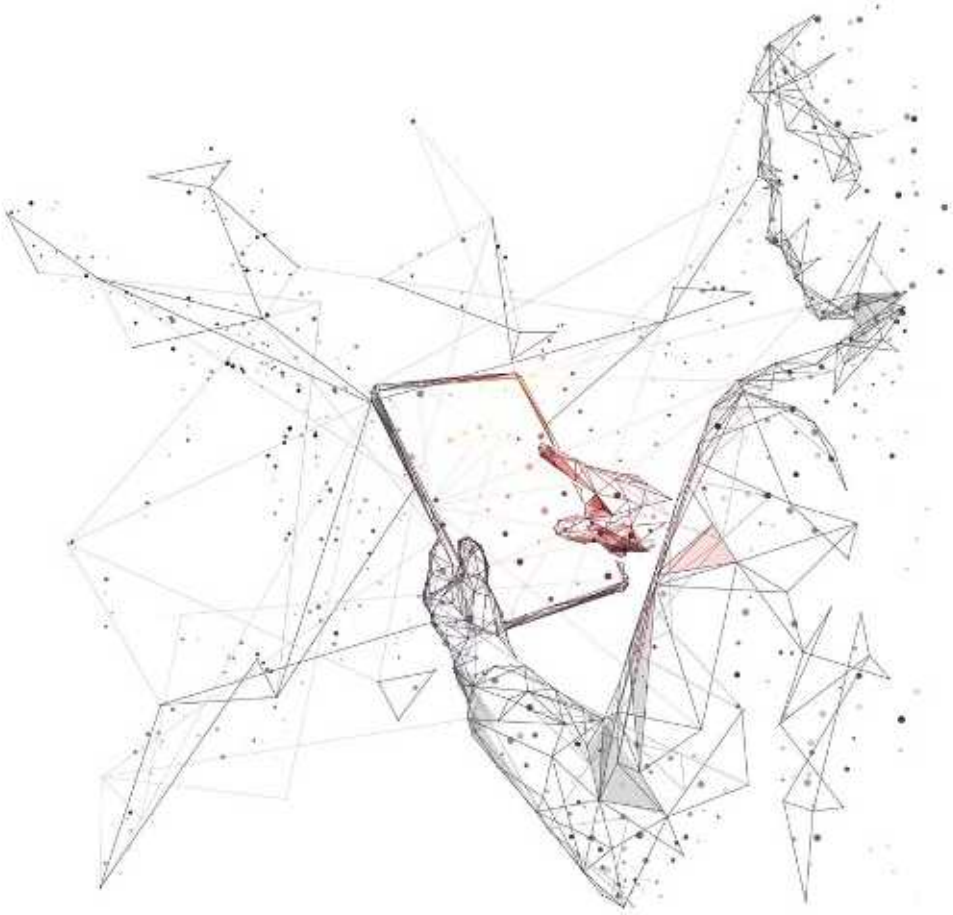
APRIL 3, 2024



BS4142:2014 ASSESSMENT OF GRAIN STORE EXTRACTION SYSTEM, BANNISTERS YARD, RALPHS LANE, BOSTON, PE20 1QU

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Table of Contents

1.0 Introduction

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1.0.1 This report has been commissioned to determine the noise impact of the construction of a grain store and associated extraction system on the East boundary of Bannisters Yard, Ralphs Lane, Boston.

1.0.2 The assessment has been conducted in line with the BS4142:2014 as a new industrial source is being added to the existing soundscape.

2.0 Site Details

2.0.1 The site is located on Ralph Street, between Kirton and Boston. The yard is already in existence for farm use and storage with warehouses currently in place. The proposed building is on the Eastern boundary of the site.

2.0.2 The extraction systems and plant units have all been identified on the existing plans for the site and entered into the models for prediction of the specific noise level of the combined development at the nearest Noise Sensitive Receptor (NSR) point.

2.0.3 The closest Noise Sensitive Receptors (NSRs) are located on Ralphs lane, across the adjacent field.

2.0.4 The noise source is not currently active and therefore background noise levels were taken for the assessment without the specific noise level present.

2.1 Location of Monitors

2.1.1 The noise location was chosen based on the proximity to the closest NSR.

Figure 1

Figure 2

2.1.2 Measurements were made in 15 minute periods, on 1 second averaging, to allow for the removal of anomalies and increased accuracy. The data was averaged into L_{Aeq1hr} daytime and $L_{Aeq15min}$ night-time with data also recorded for L_{AMax} in both day and night periods for the BS4142:2014 assessment.

2.1.3 The monitoring was conducted using 1 x Type 1 NTi XL2 sound level meter with batteries and outdoor microphone protection.

2.1.4 All measurements were taken after a field calibration was undertaken to ensure accuracy and repeatability of measurements. Drift was also checked post-measurement to ensure validity of data collected.

2.1.5 Further data such as wind speed, wind direction, rainfall intensity, temperature and cloud cover were all recorded at the beginning and end of the assessment at the monitoring location.

2.1.6 Any anomalies (such as noise by the engineer during setup and collection of the kit) were removed from the survey for a true reflection of the ambient levels in the vicinity. This was done by recording audio throughout the survey at each location and listening back through the files during the analysis process to confirm what was recorded manually during the survey.

2.2 Plan Views of Site with Designated Work Areas

Figure 3

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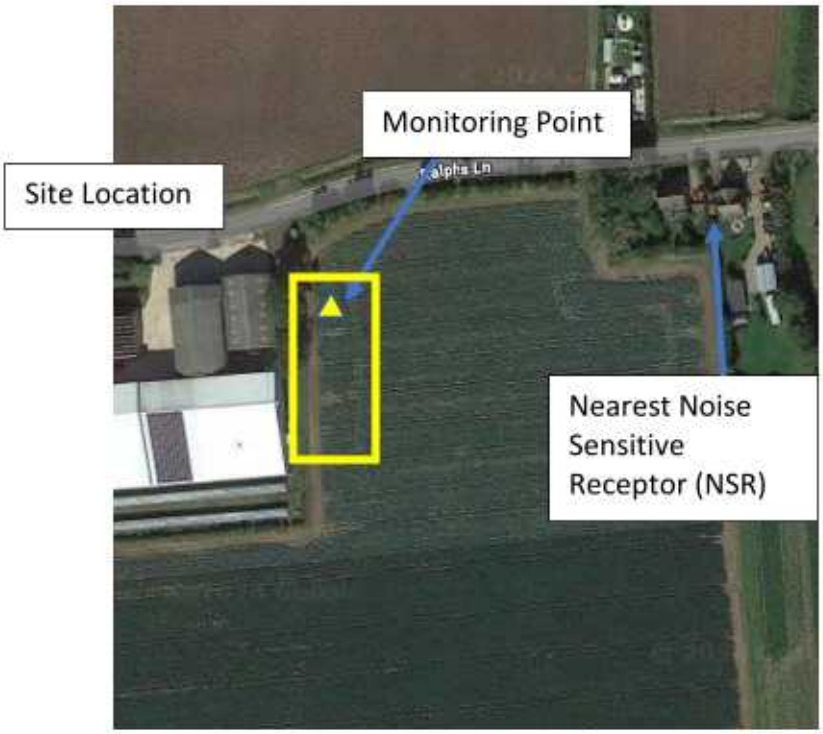
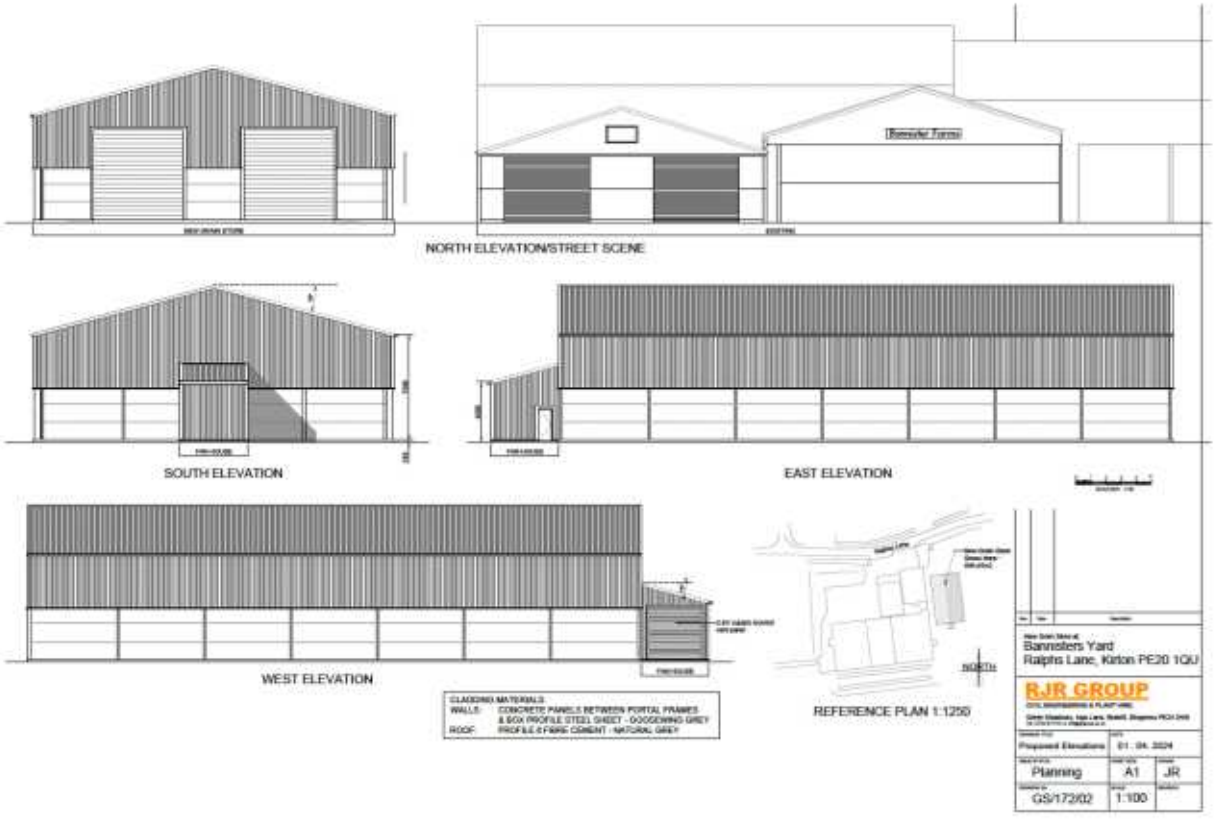


2.3 Proposed Development



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3.0 Legislation

3.0.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 174 of the NPPF states the following:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) 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…."

Paragraph 185 goes on to mention:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

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a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;"

3.0.2 The NPPF reinforces the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"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."

3.0.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.

3.1 BS4142:2014 +A1 (2019)

3.1.1 Noise effects on residential properties due to the current operational hours and extended hours have been assessed according to the guidance in BS 4142:2014. This standard primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development) at residential sensitive receptors.

3.1.2 The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the 'rating level', whether or not a rating penalty is applied. The 'residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

3.1.3 According to BS 4142:2014, the background sound levels adopted for the assessment should be representative of the periods being assessed. The standard recommends that the background sound level should be collected from continuous measurements of normally not less than 15-minute intervals. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods.

3.1.4 The method chosen for this section of the report is to use the data collected at the nearest NSR for the day and night periods to provide the ambient and background noise levels. The mode $L_{Aeq\_1hr(Day)}$ and $L_{Aeq\_15min(Night)}$ value will then be used for each time period over the course of the measurement as the most appropriate way of creating a representative value.

3.1.5 The specific sound levels have been determined separately in terms of the L_{Aeq1hr} during the daytime $L_{Aeq15min}$ during the night-time. Daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours, so these periods have been adopted for this assessment.

3.1.6 At each of the most likely sensitive receptor locations, the rating level has been determined from the predicted specific sound level. Where it has considered it to be appropriate, a rating penalty has been applied for tonality, impulsivity and/or intermittent specific sounds as described in the commentary to paragraph 9.2 of BS4142:2014. This has been applied with consideration for the main sound sources from site that contribute to the level of specific sound at the receptor location.

3.1.7 As per the requirements of the standard, an initial estimate of the impact of the specific sound has been obtained by subtracting the measured background sound level from the rating level of the

specific sound. Table 2 provides the initial evaluation of impact following this method.

Table 1

Magnitude	Difference Between rating Level and Background Level	Comments
High	**+10dB**	**Significant Adverse impact Likely**
Medium	**+5 to +10dB**	**Adverse impact Likely**
Low	**0 to +5 dB**	**Adverse impact unlikely**
Negligible	**Less than 0dB**	**Low Chance of Adverse impact**

3.1.8 Following the initial evaluation of impact, the context of the sound has also been considered, which is a key requirement of the Standard. In evaluation of the context, the following factors have been considered:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

4.0 Results

4.1 - 11.10am 30/03/24 – 14.10pm 02/04/24

Table 2

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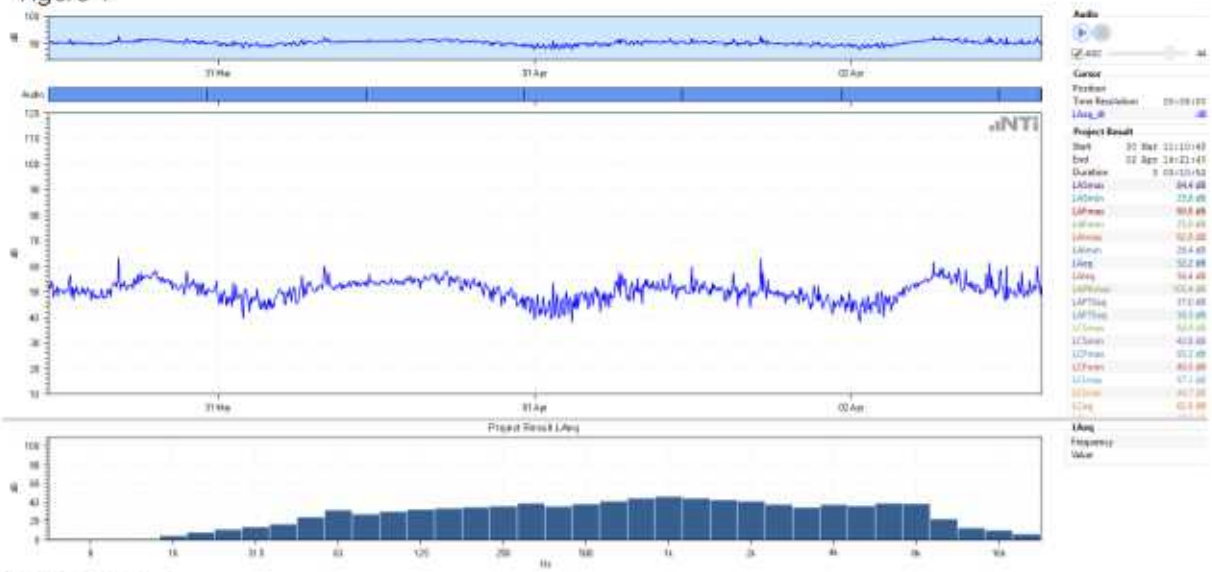
Location	Start Date/Time	L_{Amax} (Mode)	L_{Aeq1hr} (Mode)	$L_{Aeq15min}$ (Mode)	L_{A90}
Day (0700-2300)	11.10am 30/03/24	68.0dBA	51.6dBA		42.6dBA
Night (2300-0700)	23.00pm 30/03/24	66.5dBA		47.1dBA	39.5dBA

Figure 4



Comments
Mainly traffic pass-by noise. Some farm traffic and bird noise close to microphone position

**based on Appendix C*

	Cloud Cover	Temperature (Celcius)	Prescence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	3	13	No	0.3	NE
Collection	6	11	No	1.2	SW

5.0 Analysis of Results

5.1 Calculated Results

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5.1.1 The specific noise level for the extraction/fan unit has been calculated using the CadnaA noise modelling software. This is based on the input details provided from the manufacturer's specification sheet (Appendix D). Table 3 below illustrates the input data used.

Table 3

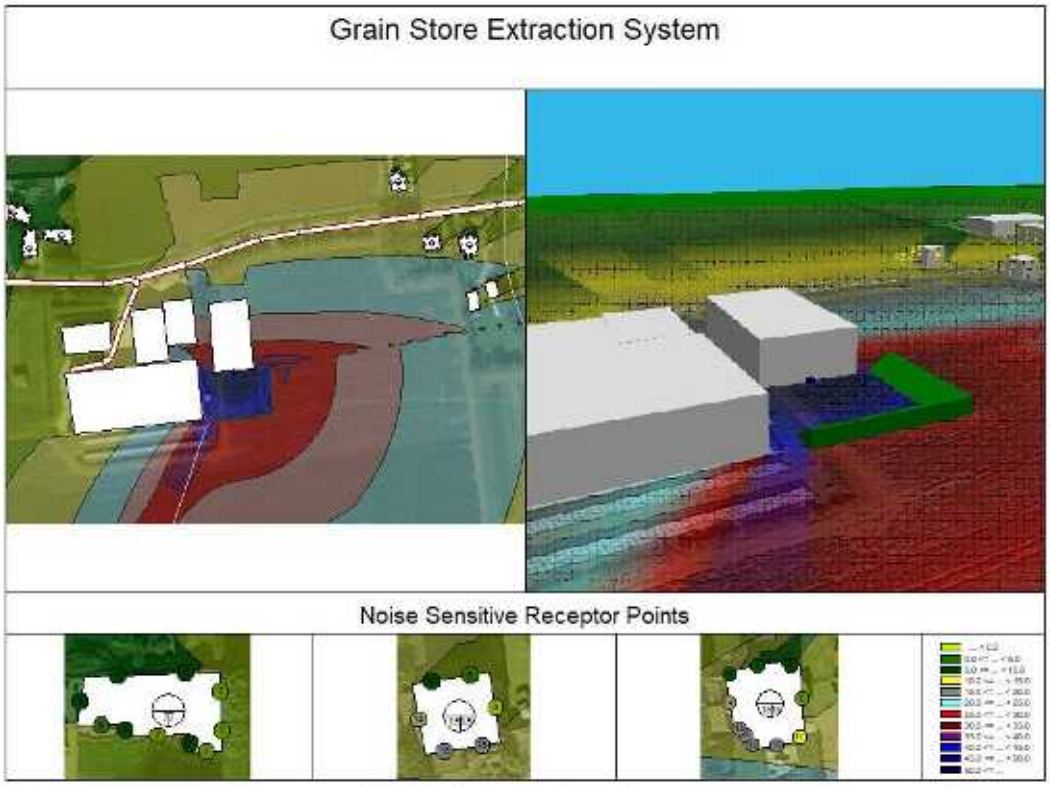
1/1 Octave Sound Pressure Levels @ 1m from the unit (Outside Casing) in dBA								
Frequency								
63 Hz	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8kHz**	**A(dBA)**
70	74	77	78	76	72	70	59	83

5.1.2 As the source was not present the background noise levels gathered can be used to compare against the predicted noise impact of the proposed development. Factors such as ground absorption, screening, topography and distance have all been considered in the model.

5.1.3 Figure 5 below shows the calculated value for the nearest NSR.

Figure 5

5.1.4



With the calculated specific noise level being at a maximum of 15dBA at the closest two NSR properties, and 7dBA at the next; 15dBA has been used in the calculations in table 4 to assess the noise impact of the units.

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Table 4

Measurement Type	*Parameter*	*Result*	*Comment*
Day			
Ambient sound	L_{Aeq}	**68dBA**	**Measured at NSR-Source present**
Residual sound level	L_{Aeq1hr}	**68dBA**	**Measured at NSR-Source present**
Background sound level	L_{A901hr}	**43dBA**	**Measured at NSR-Source not present**
Specific Sound Level	L_{Aeq1hr}	**15dBA**	**Modelled**
Acoustic Feature Correction	**dBA**	**+4**	**Likely intermittent sound source**
Rating Level	**dBA**	**19dBA**	
Difference of Background vs Rating level	**dBA**	**-24dB**	
BS4142:2014 Conclusion			**Low Adverse impact**
Night			
Ambient sound	L_{Aeq}	**47dBA**	**Measured at NSR-Source not present**
Residual sound level	$L_{Aeq15mins}$	**47dBA**	**Measured at NSR-Source not present**
Background sound level	$L_{A9015mins}$	**40dBA**	**Measured at NSR-Source not present**
Specific Sound Level	$L_{Aeq15mins}$	**15dBA**	**Modelled**
Acoustic Feature Correction	**dBA**	**+4**	**Likely intermittent sound source**
Rating Level	**dBA**	**19dBA**	
Difference of Background vs Rating level	**dBA**	**-21dB**	
BS4142:2014 Conclusion			**Low Adverse impact**

6.0 Conclusion and Further Comments

6.1 Discussion of Levels

6.1.1 The specific noise level of the extraction/fan unit is below the required levels, in accordance with BS4142:2014, for there to be the likelihood of adverse impact on the nearest NSR.

6.1.2 The model takes into account both daytime and night-time operation as well as the potential intermittent nature of the source.

6.1.3 The model also takes into account the planned 4m high bund that surrounds the south side of the building and fan/extraction area. This is illustrated in the 3D view as part of figure 5.

7.0 Credentials

Name	Title	Credentials
James Flitton BSc AMIOA	**Acoustic Consultant**	**CSCS Professionally Qualified person**

		IOA Diploma in Acoustics and Noise Control
		Associate Member Institute of Acoustics
		Affiliate Member of IDE
		Affiliate Member of IOR
Signed		

Appendix A – Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).

Parameter	Description
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

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Appendix B – Survey Instrumentation

Type	Manufacturer	Model	Serial Number	Last Cal	Cal Due
SLM	NTi	XL2-TA	A2A-18475-E0	19/10/2022	18/10/2024
Pre-amp	NTi	MA220	9378	19/10/2022	18/10/2024
Microphone	NTi	MC230A	A19093	19/10/2022	18/10/2024
Calibrator	NTi	CAL200	19829	20/11/2023	19/11/2024

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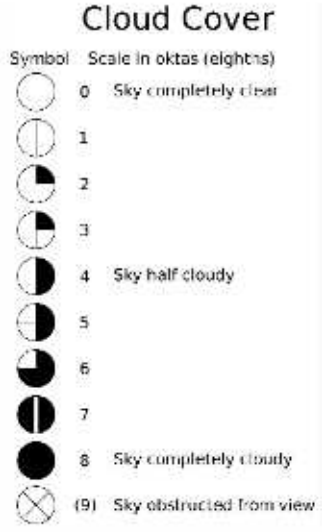
Appendix C – Weather Conditions Chart Used
(Blank Version)

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
		Temperature:		
		Precipitation:		
		Cloud cover (oktas - see guide)		
		Presence of fog/snow/ice		
		Presence of damp roads/wet ground		
		Wind Speed (m/s)		
		Wind Direction		
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)		

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Appendix D – Extraction Unit Technical Data Sheet

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Project : Standard Range
Item 9 - Ref : 125hp

07/03/2024

Gas Properties :

Abs Inlet Pressure:	406.78	ins wg
Operating Temp:	20	Deg.C.
Humidity:	0	%
Specific Gravity:	1.0	
Inlet Density:	1.204	Kg/m3
Dust Load:	0	g/m3

Duty Required :

Inlet Volume Flow:	84000	cfm
Fan Static Pressure:		
Inlet Pressure:	-0	ins wg
Outlet Pressure:	5	ins wg

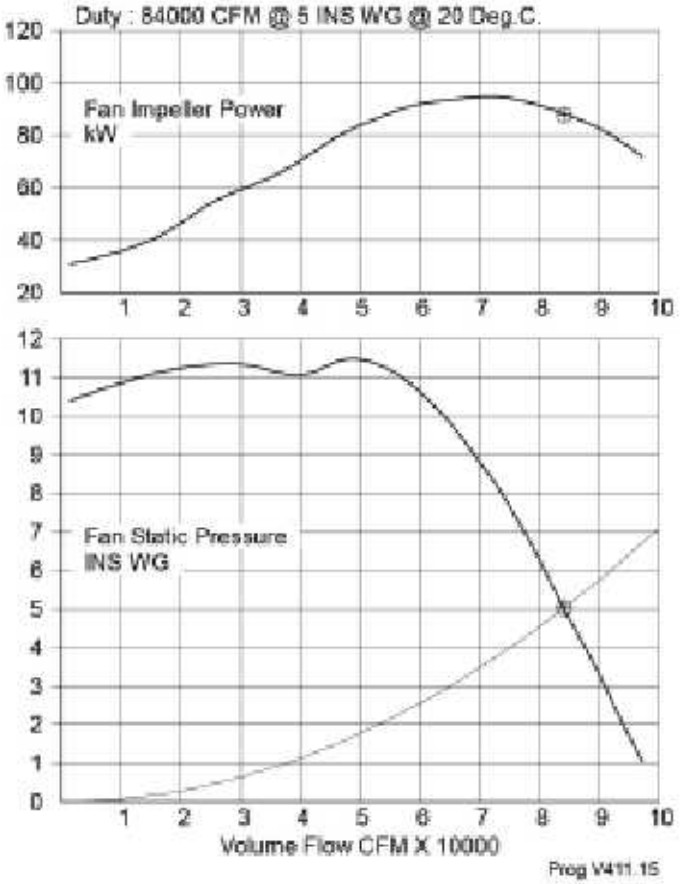
Fan Selected :

SWSI-BCW-1420/100-99

Speed:	950	Rpm
Impeller Ø:	1420	mm
Fan Class:	3	

Impeller Power :

@ 20 Deg C :	88.0	kW
@ Duty Temp:	88.0	kW
Tip Speed:	70.6	m/s
Inlet Velocity:	23.6	m/s
Outlet Velocity:	19.4	m/s
Temp Rise:	1.8	Deg.C.



Noise Details :	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Total
Internal SWL dB	118	113	112	107	102	97	95	88	**120**
Free Inlet SPL dBA	83	91	98	99	97	93	91	82	**104**
Free Outlet SPL dBA	83	91	97	98	96	92	90	81	**103**
Outside Casing dBA	70	74	77	78	76	72	70	59	**83**

Motor noise is NOT included in the figures above.

Sound Pressure levels (SPL) are estimated within the Near Field range at 1 metre(s)
Breakout at 1 metre from 5 mm thick casing (inside Near Field range).
Casing levels assume the inlet / outlet are ducted and noise does not breakout through duct.
All values are averages. Free Inlet assumes that outlet is ducted and vice versa.