculation is as follows:

$$\mathbf{A = A_{div} + A_{gr} + A_{bar} + A_{misc}}$$

Where:
A is the attenuation due to site conditions
A_{div} is the attenuation due to the geometrical divergence (distance from source)
A_{gr} is the attenuation due to the ground effect
A_{bar} is the attenuation due to a barrier
A_{misc} is the attenuation due to miscellaneous other effects as appropriate

This attenuation factor is then subtracted from the predicted noise of the proposed activity. The resultant figure is the predicted noise from the proposed activity at a given noise monitoring location.

This figure may then be added logarithmically to the existing background noise at the noise monitoring location to attain the predicted noise level if the proposed activity were to begin.

Relevant Formulae

In order to carry out this predictive analysis, the following attenuation characteristics have been taken into account:

Divergence – A_{div}

The geometrical divergence accounts for the spherical spreading in the free field from the point sound source, causing attenuation due to the inverse square law. Divergence is calculated as follows:

$$A_{div} = 20.\mathrm{Log}\left(\frac{\mathrm{d}}{\mathrm{do}}\right)$$

Where:
d is the distance from the source to the receiver (meters)
d_o is the reference distance

3.0 MEASUREMENT PARAMETERS

The parameters used to assess the noise are as follows:

Leq(T): The noise values recorded continuously at every instant during the t-minute sampling period are integrated by the noise metre to give a single value that represents the continuous equivalent sound level over the t-minute period during this survey.

L_{10} and L_{90}: are both statistical noise levels. L_{10} indicates that for 10% of the monitoring period the sound levels were greater than the quoted value. L_{90} indicates that for 90% of the monitoring period, the sound levels were greater than the quoted value. L_{10} is used to express event noise. L_{90} is used to express background noise, usually filtering out loud and intermittent interferences such as traffic noise.

Continuous: noise produced without interruption.

Intermittent: noise that is punctuated with interruptions e.g. equipment operating in cycles or events such as single passing vehicle or aircraft.

Impulsive: a noise of short duration (typically less than one second), the sound pressure of which is significantly higher than the background; brief and abrupt.

Tonal: noise which contains a clearly audible tone i.e. a distinguishable, discrete or continuous note (whine, hiss, hum or screech etc).

For the purpose of this noise assessment, a tonal characteristic incurs a penalty of +5dB(A) in accordance with Section 4.3 of the EPA 2016 *Guidance Note for Noise in Relation to Scheduled Activities*.

In order for a tone or impulsive element to warrant a penalty, it should be clearly noticeable and audible. Situations in which a 5 dB penalty applies include the following:

- The noise contains a distinguishable, discrete continuous note (whine, hiss, screech, hum etc).
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- The noise is irregular enough to attract attention.
- The tonal components are clearly audible and the level in a 1/3rd octave band is greater than or equal to the following level in the two adjacent bands;
    - 15dB in low-frequency bands (25Hz to 125Hz);
    - 8dB in middle-frequency bands (160Hz to 400Hz), and;
    - 5dB in high-frequency bands (500Hz to 10,000Hz)

As per *'Tonal'* column in Table 7.2, *'NP'* indicates no penalty and *'P'* indicate a penalty for tonal noise.

The noise measurements were 'A' weighted (to equate to human ear hearing) and the time-weighting 'Fast' was applied.

A-Weighted Decibels dB(A)

Noise, in its simplest form can be described as unwanted sound. Sound is the result of a propagating disturbance through a physical medium i.e. sound wave. Through air, it is perceived by the ear as a pressure wave superimposed upon the ambient air pressure about the ear of the listener. When the medium is a fixed body, it is called vibration.

'A' Weighting is standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. At low and high frequencies, the human ear is not very sensitive, but between 500 Hz and 6 kHz the ear is much more sensitive. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with un-weighted decibels, in which no correction is made for audio frequency.

Sound level (Lp dB) and sound power (L_W dB) are physical quantities which measure derivatives of the energy associated with a sound that can be measured by recording instruments.

Loudness is a psycho-physical subjective measure of the perceived response by the human auditory system to a sound. The loudness level of a sound is determined by adjusting a sound pressure level of a comparison pure tone of specified frequency until it is judged by normal hearing observers to be equal in loudness. Loudness level is expressed in phons.

In the mid-frequency range at sound pressures greater than approximately $2x10^{-3}$ Pa (40 dB re 20 µPa SPL), the following table summarises the average subjective perception of noise level changes.

Table 3.1: WHO International: Fundamentals of Acoustics

Change in Sound Level (dB)	Change in Power		Change in Apparent Loudness
	Decrease	Increase	
3	1/2	2	Just Perceptible
5	1/3	3	Clearly Noticeable
10	1/10	10	Half or Twice as Loud
20	1/100	100	Much Quieter or Louder

As can be seen in the above table, an increase of 3 dB is double the sound power level; however, the change in loudness is just perceptible.

The term L_{eq} is used to express the average noise level. It is measured in dB (A) and measured over a defined period of time. Specifically, it is the constant level equivalent to the same acoustic energy as a given event. The L_{eq} is written as LA_{eq} when it is measured with the A frequency weighting.

4.0 EQUIPMENT USED

The equipment used for the noise monitoring was a Cirrus CR:171B Sound Level Meter, a MK:224 Microphone and a CR:515 Acoustic Calibrator. Both the CR:171B and MK:224 were calibrated externally on 29th of July 2021.

The CR:515 was calibrated externally on the 30th of July 2021. The CR:831B confirms to IEC 61672-3:2016.

A calibration check of 94 dB(A) at 1kHz was carried out on the instrument before and after measurement. The calibrator is a Class 1 grade, which conforms to IEC 60942:2003.

The difference between the initial calibration value, any subsequent calibration check, and a final calibration check on completion of measurements did not exceed 0.5 dB, and the instrument calibration was found to be satisfactory.

Measurement periods were appropriate to establish a typical noise level reading at each location in order to establish a dB(A) LAeq reading.

5.0 METEOROLOGICAL CONDITIONS

Weather conditions during the survey were dry, cool and calm with wind speeds of less than 5 m/s (the preferred limit for taking measurements).

The Sound Level Meter was also fitted with a windshield to minimise interference from meteorological conditions.

6.0 MONITORING LOCATIONS

For this assessment, three off-site noise monitoring locations were chosen to determine the background noise level in the vicinity of the site where the site was not audible.

Additionally, five monitoring locations at the site boundary were choses to determine the ambient noise level surrounding the site, where the site was clearly audible.

The selected monitoring locations are described in Table 6.1 below.

The background and ambient noise level will be used to determine the potential impact at the closest four noise sensitive receptors (NSR's) int the vicinity of the site.

The selected monitoring locations are described in Table 6.2 below.

All measurements were taken at:

- 1.2 – 1.5m height above local ground level
- >3.5 away from reflective surfaces

These locations are also shown on the map as per Appendix A.1 & A.2.

Table 6.1: Monitoring Locations Summary				
Ref.	Grid Ref.		Location Type	Location
	X	Y		
BG1	465448	321341	Background Noise Monitoring Locations	Private access road, at a similar setback distance from the Melton Rd/Six Hills Ln (B676) as NSR1.
BG2	464388	320652		Private access road, at a similar setback distance from the A46 Road as NSR2 & NSR3.
BG3	464322	320964		At the entrance to a residential complex (NSR4), adjacent to a local road.
AM1	464717	320995	Ambient Noise Monitoring Locations	South-eastern site boundary.
AM2	464696	321030		Eastern site boundary.
AM3	464548	321047		North-western site boundary.
AM4	464553	320972		Western site boundary.
AM5	464562	320914		South-western site boundary.

Grid Ref: https://gridreferencefinder.com/

Using the formula outline in Section 2.0, predictive calculations were carried out for the following four closest noise sensitive receptors (NSR's) in the vicinity of the site, as per Section 8.3 below.

Table 6.2: Noise Sensitive Receptors				
Ref.	Grid Ref		Location Type	Location
	X	Y		
NSR1	465530	321302	Noise Sensitive Receptors	Residential property located approx. 840m east-northeast of the site boundary.
NSR2	464396	320752		Residential property located approx. 225m southwest of the site boundary.
NSR3	464286	320616		Residential property located approx. 400m southwest of the site boundary
NSR4	464375	320952		Residential complex located approx. 175m west of the site boundary

Grid Ref Source: https://gridreferencefinder.com/

7.0 MEASUREMENT RESULTS

The tables below show the daytime and night-time measurement results at the three background noise monitoring locations, the five ambient monitoring locations and multiple source noise locations.

Associated particulars such as a description of the noise, the equipment operational/audible in each location and any interferences/background noise recorded are also provided in the table.

Daytime monitoring was carried out on Thursday 21st October 2021 between 07.00 - 23.00.

Night-time monitoring was carried out between 23.00 on Thursday 21st October and 07.00 Friday 22nd October 2021.

7.1 Background Noise Monitoring Results

Table 7.1: Background Noise Monitoring Results Table

Ref.	Daytime				Night-time			
	LAeq	LA_{10}	LA_{90}	Description	LAeq	LA_{10}	LA_{90}	Description
BG1	60	63	**54**	• No site related noise audible. • Local traffic on the B676. • Distant traffic on the A46. • Cattle looing in adjacent field. • Planes passing overhead.	53	56	**43**	• No site related noise audible. • Local traffic on the B676. • Distant traffic on the A46. • Planes passing overhead. • Slight breeze in trees.
BG2	71	73	**67**	• No site related noise audible. • Local traffic on the A46. • Dog barking in the distance.	64	68	**49**	• No site related noise audible. • Local traffic on the A46.
BG3	65	69	**56**	• No site related noise audible. • Local traffic on the slip-road. • Local traffic on the A46. • Bird Song. • Idling vehicle engine. • Residential door banging.	58	56	**44**	• No site related noise audible. • Local traffic on the slip-road. • Local traffic on the A46. • Planes passing overhead.

7.2 Ambient Noise Monitoring Results

Table 7.2: Ambient Noise Monitoring Results Table						
Ref.	**LAeq**	**LA_{10}**	**LA_{90}**	**Tonal**	**Site Noise Description**	**Background Noise**
	Daytime					
AM1	**63**	64	62	NP	• Refrigerated Trailers x3.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous distant traffic on the A46.
AM2	**62**	63	58	NP	• Refrigerated Trailers x3. • Forklift engine & reverse signal. • Banging of Dolav into CAT trailer.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous distant traffic on the A46.
AM3	**63**	64	60	NP	• Refrigeration condenser noise. • Rattling forklift forks. • Vehicle operations in carpark.	• Continuous traffic on the A46. • Bird Song. • Intermittent vehicle operations in adjacent yard.
AM4	**59**	61	57	NP	• Refrigeration condenser noise. • Dolav banging. • HGV operations on-site.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous traffic on the A46. • Squeaky HGV breaks on access road.
AM5	**61**	62	59	NP	• Refrigeration condenser noise. • Refrigerated Trailers x3. • Refrigeration unit to front of site.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous traffic on the A46.

Table 7.2: Ambient Noise Monitoring Results Table						
Ref.	**Night-time**					
AM1	**59**	61	53	NP	• Refrigerated Trailers x3.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous distant traffic on the A46.
AM2	**57**	58	56	NP	• Refrigerated Trailers x3.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous distant traffic on the A46.
AM3	**56**	59	54	NP	• Refrigeration condenser noise. • Internal power-washing.	• Continuous traffic on the A46.
AM4	**54**	55	53	NP	• Refrigeration condenser noise.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous traffic on the A46.
AM5	**52**	53	51	NP	• Refrigeration condenser noise. • Refrigerated Trailers x3. • Refrigeration unit to front of site.	• Intermittent local road traffic on the Melton Rd/Six Hills Ln (B676). • Continuous traffic on the A46. • Plane passing overhead.

7.3 Source Noise Monitoring Results

Table 7.3: Source Noise Monitoring Results Table

Ref.	Description	Daytime			Night-time		
		LAeq	LA_{10}	LA_{90}	LAeq	LA_{10}	LA_{90}
SN1	Refrigeration Unit	83	84	82	83	84	82
SN2	Refrigerated Trailers x3	81	81	81	81	81	81
SN3	Blood Screen & Motor	75	76	74	-	-	-
SN4.1	Air Compressor No.1	82	82	81	-	-	-
SN4.2	Air Compressor No.2	-	-	-	74	76	73
SN5	ABP Handing Area	71	70	68	68	70	65
SN6.1	Dispatch Area (condenser & ref' trailer)	77	77	74	-	-	-
SN6.2	Dispatch Area (condenser only)	-	-	-	73	74	72

8.0 BS4142:2014 – ASSESSMENT

8.1 Background Noise Level

Definition:
A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

In order to determine the Background (L_{90}) noise levels at the closest noise sensitive locations, monitoring was carried out at locations that represent the noise level that would be experienced at the NSL's in the absence of facility related noise.

Monitoring locations are mapped in Appendix A.1

Table 8.1: Background Noise Levels			
Daytime		Night-time	
Ref.	LA_{90}	Ref.	LA_{90}
BG1	54	BG1	43
BG2	67	BG2	49
BG3	56	BG3	44

8.2 Ambient Noise Levels

Definition:
Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far, at the assessment location over a given time interval, T.

Ambient Noise (LAeq) measurements were taken at setback distances from the site boundary location where the facility was still clearly audible and the dominant noise source.

Monitoring locations are mapped in Appendix A.2

Table 8.2: Ambient Noise Levels			
Daytime		Night-time	
Ref.	LAeq	Ref.	LAeq
AM1	63	AM1	59
AM2	62	AM2	57
AM3	63	AM3	56
AM4	59	AM4	54
AM5	61	AM5	52

8.3 Specific Noise Levels at NSR's

Definition:
Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

Table 8.3: Predicted Specific Noise Levels at Receptors - Daytime

Receptor			Ambient Noise Levels				Divergence		LAeq (dB)
$Ref_{(NSR)}$	$X_{(NSR)}$	$Y_{(NSR)}$	$Ref_{(S)}$	$X_{(AM)}$	$Y_{(AM)}$	$L_{(AM)}$ (dB)	Dist (m)	A_{div} (dB)	
NSR1	465530	321302	AM1	464717	320995	63	869	59	**4**
NSR1	465530	321302	AM2	464696	321030	62	877	59	**3**
NSR2	464396	320752	AM5	464562	320914	61	232	47	**14**
NSR3	464286	320616	AM5	464562	320914	61	406	52	**9**
NSR4	464375	320952	AM4	464553	320972	59	179	45	**14**

Distances are from the noise sensitivity receptors (NSR's) to the closest ambient monitoring locations. For NSR1 both AM1 and AM2 figures were used. For NSR2 & NSR3 the noise level at AM5 was used.

$$\text{Dist} = \sqrt{(X_{NSR} - X_{AM})^2 + (Y_{NSR} - Y_{AM})^2}$$

$$A_{div} = 20.\text{Log}\left(\frac{\text{d}}{\text{do}}\right) \qquad \text{when d} = \text{distance \& } \text{d}_o = 1\text{m}$$

$$\text{LAeq} = L_{(AM)} - A_{div} \qquad \text{when } L_{(s)} = \text{source noise level}$$

Table 8.4: Predicted Specific Noise Levels at Receptors – Night-time									
Receptor			Ambient Noise Levels				Divergence		LAeq (dB)
$Ref_{(NSR)}$	$X_{(NSR)}$	$Y_{(NSR)}$	$Ref_{(S)}$	$X_{(AM)}$	$Y_{(AM)}$	$L_{(AM)}$ (dB)	Dist (m)	A_{div} (dB)	
NSR1	465530	321302	AM1	464717	320995	59	869	59	**0**
NSR1	465530	321302	AM2	464696	321030	57	877	59	**-2**
NSR2	464396	320752	AM5	464562	320914	52	232	47	**5**
NSR3	464286	320616	AM5	464562	320914	52	406	52	**0**
NSR4	464375	320952	AM4	464553	320972	54	179	45	**9**

Distances are from the noise sensitivity receptors (NSR's) to the closest ambient monitoring locations. For NSR1 both AM1 and AM2 figures were used. For NSR2 & NSR3 the noise level at AM5 was used.

$$\text{Dist} = \sqrt{(X_{NSR} - X_{AM})^2 + (Y_{NSR} - Y_{AM})^2}$$

$A_{div} = 20.\text{Log}\left(\frac{\text{d}}{\text{do}}\right)$ when d = distance & d_o = 1m

$\text{LAeq} = L_{(AM)} - A_{div}$ when $L_{(s)}$ = source noise level

8.4 Rated Noise Level

The specific sound levels of noise emissions undergo relevant penalties for characteristics such as tonality, intermittency and impulsivity in line with BS4142:2014. Penalties are applied based on the perception of sound at the NSR's.

If the source noise is tonal (containing a noticeable hiss, whine or hum) or if it is impulsive (contains bangs, clatters, clicks or thumps) or if it is irregular enough to attract attention, a correction is added to the specific level to produce the rating level.

In order to predict the rated noise levels at the nearest receptors, the following formula is used:

Rated Noise Levels = Specific Noise + Penalties

Table 8.5: BS 4142:2014 Penalties Summary Table

Tonality		**Impulsivity**	
Detectability	Penalty	Detectability	Penalty
Just perceptible	2 dB	Just perceptible	3 dB
Clearly perceptible	4 dB	Clearly perceptible	6 dB
Highly perceptible	6 dB	Highly perceptible	9 dB

Additional Methodology

The 5 dB penalty is also applied instead of the above if the level in a 1/3rd octave band is greater than or equal to the following level in the two adjacent bands;

- 15dB in low-frequency bands (25Hz to 125Hz);
- 8dB in middle-frequency bands (160Hz to 400Hz);
- 5dB in high-frequency bands (500Hz to 10,000Hz)

Where a specific sound is intermittent and readily distinctive, a penalty of 3 dB can be applied.

Penalties have been determined based on noise audible at the ambient noise monitoring locations and the tonal analysis carried out on the measured ambient noise, as per Appendix D.

As can be seen from Table 7.3, the site contend few noise sources. The similarity between LAeq and LA90 at the sources also indicates a continuous noise environment.

No *tonal*, *impulsive*, or *intermittent* noise elements were detected at any of the ambient noise monitoring locations during the site assessment. Therefore, no penalty was applied based on these parameters.

Based on the third-octave analysis reports provided in Appendix D, no two adjacent band were greater than or equal to 15dB in low-frequency bands (25Hz to 125Hz), 8dB in middle-frequency bands (160Hz to 400Hz) or 5dB in high-frequency bands (500Hz to 10,000Hz). Therefore, a penalty of 6 dB was not applied based on these parameters.

At both AM1 & AM2 a refrigeration trailer motor noise was *readily distinctive*. Additionally, at AM3, AM4 & AM5 the refrigeration condenser was *readily distinctive*. Therefore, a penalty of 3 dB has been applied to all five monitoring locations.

Table 8.6: Rated Levels Calculations						
Ref.	Specific Level	Penalties				Rated Level
		Tonal	Impulsivity	Intermittent	Distinctive	
Daytime						
NSR1	4	0	0	0	3	**7**
NSR1	3	0	0	0	3	**6**
NSR2	14	0	0	0	3	**17**
NSR3	9	0	0	0	3	**12**
NSR4	14	0	0	0	3	**17**
Night-time						
NSR1	0	0	0	0	3	**3**
NSR1	-2	0	0	0	3	**1**
NSR2	5	0	0	0	3	**8**
NSR3	0	0	0	0	3	**3**
NSR4	9	0	0	0	3	**12**

8.5 Excess Noise Level

The excess figure is used to determine the impact at designated locations as a result of site specific noise.

In order to predict the excess noise levels at the nearest receptors, the following formula is used:

Excess = Rated Noise Levels – Background LA_{90}

Table 8.7: Excess Noise Level Calculations			
Ref.	Rated Levels	Background LA_{90}	Excess
Daytime			
NSR1	7	54	**-47**
NSR1	6	54	**-48**
NSR2	17	67	**-50**
NSR3	12	67	**-55**
NSR4	17	56	**-39**
Night-time			
NSR1	3	43	**-40**
NSR1	1	43	**-42**
NSR2	8	49	**-41**
NSR3	3	49	**-46**
NSR4	12	44	**-32**

9.0 DISCUSSION

BS4142 infers that, for a given excess of the rating level over the background level, the impacts and potential likelihood of complaints are as follows:

Table 9.1: BS4142 Impact Criteria

Excess	Likelihood	Interpretation of Impact
+ 10dB	Likely	An indication of a *significant adverse impact*.
+ 5dB	Possible	An indication of an *adverse impact*.
≤ 5dB	Unlikely	An indication that it is *unlikely* that the specific sound source will have an *adverse impact or a significant adverse impact.*
< 0dB	Very Unlikely	An indication that the specific sound source will have a *low impact.*

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

Based on this rating system the following has been utilised for this assessment:

- Typically, the greater this 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 sound source will have an adverse impact or a 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.

The daytime BS4142:2014 assessment indicates that the noise levels calculated at NSL1 – NSL4 in the nearest agglomeration are between 39 – 55 dB below the measured background noise level, as per table 8.7. This indicates that the specific sound source is very unlikely to have an adverse impact or significant impact at these locations, as per the above BS4142 Impact Criteria.

The night-time BS4142:2014 assessment indicates that the noise levels calculated at NSL1 – NSL4 in the nearest agglomeration are between 32 – 46 dB below the measured background noise level, as per table 8.7. This indicates that the specific sound source is very unlikely to have an adverse impact or significant impact at these locations, as per the above BS4142 Impact Criteria.

Daytime background noise levels ranged between 54 – 67 dB and were elevated as a result of passing traffic, particularly on the A46. Night-time background noise levels ranged between 43 – 49 dB, also elevated as a result of passing traffic, however volumes were reduced compared to the daytime period.

The results of the predicted noise calculations should be considered worst case scenario as there have not been any corrections made to the predicted noise levels for sound attenuating effects such as sound degradation from ground absorption, air absorption, reflections and attenuation by surfaces, foliage and topography.

The calculated noise level at all noise sensitive locations, as per Table 8.2, are less than the WHO guidelines for outdoor noise recommended levels of 55dB and 45dB at the various residential properties in the nearest agglomeration during the day and during the night periods.

Noise sources throughout the site are continuous, as can be seen from the similarity in the monitored LAeq and LA_{90} values in Table 7.3. Noise sources that continue to be active during the night-time period do not change in intensity/power when compared to the daytime period, with the exception of the dispatch area which contained an operational refrigeration trailer during the daytime period.

10.0 CONCLUSION

The main findings from this survey were as follows:

- The daytime BS4142:2014 assessment indicates that the noise levels predicted at the four noise sensitive receptors would create a *low impact*, very unlikely to have an adverse impact or significant impact, and that complaints are very unlikely.

- The night-time BS4142:2014 assessment indicates that the noise levels predicted at the four noise sensitive receptors would create a *low impact*, very unlikely to have an adverse impact or significant impact, and that complaints are very unlikely.

- The predicted noise level at all noise sensitive locations are less than the WHO guidelines for outdoor noise recommended levels of 55dB and 45dB at the various residential properties during the day and the night-time periods.

The results of the predicted noise calculations should be considered worst case scenario as there have not been any corrections made to the predicted noise levels for sound attenuating effects such as sound degradation from ground absorption, air absorption, reflections and attenuation by surfaces, foliage and topography.

It is recommended that the site prepare and review bi-annually, a Noise Management Programme, in order to ensure continued reduction of environmental noise beyond the site boundary.

11.0 REFERENCES

- BS4142:2014 – *Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* as published by The British Standards Institution.

- Environment Agency Horizontal Guidance (H3), 2002. *Horizontal Guidance for Noise Part 2 - Noise Assessment and Control* Series issued by the Environment Agency UK.

- *Guidelines for Community Noise*, Birgitta Berglund, Thomas Lindvall, Dietrich H Schwela © World Health Organization 1999.

- EPA, *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4),* 2016.

- EPA, *Environmental Noise Survey Guidance Document,* 2003.

- EN BS 4142:2014 *Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas*".

- Grant S. Anderson and Ulrich J. Kurze, *Outdoor Sound Propagation*, Chpt. 5 in Noise and Vibration Control Engineering – Principals and Applications, edited by L.L. Beranek and I.L. Vér, (John Wiley & Sons, NY, NY 1992).

- ISO 9613 – *Acoustics: Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

- ISO 1996 – *Acoustics: Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.*

APPENDIX A

- NOISE MONITORING LOCATIONS MAPS -

Appendix A.1: Background Noise Monitoring Locations Map

Notes

– Site Location

Project Title:

BG NOISE MONITORING LOCATIONS MAP

Client Name:

Foyle

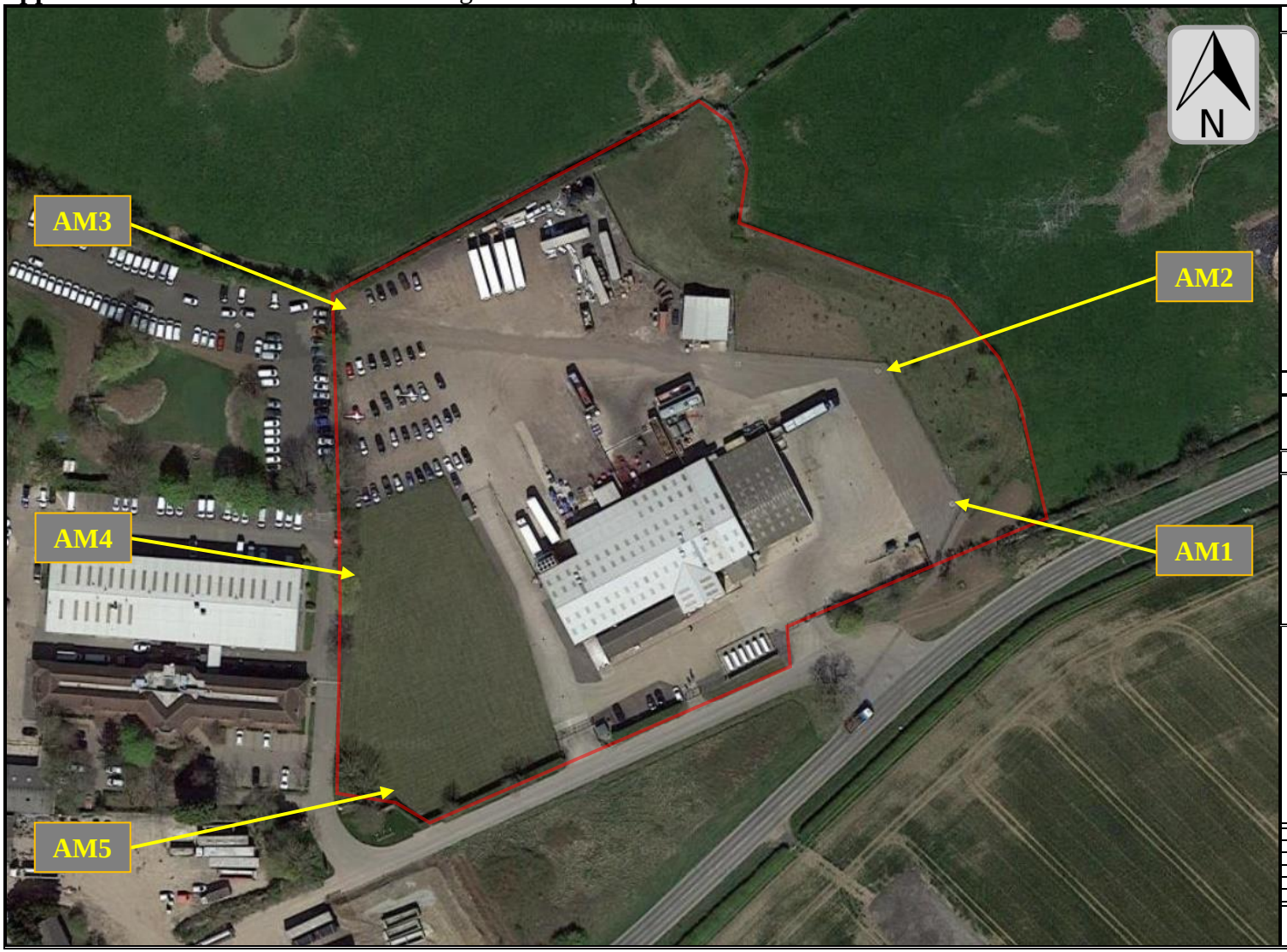
PANTHER ENVIRONMENTAL SOLUTIONS LTD

UNITS 3 & 4
INNOVATION CENTRE
GREEN ROAD
CARLOW
R93 W248

TELE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

Drawing Status:	Scale:	NTS	A4
Report	Datum:	Magic	
Drawing Number:	Drawn:	NR	
	Checked:	MF	
Revision:	Approved:		
R0	Date:	01/05/2020	

Appendix A.2: Ambient Noise Monitoring Locations Map



Notes

– Site Location

Project Title:

AMBIENT MONITORING LOCATIONS MAP

Client Name:

Foyle

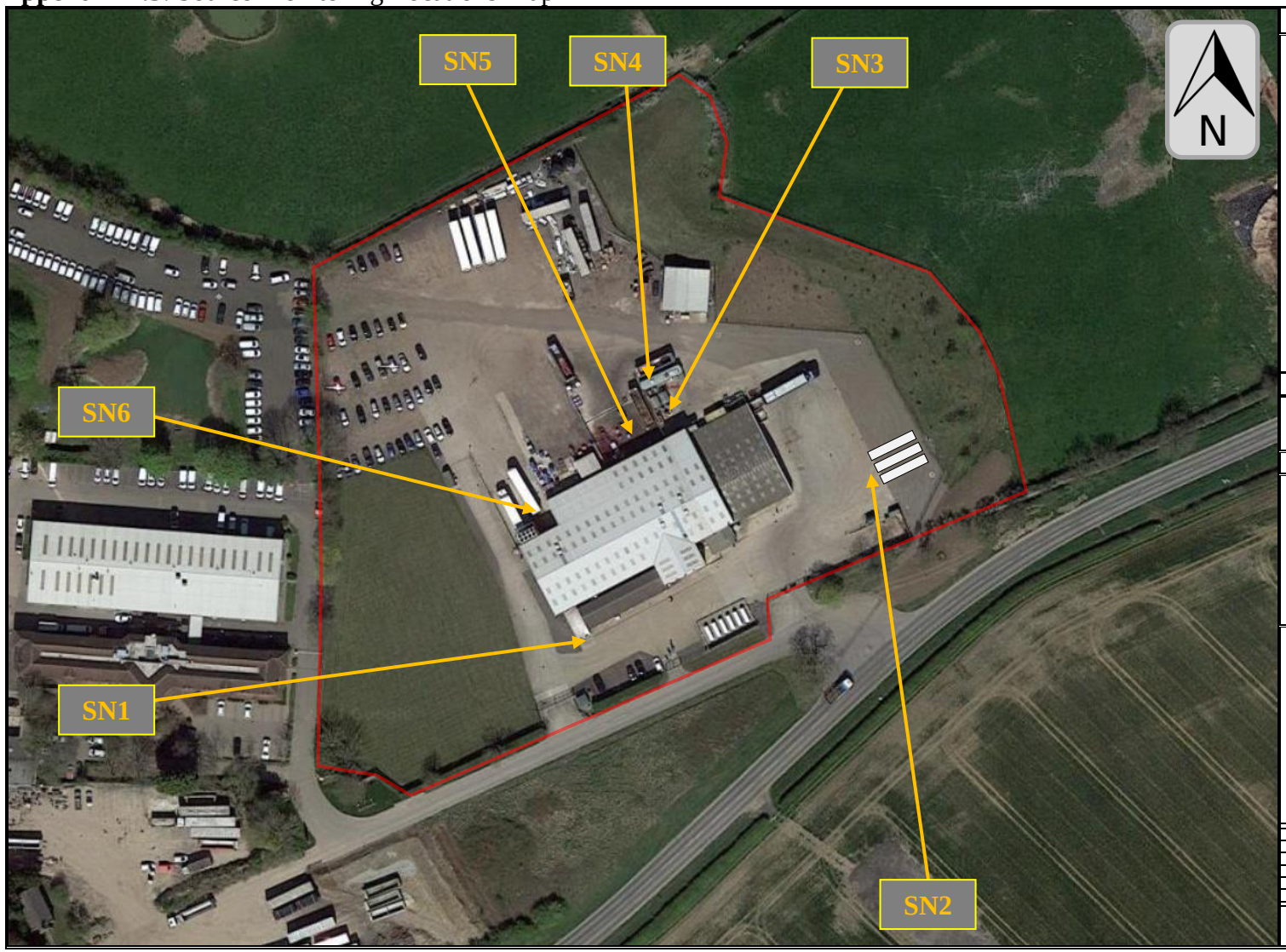
PANTHER ENVIRONMENTAL SOLUTIONS LTD

UNITS 3 & 4
INNOVATION CENTRE
GREEN ROAD
CARLOW
R93 W248

TELE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

Drawing Status:	Scale:	NTS	A4
Report	Datum:	Magic	
Drawing Number:	Drawn:	NR	
	Checked:	MF	
Revision:	Approved:		
R0	Date:	01/05/2020	

Appendix A.3: Source Monitoring Locations Map



Notes

– Site Location

Project Title:

SOURCE MONITORING LOCATIONS MAP

Client Name:

Foyle

PANTHER ENVIRONMENTAL SOLUTIONS LTD

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TELE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

Drawing Status:	Scale:	NTS	A4
Report	Datum:	Magic	
Drawing Number:	Drawn:	NR	
	Checked:	MF	
Revision:	Approved:		
R0	Date:	01/05/2020	

APPENDIX B

- MONITOR EQUIPMENT CALIBRATION CERT -

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research Plc
Instrument Type	CR:171B
Description	Sound Level Meter
Serial Number	G071199

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2013, IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:2003, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	GRAS 40AP	Serial Number	173198	Calibration Ref.	0170
Calibrator Type	B&K 4231	Serial Number	2594796	Calibration Ref.	A1811

Calibrated by T. A. Goodall.

Calibration Date 08 November 2018
Calibration Certificate Number 265284

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Certificate Number: **121599**
Date of Issue: **28 August 2018**

Instrument

Manufacturer: **Cirrus Research plc** Serial Number: **54060**
Model Number: **CR:515**

Calibration Procedure

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer s data.

Date of Calibration: **28 August 2018**

Initial Calibration Results

Measurement	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
1	94.14	1000.1	0.25
2	94.13	1000.1	0.24
3	94.12	1000.1	0.25
Average	**94.13**	**1000.1**	**0.25**
Uncertainty	± 0.13	± 0.1	± 0.10

The reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level.

Adjusted Calibration Results

Measurement	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
1	93.99	1000.1	0.24
2	93.99	1000.1	0.25
3	94.00	1000.1	0.25
Average	**93.99**	**1000.1**	**0.25**
Uncertainty	± 0.13	± 0.1	± 0.10

The reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level.

Cirrus Research plc, Acoustic House, Bridlington Road
Hunmanby, North Yorkshire, YO14 0PH, United Kingdom
Telephone: 0845 230 2434 **Int**: +44 1723 891655
Email: sales@cirrusresearch.co.uk
Web: www.cirrusresearch.co.uk
UK Registration No. 987160

Page 1 of 2

bsi. ISO 9001:2015 Quality Management FM 531001 ISO 14001 Environmental Management EMS 552104

Environmental Conditions

Pressure:	100.91 kPa
Temperature:	21.6 °C
Humidity:	51.4 %

Evidence of Pattern Approval

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC 60942:2003 Annex A to Class 1. This has been confirmed with the PhysikalischTechnische Bundesanstalt (PTB).

Statement of Calibration

As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the Class 1 requirements of IEC 60942:2003.

Calibration Laboratory

Laboratory: Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Test Engineer: Terry Goodrich

T. A. Goodrich.

Page 2 of 2

APPENDIX C

- PHOTO LOG -

Figure C.1: Refrigeration Unit

Figure C.2: Refrigerated Trailers x3

Figure C.3: Blood Screen & Motor

Figure C.4: Air Compressors

Figure C.5: ABP Handing Area

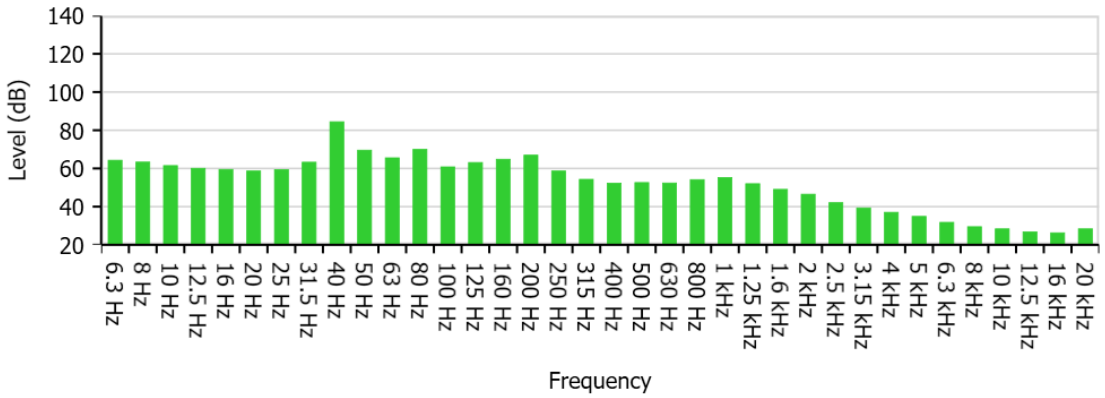
Figure C.6: Dispatch Area

APPENDIX D

- THIRD-OCTAVE ANALYSIS -

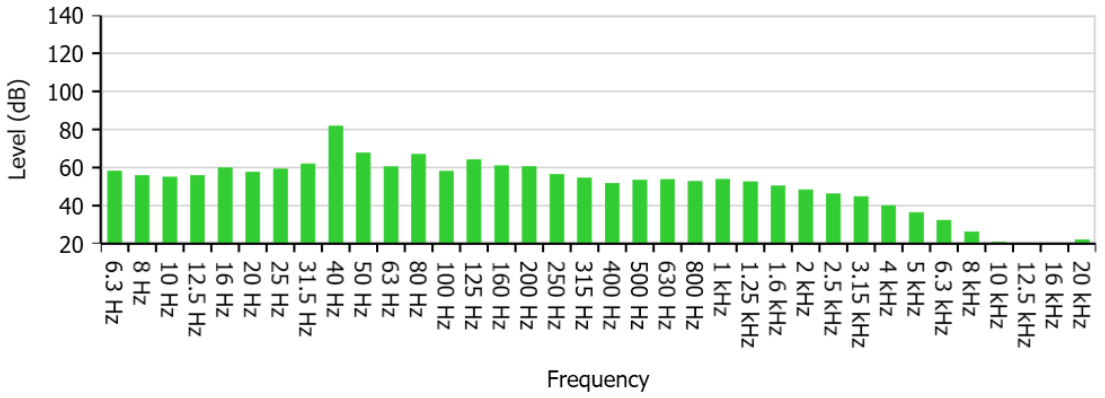
Daytime Third-Octave Analysis

AM1



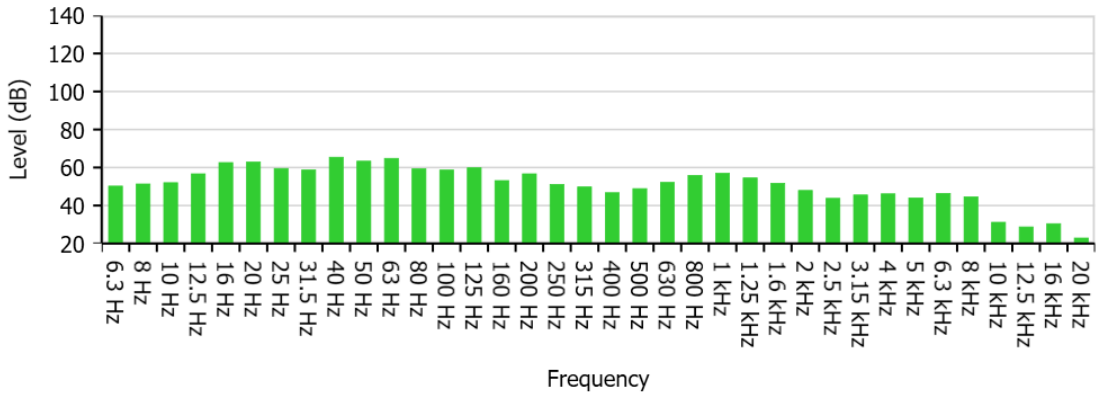
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	64.3	63.3	61.5	60.1	59.4	58.7	59.4	63.3	84.4
-	50	63	80	100	125	160	200	250	315
-	69.6	65.6	70.0	60.8	63.1	64.8	66.9	58.6	54.3
-	400	500	630	800	1 000	1 250	1 600	2 000	2 500
-	52.3	52.6	52.3	54.1	55.2	52.0	49.0	46.5	42.1
-	3 150	4 000	5 000	6 300	8 000	10 000	12 500	16 000	20 000
-	39.3	37.0	34.8	31.8	29.5	28.3	26.8	26.3	28.3

AM2



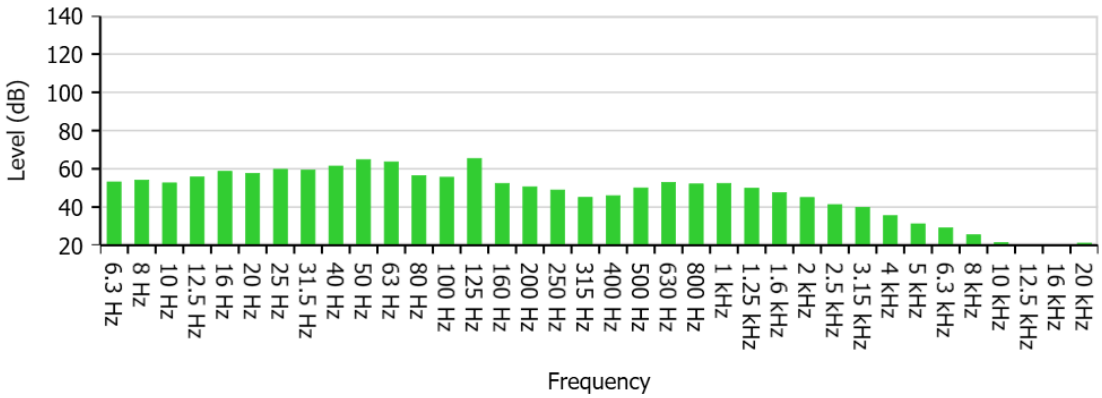
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	58.0	55.8	54.9	55.8	59.8	57.6	59.2	61.9	81.7
-	50	63	80	100	125	160	200	250	315
-	67.6	60.4	66.9	58.0	64.1	60.9	60.4	56.4	54.4
-	400	500	630	800	1 000	1 250	1 600	2 000	2 500
-	51.7	53.3	53.7	52.6	53.7	52.5	50.3	48.3	46.2
-	3 150	4 000	5 000	6 300	8 000	10 000	12 500	16 000	20 000
-	44.7	40.0	36.3	32.3	26.2	20.8	18.7	19.1	22.0

AM3



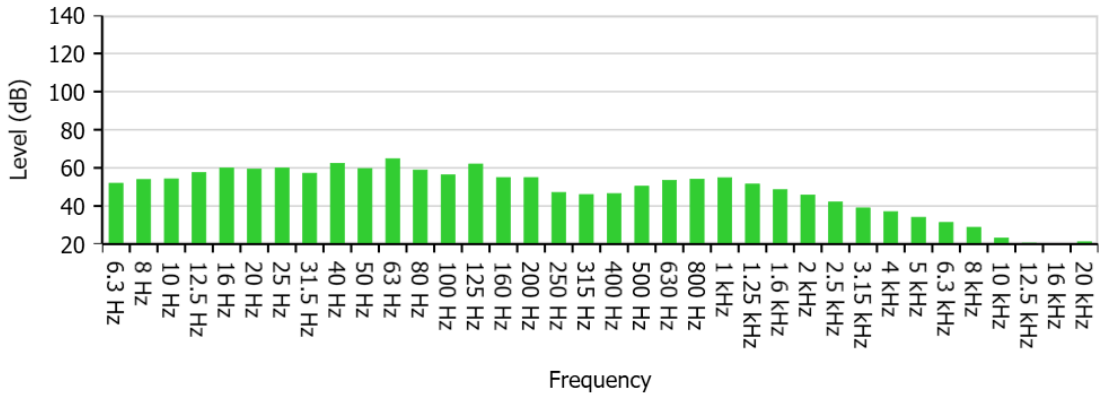
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	50.2	51.3	52.0	56.7	62.5	62.9	59.5	58.8	65.4
-	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**
-	63.3	64.8	59.3	58.7	59.8	53.1	56.7	51.1	49.8
-	**400**	**500**	**630**	**800**	**1 000**	**1 250**	**1 600**	**2 000**	**2 500**
-	46.8	48.9	52.2	55.9	56.9	54.5	51.7	47.9	43.7
-	**3 150**	**4 000**	**5 000**	**6 300**	**8 000**	**10 000**	**12 500**	**16 000**	**20 000**
-	45.5	46.1	44.0	46.4	44.6	31.2	28.7	30.4	22.9

AM4



Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	53.1	54.0	52.6	55.7	58.7	57.6	59.7	59.3	61.4
-	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**
-	64.8	63.6	56.4	55.6	65.4	52.3	50.6	48.8	45.0
-	**400**	**500**	**630**	**800**	**1 000**	**1 250**	**1 600**	**2 000**	**2 500**
-	45.9	50.0	52.9	52.1	52.3	49.8	47.5	44.9	41.2
-	**3 150**	**4 000**	**5 000**	**6 300**	**8 000**	**10 000**	**12 500**	**16 000**	**20 000**
-	39.8	35.4	31.2	29.1	25.5	21.4	19.5	18.9	21.1

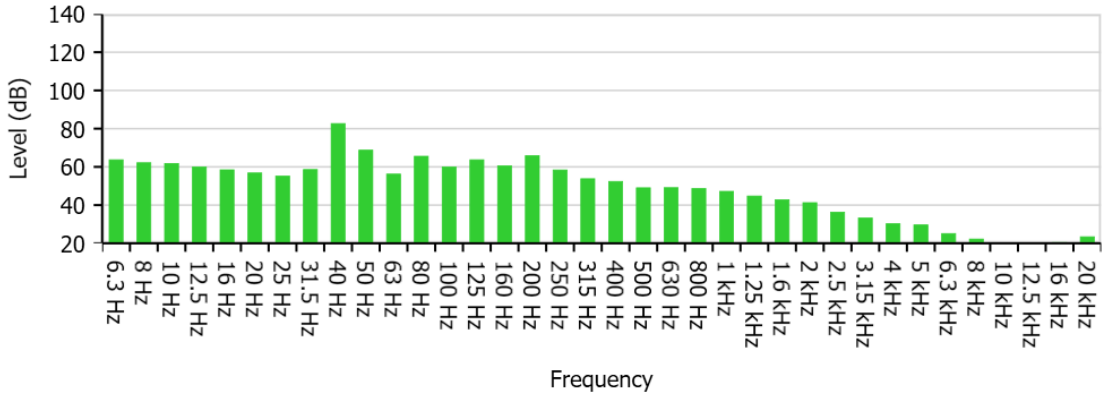
AM5



Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	51.9	53.8	54.2	57.5	59.9	59.3	59.9	57.2	62.4
-	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**
-	59.6	64.8	58.9	56.3	62.0	54.9	54.9	47.1	46.0
-	**400**	**500**	**630**	**800**	**1 000**	**1 250**	**1 600**	**2 000**	**2 500**
-	46.5	50.3	53.4	54.0	54.8	51.4	48.5	45.8	42.1
-	**3 150**	**4 000**	**5 000**	**6 300**	**8 000**	**10 000**	**12 500**	**16 000**	**20 000**
-	38.9	37.0	34.1	31.3	28.8	23.1	20.5	20.3	21.1

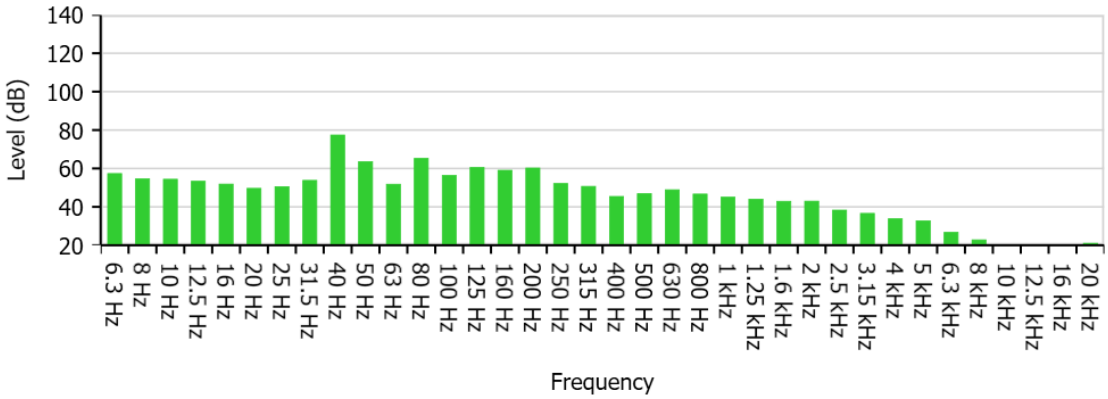
Night-time Third-Octave Analysis

AM1



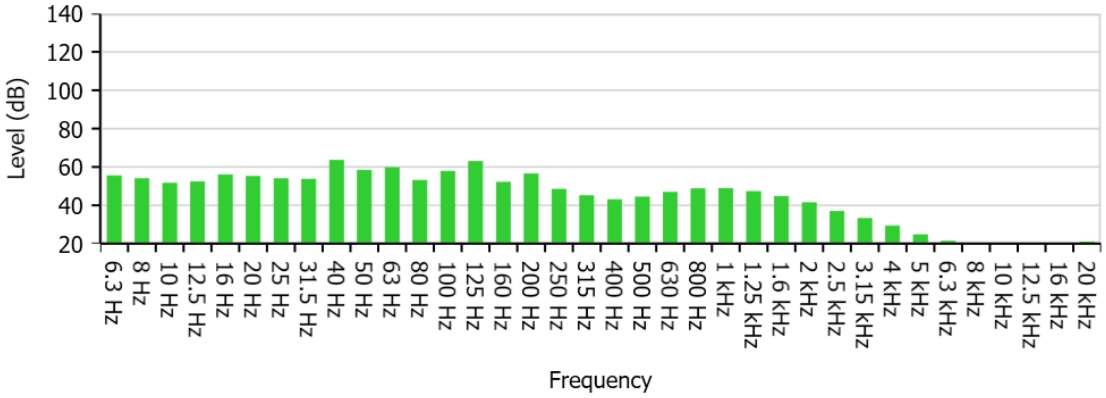
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	63.7	62.1	61.8	59.9	58.4	56.8	55.2	58.6	82.7
-	50	63	80	100	125	160	200	250	315
-	68.7	56.2	65.6	59.9	63.7	60.5	65.9	58.4	53.7
-	400	500	630	800	1 000	1 250	1 600	2 000	2 500
-	52.3	49.0	49.1	48.7	47.2	44.8	42.8	41.3	36.3
-	3 150	4 000	5 000	6 300	8 000	10 000	12 500	16 000	20 000
-	33.3	30.2	29.6	25.1	22.2	19.6	19.0	20.3	23.4

AM2



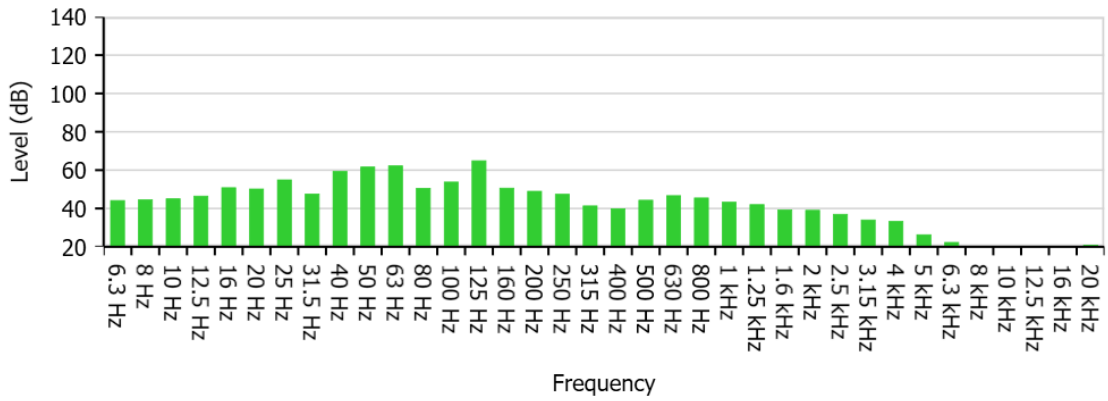
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	57.3	54.6	54.3	53.3	51.8	49.6	50.5	53.8	77.4
-	50	63	80	100	125	160	200	250	315
-	63.5	51.8	65.2	56.4	60.5	59.0	60.2	52.2	50.7
-	400	500	630	800	1 000	1 250	1 600	2 000	2 500
-	45.4	46.9	48.8	46.7	45.0	44.0	42.9	42.9	38.3
-	3 150	4 000	5 000	6 300	8 000	10 000	12 500	16 000	20 000
-	36.6	33.7	32.8	26.7	22.8	18.8	17.0	17.9	21.0

AM3



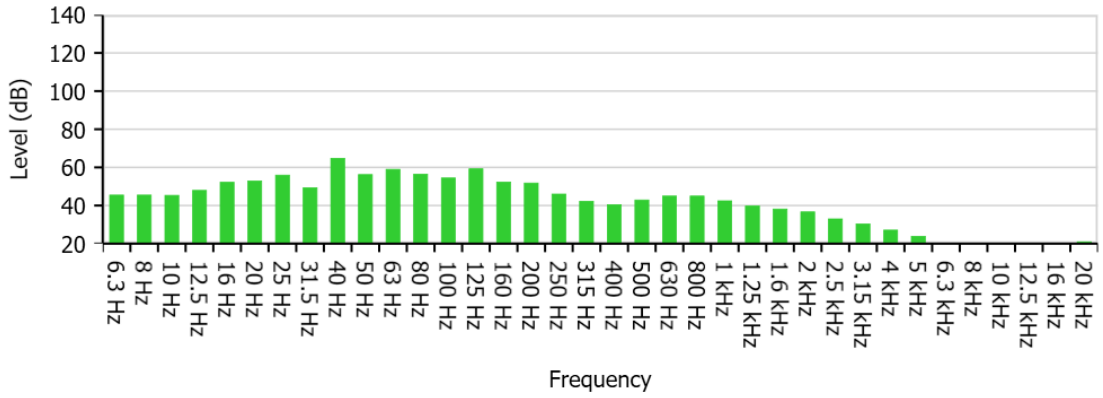
Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	55.4	53.8	51.5	52.2	55.9	55.1	53.8	53.7	63.4
-	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**
-	58.3	59.6	53.0	57.8	62.8	52.0	56.3	48.4	45.0
-	**400**	**500**	**630**	**800**	**1 000**	**1 250**	**1 600**	**2 000**	**2 500**
-	42.9	44.3	46.8	48.6	48.8	47.2	44.6	41.3	36.8
-	**3 150**	**4 000**	**5 000**	**6 300**	**8 000**	**10 000**	**12 500**	**16 000**	**20 000**
-	33.1	29.3	24.6	21.2	18.5	16.1	16.2	17.7	20.9

AM4



Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	44.2	44.5	45.0	46.5	50.8	50.1	54.9	47.5	59.3
-	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**
-	61.6	62.2	50.5	53.7	64.9	50.6	48.9	47.4	41.3
-	**400**	**500**	**630**	**800**	**1 000**	**1 250**	**1 600**	**2 000**	**2 500**
-	39.8	44.3	46.7	45.5	43.2	42.0	39.2	39.0	36.9
-	**3 150**	**4 000**	**5 000**	**6 300**	**8 000**	**10 000**	**12 500**	**16 000**	**20 000**
-	34.0	33.2	26.3	22.3	20.2	16.9	16.5	17.8	20.9

AM5



Frequency (Hz)	6.3	8	10	12.5	16	20	25	31.5	40
Level (dB)	45.5	45.5	45.3	47.9	52.2	52.9	55.9	49.3	64.7
-	50	63	80	100	125	160	200	250	315
-	56.2	59.0	56.5	54.4	59.3	52.3	51.8	46.0	42.2
-	400	500	630	800	1 000	1 250	1 600	2 000	2 500
-	40.4	42.9	45.0	44.9	42.4	39.7	38.2	36.7	32.9
-	3 150	4 000	5 000	6 300	8 000	10 000	12 500	16 000	20 000
-	30.3	27.1	23.9	19.2	17.0	15.6	16.1	17.7	20.9