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Noise Impact Assessment

S73 Application to vary an existing approved Agricultural AD Development
Land east of A162, Low Farm, Bond Ings, Sherburn in Elmet, LS25 6FW

Halstow Energy Ltd

SHF.0174.006.NO.R.001

'Experience and expertise working in union'

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Noise Impact Assessment

Project:	S73 Application to vary an existing approved Agricultural AD Facility on land east of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW
For:	Halstow Energy Ltd
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Contents

1 Introduction 4

2 Standards and Guidance 7

3 Baseline Survey Information & Results 11

4 Assessment of Impacts 14

5 Conclusion 18

Glossary of Terminology 19

Statement of Uncertainty 22

Statement of Competency 23

Tables & Figures

Figure 1-1: Site Location Plan 5

Figure 1-2: Proposed Revised Site Layout 6

Table 2-1: Noise Hierarchy Table Excerpt 7

Table 2-2: BS4142 Subjective Method Rating Corrections 9

Table 2-3: BS8233 Indoor Ambient Noise Levels for Dwellings 9

Table 3-1: Noise Monitoring Locations 11

Table 3-2: Weather Conditions 11

Table 3-3: Noise Monitoring Equipment 12

Table 3-4: Summary of Baseline Survey Results, dB 12

Table 4-1: Noise Source Information 14

Table 4-2: Predicted Specific Sound Levels at the Receptors 15

Table 4-3: BS4142 Assessment 16

Table G-1: Typical Noise Levels 19

Table G-2: Terminology 20

Table A1: Location ML01, Midweek Daytime 25

Table A2: Location ML01, Midweek Night-time 29

Table A3: Location ML01, Weekend Daytime 31

Table A4: Location ML01, Weekend Night-time 34

Figure B-1: Daytime L_{Aeq} Noise Contour Plot 38

Figure B-2: Night-time L_{Aeq} Noise Contour Plot 39

1 Introduction

1.1 Project Introduction

1.1.1 Enzygo Limited has been commissioned by Halstow Energy Ltd to undertake a revised noise impact assessment to support a Section 73 application for the development of an agricultural Anaerobic Digestion (AD) facility on land to the east of the A162, Low Farm, Bond Ings, Sherburn in Elmet, LS25 6FW, known as Home Farm.

1.1.2 The noise assessment has been undertaken to assess the potential impact of the proposed changes, in accordance with the relevant standards and guidance, at the nearest noise-sensitive properties to the site and to provide outline mitigation advice if considered necessary.

1.1.3 Details of the assessment methodology employed, together with the results of the noise predictions, assessment and conclusions are presented within this report.

1.2 Site Description

1.2.1 The site is located adjacent to the A162 to the southeast of Sherburn in Elmet, between the A162, Sherburn Curve, Hull Line and Normanton and Colton Junction Line railways.

1.2.2 To the north of the site is Low Farm Energy Plant, with open farmland beyond. To the northeast is the Sherburn Industrial Area which is home to significant industrial development.

1.2.3 To the east is the Normanton and Colton Junction Line and Sherburn Curve railways beyond which is Sherburn Aero Club and Sherburn Rail Freight terminal, and other industrial/business premises all separated by open farmland.

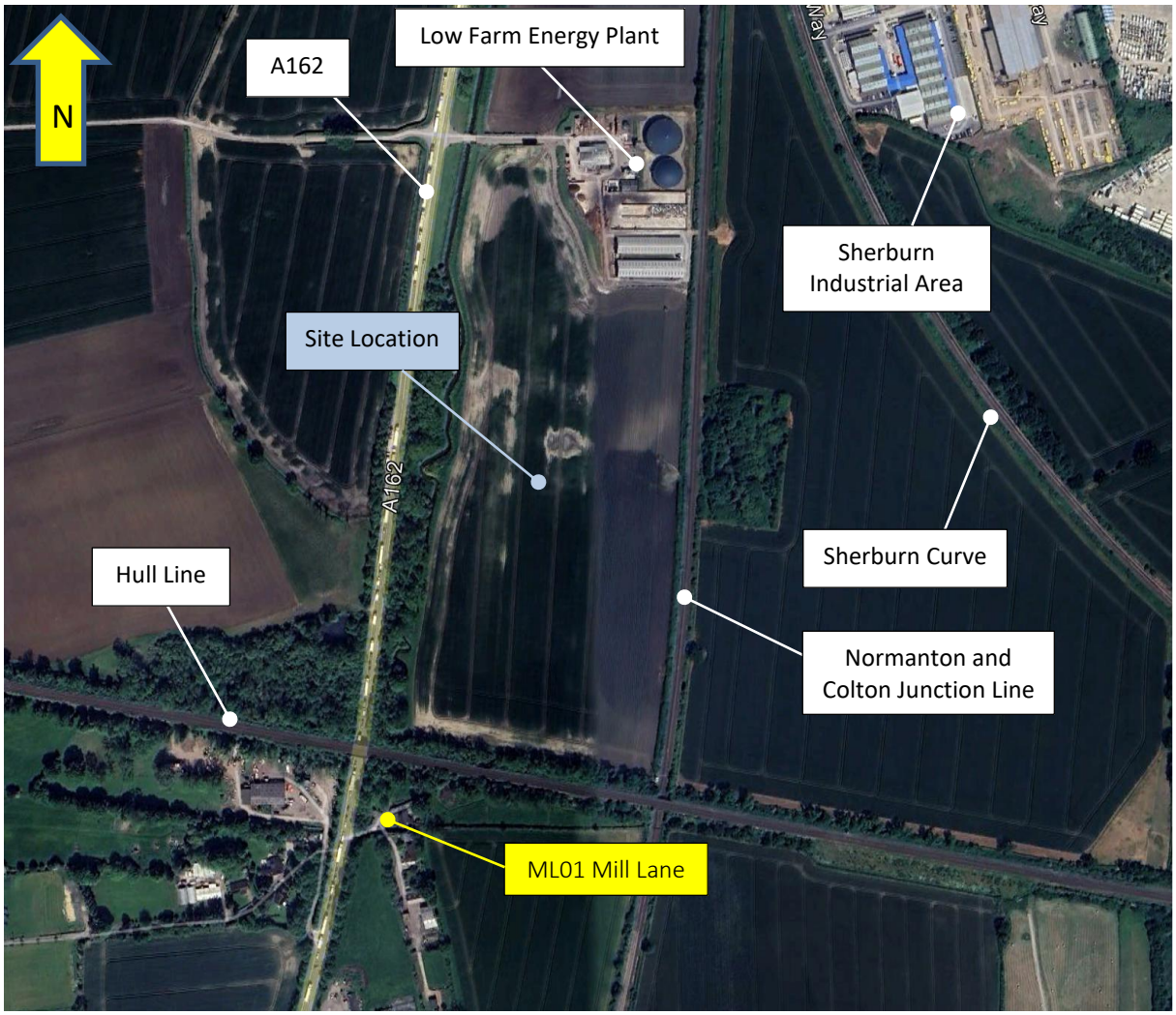
1.2.4 To the south is the Hull Line railway beyond which is the nearest identified noise-sensitive receptor on Mill Lane.

1.2.5 To the west is the A162 with open farmland as far as Milford Road beyond. There are sporadic properties along Milford Road which are more distant than the property located to the south.

1.2.6 The nearest identified noise-sensitive residential property to the proposed development site is located on Mill Lane to the south and the site location and residential receptor are shown in Figure 1-1 below.

1.2.7 An application for 106no. residential properties on land approximately 700m northwest of the proposed agricultural AD Facility was submitted in July 2023; however, the proposed residential development is considered too distant from the noise sources to be adversely impacted and has not been considered further within this assessment. Since the original noise assessment was undertaken there are no new applications in the area on which the approved development would impact.

Figure 1-1: Site Location Plan



Google ©

1.3 Development Being Assessed

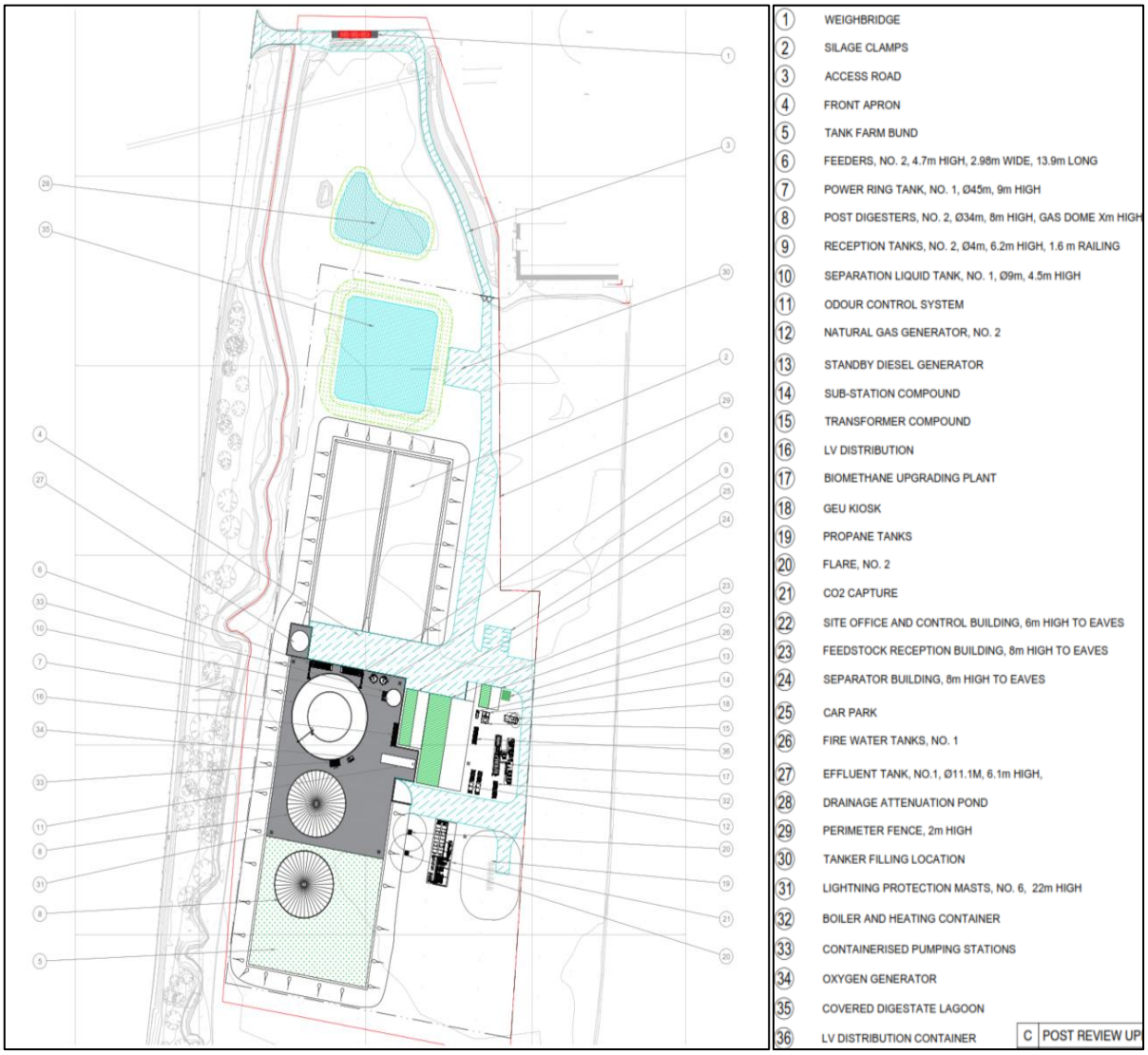
1.3.1 The following S73 noise impact assessment is being undertaken as a review the original noise impact assessment, referenced CRM.0174.002.NO.R.001, considering revisions to the site layout, plant/equipment revisions and updated noise emission data.

1.3.2 The original noise impact assessment concluded that noise levels generated by the consented AD facility, at the nearest receptor, would be below the prevailing daytime background noise levels and slightly above the prevailing night-time background noise levels during the week and at the weekend. In all cases indicating a low impact.

1.3.3 The revisions to the AD plant include changes to the layout in the southern part of the site with changes to building sizes and plant/equipment. There are no changes proposed to the site access, silage clamp area, digestate lagoon, weighbridge or attenuation pond in the northern part of the site.

1.3.4 The main changes relate to the digestion tanks and building sizing and layouts with some changes to the type of processing plant employed; removal of nitrogen stripping and replacing the CHP engines with natural gas generators.

Figure 1-2: Proposed Revised Site Layout



1.4 Noise Assessment Methodology

1.4.1 A noise assessment for the consented development has been undertaken in accordance with the guidance contained in British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* (BS4142) with reference made to the internal noise criteria outlined in British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS8233).

1.4.2 Noise levels generated by the proposed development have been predicted to the nearest noise-sensitive receptors, using the calculation methodology outlined in ISO9613:2024 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering methods of the prediction of sound pressure levels outdoors* (ISO9613) using the proprietary noise modelling software CadnaA.

1.4.3 The assessment is based upon the results of a baseline noise survey undertaken at a location representative of the nearest residential receptor to the site over representative daytime and night-time periods.

2 Standards and Guidance

2.1 Planning Practice Guidance: Noise

2.1.1 The Planning Practice Guidance: Noise is the Government's online guidance on managing potential noise impacts from new developments.

2.1.2 The guidance includes a noise exposure hierarchy table which relates response to noise and example outcomes to effect levels. The hierarchy table also identifies actions required for each effect level.

2.1.3 Particularly relevant to this assessment are the No Observed Effect Level and the No Observed Adverse Effect Level (NOAEL) to which the guidance states:

Table 2-1: Noise Hierarchy Table Excerpt

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

2.2 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

2.2.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;

- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and,
- 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.

2.2.2 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically "*the greater this difference, the greater the magnitude of the impact*". This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context; and,
- 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.

2.2.3 BS4142 further states that "*where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact*" again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that "*not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*", thus implying that all sites should be assessed on their own merits and specifics.

2.2.4 The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.2.5 The Standard outlines methods for defining appropriate "*character corrections*" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.2.6 The Subjective Method is based on the following corrections:

Table 2-2: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for "Other sound characteristics"	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.3 British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.3.1 BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

2.3.2 The Standard suggests suitable guidance values for residential dwellings shown in Table 2-3.

Table 2-3: BS8233 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 Hours	23:00 to 07:00 Hours
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

2.3.3 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*"

2.3.4 The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

2.3.5 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

"*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.*"

2.3.6 These guideline design-criteria values are meant for new residential development rather than for assessing new noisy development being introduced into a residential area. However, the guideline values provide good noise limits to attain in this instance.

2.4 ISO9613 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors*

2.4.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

2.4.2 The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

3 Baseline Survey Information & Results

3.1 Baseline Noise Survey

3.1.1 The baseline noise survey undertaken for the original noise impact assessment, referenced CRM.0174.002.NO.R.001 is considered still valid as there have been no significant changes in the area and the monitoring location remains representative. For reference the details of the original survey are set out below.

3.1.2 The baseline noise survey was undertaken between Friday 19th July and Wednesday 24th July 2024 to gather background and ambient noise level data at a location representative of the nearest noise-sensitive receptor to the proposed development site.

3.1.3 The monitoring location used for the survey is shown in Figure 1-1 and detailed in Table 3-1 below. The measurement microphone was mounted on a tripod with a windshield approximately 1.5m above the ground in free-field conditions.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Approx. Distance from Site	Reflecting Surfaces between Source & Receptor	Topography of Intervening Ground	Justification for Choice of Measurement Location
ML01	125	None	Generally flat ground with a railway embankment close to the receptor provides a significant barrier	Nearest noise-sensitive property to the site as agreed with the local Environmental Health Officer at North Yorkshire Council

3.2 Weather Conditions

3.2.1 Weather conditions during the survey period were noted and are detailed in Table 3-2. The data is gathered from Weather Underground for the Sherburn in Elmet PWS – ILEEDS169 weather station.

Table 3-2: Weather Conditions

Day	Date	Max. Wind Speed & Direction	Rain	Fog or Mist	Ground Conditions	Av. Temp
Friday	19/7/24	2.9m/s WSW	None	None	Dry	24°C
Saturday	20/7/24	2.7m/s W	None	None	Dry	22°C
Sunday	21/7/24	3.3m/s S	None	None	Dry	18°C
Monday	22/7/24	3.8m/s WSW	None	None	Dry	18°C
Tuesday	23/7/24	4.2m/s WNW	None	None	Dry	19°C
Wednesday	24/7/24	3.6m/s W	None	None	Dry	24°C

3.3 Measuring Equipment

3.3.1 The noise monitoring equipment used during the surveys is shown in Table 3-3 and was set to record the $L_{Aeq,T}$, L_{A90}, L_{A10} and L_{Afmax} parameters.

3.3.2 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:

Time Weighting: Fast

Frequency Weighting: "A"

3.3.3 The sound level meters were field calibrated, using the acoustic calibrator, prior to and upon completion of the overall survey. No drifts in calibration were noted.

Table 3-3: Noise Monitoring Equipment

Location	Equip. Make & Model	Class	Calibration Level, dB	Serial No.	Calibration Date Prior to Survey
ML01	RION NL-52 Sound Level Meter	1	94.0	00520990	17th August 2022
	RION Acoustic Calibrator	-	-	35024433	14th November 2023

3.3.4 The external calibration documentation for the equipment used is available upon request.

3.4 Survey Details and Results

3.4.1 The results of the baseline surveys are summarised in Table 3-4 below and can be found in full in Appendix A.

Table 3-4: Summary of Baseline Survey Results, dB

Location	Date	Period	Duration hh:mm	Average dB $L_{Aeq,T}$	Maximum dB L_{AFmax}	Average dB L_{A90}	Average dB L_{A10}
ML01	19/7/24	Day	11:45	61.8	84.0	49.0	65.0
		Night	01:00	57.0	75.2	34.9	61.8
	20/7/24	Day	16:00	61.2	88.4	44.8	64.0
		Night	08:00	56.2	79.0	35.4	60.0
	21/7/24	Day	16:00	60.0	93.1	43.6	63.5
		Night	08:00	54.4	74.4	35.4	56.1
	22/7/24	Day	16:00	61.1	81.4	47.5	64.9
		Night	08:00	57.2	77.1	37.5	59.1
	23/7/24	Day	16:00	60.8	88.0	45.9	64.7
		Night	08:00	57.8	75.4	37.0	61.3
	24/7/24	Day	06:30	62.2	87.4	48.3	65.6
		Night	07:00	58.0	78.6	39.8	61.2

3.5 Analysis of Baseline Data

3.5.1 During the week the average measured ambient L_{Aeq} noise level during the day ranges from 60.8dB to 61.8dB, giving an overall average daytime ambient noise level of 61.5dB $L_{Aeq,T}$. During the day the average measured background L_{A90} noise level ranges from 45.9dB to 49.0dB, giving an overall average night-time background noise level of 47.7dB L_{A90}.

3.5.2 During the week the average measured ambient L_{Aeq} noise level at night ranges from 57.0dB to 58.0dB, giving an overall average daytime ambient noise level of 57.5dB $L_{Aeq,T}$. During the night the average measured background L_{A90} noise level ranges from 34.9dB to 39.8dB, giving an overall average night-time background noise level of 37.3dB L_{A90}.

3.5.3 At the weekend, the average measured ambient L_{Aeq} noise level during the day ranges from 60.0dB to 61.2dB, giving an overall average daytime ambient noise level of 60.6dB $L_{Aeq,T}$. During the day the average measured background L_{A90} noise level ranges from 43.6dB to 44.8dB, giving an overall average night-time background noise level of 44.2dB L_{A90}.

3.5.4 At the weekend, the average measured ambient L_{Aeq} noise level at night ranges from 54.4dB to 56.2dB, giving an overall average daytime ambient noise level of 55.4dB $L_{Aeq,T}$. During the night the measured background L_{A90} noise level is steady at 35.4dB L_{A90}.

3.6 Subjective Context

3.6.1 During the setup of the monitoring equipment, the main source of noise audible at the monitoring location was road traffic on the A162, rail traffic on the adjacent line (including the use of horns), and birdsong. As the monitoring equipment was left unattended no notes on the night-time noise climate are available. However, the L_{A10} measured data indicates that traffic noise also affected the night-time noise climate.

4 Assessment of Impacts

4.1 Introduction

4.1.1 Specific sound levels generated by the development proposals have been predicted to the site facing façade or site facing outdoor amenity space of the nearest noise-sensitive receptors identified using the calculation methodology outlined in ISO9613.

4.1.2 The resulting predicted specific sound levels have then been assessed in accordance with the guidance contained in BS4142.

4.2 Sources Being Assessed

4.2.1 The noise source data, advised by the client, their agent or taken from a similar site, used in the assessment is shown in Table 4-1. The figures are shown in either sound power levels or sound pressure levels at a given distance. It should be noted that the noise source data reflects that some sources have higher and some sources have lower noise emissions than those previously modelled.

Table 4-1: Noise Source Information

Plant Noise Source		Operating Hours/day	Qty	Noise Source Level
Mixer	Digester	16	9	54dB(A)@10m
Mixer	Secondary	16	2	82dB(A)@1m
Mixer	Power Digest	12	8	75dB(A)@1m
Pump	Digester	16	1	75dB(A)@1m
Feeder		12	2	71dB(A)@1m
Compressor	BUP	24	1	90dB(A) @ 1m
Compressor	CO_2	24	1	90dB(A) @ 1m
Natural Gas Generator		12	2	75dB(A)@1m
Standby Generator		<1%/yr	1	82dB(A) @ 1m
Gas Flare		<2%/yr	2	71dB(A)@15m
Odour Control Unit		24	1	71dB(A)@1m
Separation Liquid Tank	Enclosed Tank*	12	1	65dB(A)@1m
Mixer	Reception Tank	16	2	75dB(A)@1m
Dome Blower	Power Digest	24	2	75dB L_{WA}
Pump	Separator	18	1	75dB(A)@1m
Boiler		12	1	70dB L_{WA}
Tanker Pump	Daytime Only	10	1	75dB(A)@1m
Loading Shovel/Telehandler	Movements Daytime Only	4	-	108dB L_{WA}

Plant Noise Source		Operating Hours/day	Qty	Noise Source Level
Delivery Vehicles (worst-case movements daytime only – October) per day	5no. per hour Daytime Only	-	-	109dB L_{WA}
* Enclosed tank assumed to give a noise reduction of 30dB				

4.3 Noise Modelling Protocols

4.3.1 The model was constructed using the proprietary noise modelling software package CadnaA utilising Google Earth geo-referenced 1:1 scaled aerial photography, openstreetmap.org mapping data, DEFRA online ground height data and noise source data measured at site.

4.3.2 It is assumed that the ground between the site and the receptors would be at least 90% soft ground. Wind and temperature gradient assisted sound propagation has been assumed to all receptors.

4.3.3 The noise modelling assumes that all sources, except the flares and the standby generator, are operational over the whole 1-hour assessment period during the day. During the night, the modelling assumes that all sources, except vehicle movements, flares, standby generator and tanker pump are operational over the whole 15-minute assessment period.

4.4 Predicted Sound Levels

4.4.1 For the purposes of this assessment the predicted sound levels assume that all equipment would be operating simultaneously.

4.4.2 Predicted specific sound levels during the day have been made to a height of 1.5m to represent outdoor amenity spaces. Predicted specific sound levels at night have been made to a height of 4.0m for first-floor bedroom windows. The results are shown in Table 4-2.

Table 4-2: Predicted Specific Sound Levels at the Receptors

Location	Period	Location	Predicted Specific Sound Level, dB $L_{Aeq,T}$
Mill Lane	07:00 – 23:00 (Day)	Amenity	32.3
	23:00 – 07:00 (Night)	1st Floor	36.9

4.5 Subjective Impressions at the Receptors

4.5.1 As the development proposals are in the planning stage there are currently no specific noise sources on site, the ambient sound level and residual sound level are considered equal and are taken as the measured $L_{Aeq,T}$. There have been no corrections applied to the measured sound levels. The specific sound level will be predicted using the proprietary noise modelling software CadnaA.

4.6 Sound Rating Levels

Existing Context

4.6.1 The site is located close to significant transport infrastructure, both road and rail, and established industrial development (Low Farm Energy Plant and Moor Lane Trading Estate).

Derived Sound Rating Levels

4.6.2 It is considered that any tonal feature generated by the proposed development would be masked by nearby road and rail infrastructure therefore no acoustic feature corrections for tonality have been included within the predictions.

4.6.3 Under normal operating conditions the facility could generate some impulsive and/or intermittent noise. However, it is considered that this would not be noticeable above those characteristics already generated by other sources in the area and therefore no corrections for these characteristics have been applied.

4.7 Assessment of the Impacts

4.7.1 BS4142 states:

"*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.*"

4.7.2 A comparative assessment has been undertaken to determine the potential impact of the predicted sound rating levels at the nearest receptors upon the measured background noise levels. Table 4-3 summarises the results of the assessment. Measured background levels have been rounded to the nearest whole decibel.

Table 4-3: BS4142 Assessment

Location	Period	Location	Rating Level dB $L_{Aeq,T}$	Background Noise Level dB L_{A90}	Difference dB
Mill Lane	Weekday Day	Amenity	32	48	-16
	Weekday Night	1st Floor	37	37	-
	Weekend Day	Amenity	32	44	-12
	Weekend Night	1st Floor	37	35	+2

4.7.3 Table 4-3 shows that the predicted rating levels during the day are significantly below the measured background noise levels, during the week and the weekend, indicating that the specific sound would have a low impact.

4.7.4 Table 4-3 also shows that the predicted rating level during the night would be slightly above the measured background noise level at the weekend. This indicates that the specific sound would have a less than adverse impact, depending on the context. The context is outlined below.

4.8 Context

4.8.1 BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

The Absolute Level of Sound

4.8.2 The specific sound levels generated by the development proposals are predicted to be below the existing prevailing average ambient $L_{Aeq,T}$ noise levels at the receptors assessed during both the day and night.

Sensitivity of the Receptor

4.8.3 The nearest residential receptor is located adjacent to the A162 and the Hull Line railway. It is therefore considered that the receptor is not particularly sensitive to noise.

4.8.4 At night, it is unlikely that occupants of the nearby receptor would be outdoors, and internal noise levels would be more important than the exceedance over background noise levels. Based on the reduction of 15dB for a window being left partially open for ventilation, internal noise levels in bedrooms facing the site would be around 22dB and well within the guideline values for sleeping in bedrooms.

Summary of Context

4.8.5 The identified receptor is located close/adjacent to significant transport infrastructure and is therefore considered to be habituated and not particularly sensitive to noise of an industrial nature.

4.8.6 Internal noise levels in bedrooms facing the site would meet the guideline values for sleeping in bedrooms at night.

5 Conclusion

5.1.1 Enzygo Limited has been commissioned by Halstow Energy Ltd to undertake a revised noise impact assessment to support a Section 73 application for the development of an agricultural Anaerobic Digestion (AD) facility on land to the east of the A162, Low Farm, Bond Ings, Sherburn in Elmet, LS25 6FW, known as Home Farm.

5.1.2 The noise assessment has been undertaken to assess the potential impact of the proposed changes, in accordance with the relevant standards and guidance, at the nearest noise-sensitive properties to the site and to provide outline mitigation advice if considered necessary.

5.2 Noise Assessment

5.2.1 Sound levels generated by the proposed development have been predicted using CadnaA and assessments have been made in accordance with the guidance contained in BS4142:2014+A1:2019.

5.2.2 The BS4142 assessment shows that the daytime predicted sound rating levels are significantly below the midweek and weekend measured background noise levels. This indicates that the rating sound level would have a **low impact** depending on the context and fall into the NOEL effect level when assessed in accordance with the Planning Policy Guidance for noise.

5.2.3 The BS4142 assessment also shows that the night-time predicted sound rating levels are slightly above the measured background noise levels at the weekend. This would indicate that the rating sound level would have a **less than adverse impact** depending on the context and fall into the NOAEL effect level when assessed in accordance with the Planning Policy Guidance for noise. However, when assessed in accordance with the guidance contained in BS8233, as suggested by BS4142, internal noise levels at night would remain below the guideline value for sleeping in bedrooms with the windows left partially open for ventilation.

5.2.4 Given the above, it has been demonstrated that, there are no reasons on noise grounds why planning consent for the proposed development cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this when undertaking the measurement of noise, the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regards to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. Attempting produce a figure that relates this variable nature of noise to human subjective response, various statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10th statistical percentile of a measurement period, i.e., the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90th statistical percentile of a measurement period, i.e., the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all noise sources incident at one location, both in the near- and far-field (*The ambient sound comprises the residual sound and the specific sound when present)*.
Ambient Sound Level $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound 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.
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $$L_{Aeq,T} = 10lg_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[p_A\frac{(t)^2}{{p_0}^2}\right]dt\right\}$$

Term	Definition
	Where p_0 is the reference sound pressure (20µPA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (*This may consist of the sum of several non-contiguous, short-term measurement time intervals)*
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over time, T.
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	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.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T.
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T.
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB;
- Meteorology – allowance of ±1.9dB; and
- CadnaA noise propagation modelling software – operational accuracy of ±2.1dB

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

Statement of Competency

The assessment has been undertaken by, or under the supervision of, Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to the assessment of noise and the application of mitigation for minerals and mining sites, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

Table A1: Location ML01, Midweek Daytime

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
19/07/2024 11:15	62.8	84.0	51.1	66.4
19/07/2024 11:30	62.5	76.1	52.0	66.4
19/07/2024 11:45	63.6	76.7	52.5	67.1
19/07/2024 12:00	61.8	75.0	50.2	65.8
19/07/2024 12:15	62.3	77.8	50.7	65.6
19/07/2024 12:30	62.5	78.4	52.7	66.0
19/07/2024 12:45	64.1	80.0	53.2	66.9
19/07/2024 13:00	60.6	71.7	50.9	64.2
19/07/2024 13:15	62.4	81.1	51.4	65.4
19/07/2024 13:30	61.3	78.5	50.3	64.9
19/07/2024 13:45	63.4	80.3	50.0	66.0
19/07/2024 14:00	66.6	81.2	54.4	69.7
19/07/2024 14:15	64.4	79.2	51.5	66.7
19/07/2024 14:30	62.0	78.0	52.8	65.4
19/07/2024 14:45	61.8	72.7	53.6	65.3
19/07/2024 15:00	62.9	75.0	55.3	66.3
19/07/2024 15:15	63.6	78.6	54.8	66.5
19/07/2024 15:30	62.9	76.4	54.4	65.9
19/07/2024 15:45	61.4	74.1	52.4	64.6
19/07/2024 16:00	62.1	74.6	53.7	65.7
19/07/2024 16:15	63.7	79.1	54.7	66.8
19/07/2024 16:30	62.5	83.1	52.9	65.5
19/07/2024 16:45	61.5	70.9	52.4	65.1
19/07/2024 17:00	61.7	72.0	52.6	64.8
19/07/2024 17:15	62.1	70.3	53.2	65.5
19/07/2024 17:30	61.8	73.7	51.0	65.4
19/07/2024 17:45	62.9	78.6	51.2	66.1
19/07/2024 18:00	61.6	71.9	48.0	65.4
19/07/2024 18:15	62.2	76.7	47.3	65.9
19/07/2024 18:30	60.8	75.8	47.5	64.9
19/07/2024 18:45	62.6	81.3	48.0	65.1
19/07/2024 19:00	60.9	71.7	49.0	65.0
19/07/2024 19:15	59.2	77.3	43.6	63.8
19/07/2024 19:30	59.8	72.2	43.5	64.2
19/07/2024 19:45	58.6	70.2	44.3	63.3
19/07/2024 20:00	58.3	72.7	42.9	63.0
19/07/2024 20:15	59.5	74.6	41.9	63.8
19/07/2024 20:30	60.5	79.4	44.7	64.7
19/07/2024 20:45	58.4	72.2	42.5	63.1
19/07/2024 21:00	58.7	72.5	41.9	63.3
19/07/2024 21:15	58.9	71.0	45.1	63.4
19/07/2024 21:30	59.0	72.1	44.0	63.7

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
19/07/2024 21:45	58.7	71.0	43.9	63.2
19/07/2024 22:00	59.2	77.8	46.9	63.0
19/07/2024 22:15	58.9	70.6	45.5	63.1
19/07/2024 22:30	58.1	71.4	39.3	63.0
19/07/2024 22:45	57.1	72.0	38.0	61.6
22/07/2024 07:00	62.2	74.1	51.8	65.8
22/07/2024 07:15	62.2	70.2	52.0	65.7
22/07/2024 07:30	62.3	73.4	53.4	65.9
22/07/2024 07:45	62.5	71.7	53.1	65.7
22/07/2024 08:00	62.0	71.6	52.2	65.5
22/07/2024 08:15	62.3	70.8	53.0	65.8
22/07/2024 08:30	62.0	71.4	49.7	66.0
22/07/2024 08:45	62.6	81.4	49.4	65.8
22/07/2024 09:00	61.8	76.4	50.3	65.7
22/07/2024 09:15	61.2	70.5	50.5	65.1
22/07/2024 09:30	62.2	71.7	53.5	66.0
22/07/2024 09:45	61.6	72.9	51.7	65.8
22/07/2024 10:00	61.5	71.8	51.6	65.5
22/07/2024 10:15	61.1	72.8	50.5	65.3
22/07/2024 10:30	61.2	70.7	50.2	65.1
22/07/2024 10:45	60.4	71.9	48.7	64.7
22/07/2024 11:00	60.8	70.7	47.8	65.0
22/07/2024 11:15	60.7	79.0	46.9	64.5
22/07/2024 11:30	60.8	76.8	47.6	64.8
22/07/2024 11:45	61.7	76.3	48.5	65.7
22/07/2024 12:00	61.5	76.8	48.7	65.4
22/07/2024 12:15	61.6	76.1	48.5	65.5
22/07/2024 12:30	63.1	77.3	47.9	67.0
22/07/2024 12:45	63.7	80.3	50.7	66.9
22/07/2024 13:00	62.0	76.7	50.1	65.9
22/07/2024 13:15	61.1	72.8	47.6	65.4
22/07/2024 13:30	61.4	70.6	50.2	65.6
22/07/2024 13:45	62.0	78.8	50.2	65.3
22/07/2024 14:00	61.5	72.1	51.5	64.9
22/07/2024 14:15	60.7	71.0	48.1	65.1
22/07/2024 14:30	61.4	74.4	50.9	65.4
22/07/2024 14:45	61.4	72.7	50.0	65.2
22/07/2024 15:00	61.8	70.9	52.0	65.7
22/07/2024 15:15	62.0	75.5	51.3	65.7
22/07/2024 15:30	62.4	77.0	52.2	66.1
22/07/2024 15:45	61.8	70.8	50.6	65.7
22/07/2024 16:00	62.7	74.0	54.0	66.0
22/07/2024 16:15	62.4	76.5	49.8	66.1
22/07/2024 16:30	62.7	73.7	53.5	66.2
22/07/2024 16:45	61.5	73.9	49.7	65.0
22/07/2024 17:00	62.4	70.8	54.2	65.5

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
22/07/2024 17:15	61.9	70.9	50.3	65.5
22/07/2024 17:30	61.5	75.0	49.4	65.2
22/07/2024 17:45	61.1	70.5	48.2	65.1
22/07/2024 18:00	61.1	70.8	48.3	65.1
22/07/2024 18:15	60.3	71.2	47.1	64.5
22/07/2024 18:30	59.7	70.4	46.2	63.9
22/07/2024 18:45	61.1	74.7	45.4	65.4
22/07/2024 19:00	60.6	70.9	44.5	65.0
22/07/2024 19:15	60.8	75.8	44.7	65.3
22/07/2024 19:30	58.5	70.1	41.0	63.6
22/07/2024 19:45	59.6	71.2	42.6	64.5
22/07/2024 20:00	58.1	70.4	38.5	63.1
22/07/2024 20:15	58.1	69.3	42.6	63.2
22/07/2024 20:30	58.3	71.0	40.5	63.3
22/07/2024 20:45	58.6	71.6	41.3	63.5
22/07/2024 21:00	58.0	70.0	40.3	63.0
22/07/2024 21:15	57.5	69.4	39.4	62.5
22/07/2024 21:30	57.4	71.0	35.2	62.5
22/07/2024 21:45	55.7	70.1	32.8	60.8
22/07/2024 22:00	58.7	70.1	41.6	63.5
22/07/2024 22:15	57.2	70.8	34.6	62.1
22/07/2024 22:30	57.9	70.9	38.6	62.8
22/07/2024 22:45	56.3	70.8	33.3	61.2
23/07/2024 07:00	61.4	70.4	47.2	65.7
23/07/2024 07:15	61.8	70.9	47.9	65.8
23/07/2024 07:30	62.5	70.7	51.7	65.9
23/07/2024 07:45	62.3	70.9	47.6	66.1
23/07/2024 08:00	60.6	70.0	46.2	64.8
23/07/2024 08:15	61.9	70.9	50.2	65.6
23/07/2024 08:30	60.7	70.5	46.8	64.8
23/07/2024 08:45	61.6	71.1	48.5	65.5
23/07/2024 09:00	60.8	70.9	46.7	64.9
23/07/2024 09:15	61.8	71.1	49.1	65.9
23/07/2024 09:30	60.8	70.3	47.8	64.9
23/07/2024 09:45	60.5	70.5	45.9	64.9
23/07/2024 10:00	60.9	71.5	46.8	65.1
23/07/2024 10:15	60.9	71.1	46.9	65.2
23/07/2024 10:30	59.9	69.6	44.9	64.4
23/07/2024 10:45	60.8	71.8	47.8	64.8
23/07/2024 11:00	61.3	71.8	47.6	65.4
23/07/2024 11:15	60.8	71.2	46.3	65.1
23/07/2024 11:30	60.8	73.5	46.8	65.3
23/07/2024 11:45	60.8	76.1	46.1	64.8
23/07/2024 12:00	60.3	70.5	45.8	64.4
23/07/2024 12:15	60.2	71.5	46.9	64.2
23/07/2024 12:30	61.3	79.3	45.6	64.9

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
23/07/2024 12:45	65.4	76.6	50.6	69.4
23/07/2024 13:00	61.2	70.9	50.7	65.2
23/07/2024 13:15	61.4	70.9	49.3	65.4
23/07/2024 13:30	61.3	71.8	50.6	65.1
23/07/2024 13:45	61.0	72.2	48.0	65.3
23/07/2024 14:00	61.1	71.4	47.6	64.9
23/07/2024 14:15	60.9	69.7	50.0	64.8
23/07/2024 14:30	61.0	73.9	49.7	64.8
23/07/2024 14:45	61.2	72.3	49.5	65.1
23/07/2024 15:00	60.8	70.4	48.8	64.7
23/07/2024 15:15	60.8	71.3	48.9	64.5
23/07/2024 15:30	60.9	70.7	50.1	64.9
23/07/2024 15:45	61.2	70.2	51.1	64.9
23/07/2024 16:00	62.6	71.4	55.1	65.7
23/07/2024 16:15	61.1	71.2	46.3	64.7
23/07/2024 16:30	61.5	73.6	51.6	65.1
23/07/2024 16:45	61.5	73.0	48.6	65.1
23/07/2024 17:00	62.2	74.8	52.7	65.3
23/07/2024 17:15	61.6	70.9	47.4	65.0
23/07/2024 17:30	61.2	70.7	47.6	64.9
23/07/2024 17:45	61.3	71.4	45.1	65.3
23/07/2024 18:00	61.4	74.4	48.5	65.0
23/07/2024 18:15	60.5	72.4	44.9	64.5
23/07/2024 18:30	60.0	72.4	43.0	64.4
23/07/2024 18:45	59.6	71.6	42.7	63.9
23/07/2024 19:00	61.1	81.5	43.8	64.7
23/07/2024 19:15	59.1	73.0	39.6	63.5
23/07/2024 19:30	58.5	74.0	39.9	63.5
23/07/2024 19:45	59.1	72.0	39.7	64.1
23/07/2024 20:00	59.3	71.2	38.4	64.4
23/07/2024 20:15	58.9	70.0	40.2	63.9
23/07/2024 20:30	59.2	81.0	41.0	63.3
23/07/2024 20:45	59.1	71.0	41.4	64.0
23/07/2024 21:00	62.8	88.0	40.0	64.0
23/07/2024 21:15	57.8	70.2	39.5	62.9
23/07/2024 21:30	58.5	70.0	40.9	63.5
23/07/2024 21:45	57.1	69.9	37.4	62.2
23/07/2024 22:00	59.0	69.6	42.4	63.6
23/07/2024 22:15	57.8	75.5	35.4	62.0
23/07/2024 22:30	56.9	69.5	38.5	62.1
23/07/2024 22:45	56.2	72.0	35.4	61.2
24/07/2024 07:00	61.2	70.1	48.0	65.4
24/07/2024 07:15	62.2	76.4	50.6	65.9
24/07/2024 07:30	62.7	70.3	52.5	66.2
24/07/2024 07:45	62.3	71.5	50.0	65.8
24/07/2024 08:00	61.8	70.8	47.6	65.7

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
24/07/2024 08:15	61.9	70.8	49.8	65.9
24/07/2024 08:30	62.1	70.4	49.3	65.8
24/07/2024 08:45	62.7	87.4	48.9	66.1
24/07/2024 09:00	61.0	70.9	47.3	65.1
24/07/2024 09:15	60.9	70.4	47.2	65.0
24/07/2024 09:30	62.9	81.5	49.4	66.2
24/07/2024 09:45	62.3	74.7	50.4	66.4
24/07/2024 10:00	62.0	75.0	47.4	65.9
24/07/2024 10:15	61.5	79.8	46.8	64.9
24/07/2024 10:30	64.9	82.7	48.8	66.3
24/07/2024 10:45	64.7	81.8	48.6	66.5
24/07/2024 11:00	62.8	79.6	48.5	66.2
24/07/2024 11:15	63.1	79.8	47.7	66.1
24/07/2024 11:30	63.3	81.7	47.1	66.3
24/07/2024 11:45	60.8	70.9	45.2	65.0
24/07/2024 12:00	60.9	72.7	44.4	65.2
24/07/2024 12:15	60.8	74.8	46.3	65.1
24/07/2024 12:30	60.8	76.5	47.4	64.8
24/07/2024 12:45	60.9	69.8	49.1	65.0
24/07/2024 13:00	61.2	74.1	50.7	65.0
24/07/2024 13:15	60.7	70.4	46.7	65.0
Overall	**61.5**	**88.0**	**47.7**	**65.1**

Table A2: Location ML01, Midweek Night-time

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
19/07/2024 23:00	57.3	75.2	38.3	61.8
19/07/2024 23:15	57.1	71.8	35.2	62.1
19/07/2024 23:30	57.8	72.1	33.7	63.0
19/07/2024 23:45	55.6	70.2	32.2	60.2
21/07/2024 00:00	52.1	69.5	33.5	54.3
22/07/2024 00:15	53.8	69.4	33.3	54.5
22/07/2024 00:30	51.7	68.2	33.5	51.7
22/07/2024 00:45	52.5	71.1	33.1	53.5
22/07/2024 01:00	51.9	69.8	32.6	53.4
22/07/2024 01:15	53.2	72.7	32.4	54.6
22/07/2024 01:30	52.9	70.9	34.4	54.5
22/07/2024 01:45	52.6	71.3	32.3	53.6
22/07/2024 02:00	52.2	68.8	33.2	54.3
22/07/2024 02:15	53.3	69.6	33.1	55.9
22/07/2024 02:30	52.7	69.5	32.6	55.8
22/07/2024 02:45	54.4	70.2	33.9	56.5
22/07/2024 03:00	52.5	69.0	33.3	54.5
22/07/2024 03:15	54.9	70.2	34.7	58.4
22/07/2024 03:30	53.3	69.6	35.1	56.7
22/07/2024 03:45	56.2	70.3	36.5	60.4

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
22/07/2024 04:00	55.1	70.3	33.9	59.1
22/07/2024 04:15	57.3	69.8	39.0	62.4
22/07/2024 04:30	57.3	70.8	38.5	62.5
22/07/2024 04:45	56.7	70.3	39.4	61.9
22/07/2024 05:00	58.7	69.8	43.0	63.6
22/07/2024 05:15	60.6	71.5	48.3	64.8
22/07/2024 05:30	61.3	72.6	48.8	65.5
22/07/2024 05:45	61.1	70.5	48.5	65.2
22/07/2024 06:00	61.3	72.5	48.1	65.7
22/07/2024 06:15	59.9	71.9	45.3	64.5
22/07/2024 06:30	62.0	71.2	47.3	66.0
22/07/2024 06:45	61.3	71.3	47.5	65.5
22/07/2024 23:00	56.4	71.1	33.5	61.5
22/07/2024 23:15	55.8	70.1	32.4	60.2
22/07/2024 23:30	56.9	77.1	34.0	60.8
22/07/2024 23:45	55.2	70.4	35.1	59.2
22/07/2024 00:00	53.9	70.9	32.0	57.9
23/07/2024 00:15	55.6	71.4	33.6	59.7
23/07/2024 00:30	56.0	70.6	34.6	60.0
23/07/2024 00:45	53.8	69.4	31.4	56.6
23/07/2024 01:00	54.1	70.0	32.9	57.3
23/07/2024 01:15	56.3	71.1	32.1	60.7
23/07/2024 01:30	55.4	69.0	33.0	60.1
23/07/2024 01:45	54.4	71.1	34.1	58.0
23/07/2024 02:00	55.3	71.1	32.2	59.5
23/07/2024 02:15	55.7	72.4	33.0	59.6
23/07/2024 02:30	53.6	70.0	31.7	56.8
23/07/2024 02:45	55.0	72.1	32.4	59.0
23/07/2024 03:00	56.1	69.9	35.3	61.0
23/07/2024 03:15	55.7	70.6	34.9	60.6
23/07/2024 03:30	55.5	69.4	34.8	60.4
23/07/2024 03:45	55.8	71.3	34.2	60.3
23/07/2024 04:00	56.6	71.9	35.3	62.0
23/07/2024 04:15	57.2	70.8	35.8	62.2
23/07/2024 04:30	56.8	70.0	37.8	62.1
23/07/2024 04:45	58.3	73.2	38.6	62.8
23/07/2024 05:00	59.0	71.6	44.3	63.9
23/07/2024 05:15	60.5	72.0	45.3	65.0
23/07/2024 05:30	60.6	73.1	44.6	64.8
23/07/2024 05:45	60.7	70.2	42.9	65.4
23/07/2024 06:00	62.0	74.5	45.7	66.1
23/07/2024 06:15	60.4	70.6	42.0	65.1
23/07/2024 06:30	61.8	71.2	47.0	65.6
23/07/2024 06:45	62.3	71.4	47.1	66.2
23/07/2024 23:00	56.6	70.8	37.9	61.3
23/07/2024 23:15	56.3	72.6	36.3	61.2

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
23/07/2024 23:30	56.7	75.4	35.3	60.4
23/07/2024 23:45	56.2	70.4	36.1	61.1
23/07/2024 00:00	56.3	70.5	35.9	61.0
24/07/2024 00:15	56.3	69.6	37.8	61.2
24/07/2024 00:30	54.4	69.1	36.3	58.4
24/07/2024 00:45	55.1	70.0	34.2	58.8
24/07/2024 01:00	55.7	72.1	35.8	59.6
24/07/2024 01:15	54.5	70.2	35.8	58.4
24/07/2024 01:30	53.8	70.5	34.8	56.2
24/07/2024 01:45	54.2	69.6	34.1	57.7
24/07/2024 02:00	54.6	69.5	34.9	58.7
24/07/2024 02:15	53.2	70.5	35.5	55.6
24/07/2024 02:30	55.2	69.3	37.5	59.8
24/07/2024 02:45	53.4	69.4	36.4	55.1
24/07/2024 03:00	55.9	69.9	39.2	60.2
24/07/2024 03:15	55.7	70.7	39.0	60.4
24/07/2024 03:30	57.2	70.4	38.6	61.9
24/07/2024 03:45	54.4	70.2	36.7	58.3
24/07/2024 04:00	57.1	71.4	38.4	62.2
24/07/2024 04:15	57.1	71.8	38.0	62.3
24/07/2024 04:30	57.4	70.5	41.2	62.7
24/07/2024 04:45	57.5	72.4	40.9	62.8
24/07/2024 05:00	58.9	70.9	43.1	63.8
24/07/2024 05:15	60.7	72.0	44.9	65.2
24/07/2024 05:30	61.9	72.4	49.1	66.0
24/07/2024 05:45	61.0	71.2	46.7	65.2
24/07/2024 06:00	61.7	78.6	46.4	65.9
24/07/2024 06:15	60.9	69.8	47.5	65.3
24/07/2024 06:30	61.7	72.5	47.3	65.7
24/07/2024 06:45	61.7	71.7	49.3	65.7
Overall (Daytime)	**57.5**	**78.6**	**37.3**	**60.9**

Table A3: Location ML01, Weekend Daytime

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
20/07/2024 07:00	58.2	70.4	39.3	63.0
20/07/2024 07:15	58.4	70.5	38.0	63.5
20/07/2024 07:30	58.1	70.2	39.3	63.2
20/07/2024 07:45	58.2	71.2	36.8	63.2
20/07/2024 08:00	58.7	71.0	39.9	63.6
20/07/2024 08:15	58.7	73.3	40.7	63.5
20/07/2024 08:30	59.6	76.5	41.9	63.8
20/07/2024 08:45	59.6	69.6	43.7	64.2
20/07/2024 09:00	59.5	71.0	43.1	63.7
20/07/2024 09:15	60.6	74.5	45.6	64.8
20/07/2024 09:30	64.7	84.9	43.9	65.3
20/07/2024 09:45	61.0	77.3	44.6	64.6

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
20/07/2024 10:00	62.6	84.0	46.9	64.8
20/07/2024 10:15	66.6	88.4	46.2	67.0
20/07/2024 10:30	63.9	85.4	46.7	65.1
20/07/2024 10:45	66.6	84.0	51.7	68.0
20/07/2024 11:00	65.6	83.7	48.2	66.6
20/07/2024 11:15	62.4	76.0	50.8	66.1
20/07/2024 11:30	60.1	73.6	47.6	64.2
20/07/2024 11:45	61.0	78.4	50.7	64.5
20/07/2024 12:00	60.8	71.4	49.6	64.9
20/07/2024 12:15	65.2	80.7	52.3	68.1
20/07/2024 12:30	63.6	80.7	49.6	66.1
20/07/2024 12:45	63.2	81.0	51.7	65.7
20/07/2024 13:00	62.4	81.5	51.8	65.4
20/07/2024 13:15	61.3	78.1	48.1	64.5
20/07/2024 13:30	60.6	69.8	52.1	64.4
20/07/2024 13:45	64.1	87.4	49.9	65.6
20/07/2024 14:00	64.2	83.1	51.0	65.6
20/07/2024 14:15	60.2	77.1	47.9	64.1
20/07/2024 14:30	60.4	80.3	44.6	63.5
20/07/2024 14:45	62.9	82.0	50.3	65.5
20/07/2024 15:00	60.9	82.8	45.6	64.0
20/07/2024 15:15	59.1	71.1	44.7	63.7
20/07/2024 15:30	61.3	78.6	49.0	64.9
20/07/2024 15:45	62.1	80.3	45.0	64.9
20/07/2024 16:00	63.5	80.9	48.7	66.4
20/07/2024 16:15	60.7	75.5	48.2	64.3
20/07/2024 16:30	62.3	81.9	48.2	65.1
20/07/2024 16:45	60.3	74.2	47.5	64.6
20/07/2024 17:00	60.1	75.2	46.4	64.3
20/07/2024 17:15	61.4	78.4	47.9	64.7
20/07/2024 17:30	61.5	75.2	47.9	65.1
20/07/2024 17:45	60.8	74.3	47.3	64.6
20/07/2024 18:00	62.3	85.6	47.9	65.1
20/07/2024 18:15	60.6	82.6	45.2	63.4
20/07/2024 18:30	59.7	76.3	43.6	63.8
20/07/2024 18:45	58.7	74.6	45.4	63.4
20/07/2024 19:00	59.8	77.2	46.8	63.8
20/07/2024 19:15	58.2	69.1	40.0	63.2
20/07/2024 19:30	58.0	69.7	44.6	62.3
20/07/2024 19:45	57.7	71.3	40.5	62.4
20/07/2024 20:00	57.1	70.4	38.1	62.3
20/07/2024 20:15	57.8	70.5	41.7	62.8
20/07/2024 20:30	58.1	80.5	40.0	62.4
20/07/2024 20:45	56.8	72.3	41.8	61.7
20/07/2024 21:00	56.2	71.3	38.9	60.9
20/07/2024 21:15	56.8	71.9	40.1	61.5

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
20/07/2024 21:30	56.4	69.2	39.5	61.7
20/07/2024 21:45	54.9	70.0	38.0	59.7
20/07/2024 22:00	57.1	70.9	38.8	62.1
20/07/2024 22:15	55.0	70.9	36.4	59.9
20/07/2024 22:30	55.4	69.9	34.8	60.0
20/07/2024 22:45	53.6	72.0	34.4	58.0
21/07/2024 07:00	57.6	71.9	43.9	62.6
21/07/2024 07:15	57.9	74.0	42.1	62.6
21/07/2024 07:30	56.1	69.0	39.6	61.0
21/07/2024 07:45	56.3	69.9	38.2	61.2
21/07/2024 08:00	58.5	77.4	41.8	62.9
21/07/2024 08:15	57.5	71.3	42.2	62.7
21/07/2024 08:30	57.7	69.6	42.0	62.8
21/07/2024 08:45	58.5	70.5	43.7	63.4
21/07/2024 09:00	59.9	72.6	44.2	64.6
21/07/2024 09:15	60.2	74.2	45.6	64.6
21/07/2024 09:30	60.7	78.6	45.6	64.3
21/07/2024 09:45	60.5	72.9	44.6	64.6
21/07/2024 10:00	60.4	73.0	44.8	64.8
21/07/2024 10:15	61.2	72.3	46.3	65.1
21/07/2024 10:30	60.9	84.5	43.8	64.7
21/07/2024 10:45	66.0	82.7	53.4	68.8
21/07/2024 11:00	61.6	72.4	50.0	65.3
21/07/2024 11:15	62.1	81.4	49.5	65.9
21/07/2024 11:30	61.9	76.0	48.9	65.5
21/07/2024 11:45	62.7	77.7	49.3	66.3
21/07/2024 12:00	62.3	81.2	47.0	65.5
21/07/2024 12:15	60.2	70.1	47.3	64.0
21/07/2024 12:30	60.0	69.4	46.3	63.8
21/07/2024 12:45	60.4	72.6	46.4	64.0
21/07/2024 13:00	60.3	77.2	47.5	63.6
21/07/2024 13:15	61.3	80.9	47.5	64.7
21/07/2024 13:30	61.1	73.2	47.2	64.8
21/07/2024 13:45	60.4	73.3	46.1	64.7
21/07/2024 14:00	60.9	72.7	47.3	64.8
21/07/2024 14:15	59.9	69.6	46.1	64.0
21/07/2024 14:30	60.4	71.2	45.9	64.6
21/07/2024 14:45	60.2	74.3	45.9	64.3
21/07/2024 15:00	59.7	71.0	45.3	64.0
21/07/2024 15:15	59.9	71.8	46.7	64.2
21/07/2024 15:30	59.9	71.9	47.1	64.3
21/07/2024 15:45	59.8	71.8	48.0	64.0
21/07/2024 16:00	60.0	81.2	45.3	63.9
21/07/2024 16:15	60.8	75.4	47.3	64.9
21/07/2024 16:30	59.0	74.1	44.2	63.4
21/07/2024 16:45	60.6	76.6	49.1	64.3

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
21/07/2024 17:00	60.4	75.4	47.7	64.1
21/07/2024 17:15	59.6	73.1	44.5	64.2
21/07/2024 17:30	61.4	79.3	44.0	64.4
21/07/2024 17:45	61.1	77.7	47.1	64.9
21/07/2024 18:00	60.5	72.9	48.9	64.5
21/07/2024 18:15	58.6	68.8	41.8	63.3
21/07/2024 18:30	58.3	71.5	42.2	63.0
21/07/2024 18:45	57.9	71.9	39.6	62.8
21/07/2024 19:00	58.5	70.6	42.6	63.2
21/07/2024 19:15	64.7	93.1	43.0	63.6
21/07/2024 19:30	58.0	74.0	40.2	63.0
21/07/2024 19:45	58.4	73.5	41.0	63.3
21/07/2024 20:00	57.2	69.0	36.1	62.3
21/07/2024 20:15	59.6	84.5	36.8	62.3
21/07/2024 20:30	57.1	68.7	38.9	62.1
21/07/2024 20:45	57.3	70.6	39.7	62.5
21/07/2024 21:00	57.1	78.2	38.8	61.9
21/07/2024 21:15	56.2	70.2	35.2	61.1
21/07/2024 21:30	55.3	70.5	35.1	60.0
21/07/2024 21:45	55.6	70.5	36.2	59.8
21/07/2024 22:00	61.3	87.1	38.2	63.0
21/07/2024 22:15	54.8	72.3	32.9	58.3
21/07/2024 22:30	54.9	73.3	32.5	58.8
21/07/2024 22:45	54.1	69.6	33.9	57.7
Overall	**60.6**	**93.1**	**44.2**	**63.8**

Table A4: Location ML01, Weekend Night-time

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
20/07/2024 00:00	57.2	75.8	36.1	61.9
20/07/2024 00:15	55.2	70.6	30.9	58.9
20/07/2024 00:30	53.6	69.1	30.6	57.1
20/07/2024 00:45	54.3	71.1	30.9	57.7
20/07/2024 01:00	56.1	70.2	34.6	60.7
20/07/2024 01:15	55.0	74.6	31.8	58.8
20/07/2024 01:30	55.4	70.0	33.1	59.8
20/07/2024 01:45	55.0	69.9	31.7	59.5
20/07/2024 02:00	55.6	74.7	32.4	59.2
20/07/2024 02:15	52.4	70.7	31.8	54.1
20/07/2024 02:30	54.2	70.1	32.1	57.7
20/07/2024 02:45	53.1	69.9	32.2	56.2
20/07/2024 03:00	54.9	72.3	34.9	58.6
20/07/2024 03:15	55.5	73.3	34.8	59.2
20/07/2024 03:30	55.2	69.7	34.2	59.9
20/07/2024 03:45	53.2	68.2	34.4	57.1
20/07/2024 04:00	55.7	68.9	34.8	60.8

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
20/07/2024 04:15	56.8	72.7	38.2	61.6
20/07/2024 04:30	55.7	70.7	35.9	60.9
20/07/2024 04:45	55.3	70.9	35.7	59.6
20/07/2024 05:00	57.8	78.7	39.3	61.7
20/07/2024 05:15	57.7	70.2	40.7	63.0
20/07/2024 05:30	59.1	73.0	43.1	63.8
21/07/2024 05:45	58.5	70.2	42.0	63.6
20/07/2024 06:00	60.0	79.0	43.2	64.6
20/07/2024 06:15	57.6	71.3	39.1	62.8
20/07/2024 06:30	58.4	70.5	38.6	63.6
20/07/2024 06:45	57.7	70.2	36.1	63.1
20/07/2024 23:00	55.6	72.0	36.6	59.7
20/07/2024 23:15	54.9	69.4	37.2	59.5
20/07/2024 23:30	53.2	69.5	33.2	57.3
20/07/2024 23:45	53.9	69.7	32.1	57.8
21/07/2024 00:00	54.2	70.6	32.3	57.8
21/07/2024 00:15	54.6	70.1	32.6	58.4
21/07/2024 00:30	52.7	69.9	32.1	55.8
21/07/2024 00:45	51.4	71.0	30.9	53.0
21/07/2024 01:00	52.7	71.7	32.2	55.1
21/07/2024 01:15	50.1	68.1	31.0	49.5
21/07/2024 01:30	52.2	70.0	34.2	54.1
21/07/2024 01:45	50.6	69.4	37.1	50.9
21/07/2024 02:00	52.7	74.4	34.7	50.3
21/07/2024 02:15	51.0	69.7	31.6	50.2
21/07/2024 02:30	49.2	70.0	31.4	45.2
21/07/2024 02:45	51.9	68.6	33.3	53.6
21/07/2024 03:00	50.3	69.0	36.7	49.0
21/07/2024 03:15	51.4	69.1	35.6	51.9
21/07/2024 03:30	52.8	68.7	37.3	55.8
21/07/2024 03:45	53.1	69.5	33.9	56.4
21/07/2024 04:00	53.5	69.9	32.0	56.0
21/07/2024 04:15	52.8	71.4	34.0	55.5
21/07/2024 04:30	54.1	69.9	35.4	57.2
21/07/2024 04:45	53.9	68.9	36.6	57.2
21/07/2024 05:00	55.9	70.2	38.8	61.1
21/07/2024 05:15	57.2	70.1	39.9	62.7
21/07/2024 05:30	57.5	69.8	38.2	63.1
21/07/2024 05:45	58.0	70.0	43.1	63.4
21/07/2024 06:00	58.2	70.1	39.6	63.4
21/07/2024 06:15	57.5	72.8	38.8	62.8
21/07/2024 06:30	57.8	71.5	40.4	63.1
21/07/2024 06:45	56.4	71.2	40.6	61.7
21/07/2024 23:00	54.2	70.4	34.9	57.7
21/07/2024 23:15	54.1	69.6	33.2	57.6
21/07/2024 23:30	53.5	70.7	35.9	55.7

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
21/07/2024 23:45	51.6	69.0	33.3	51.4
Overall (Daytime)	**55.4**	**79.0**	**35.4**	**58.1**

Appendix B – Noise Contour Plots

Figure B-1: Daytime L_{Aeq} Noise Contour Plot

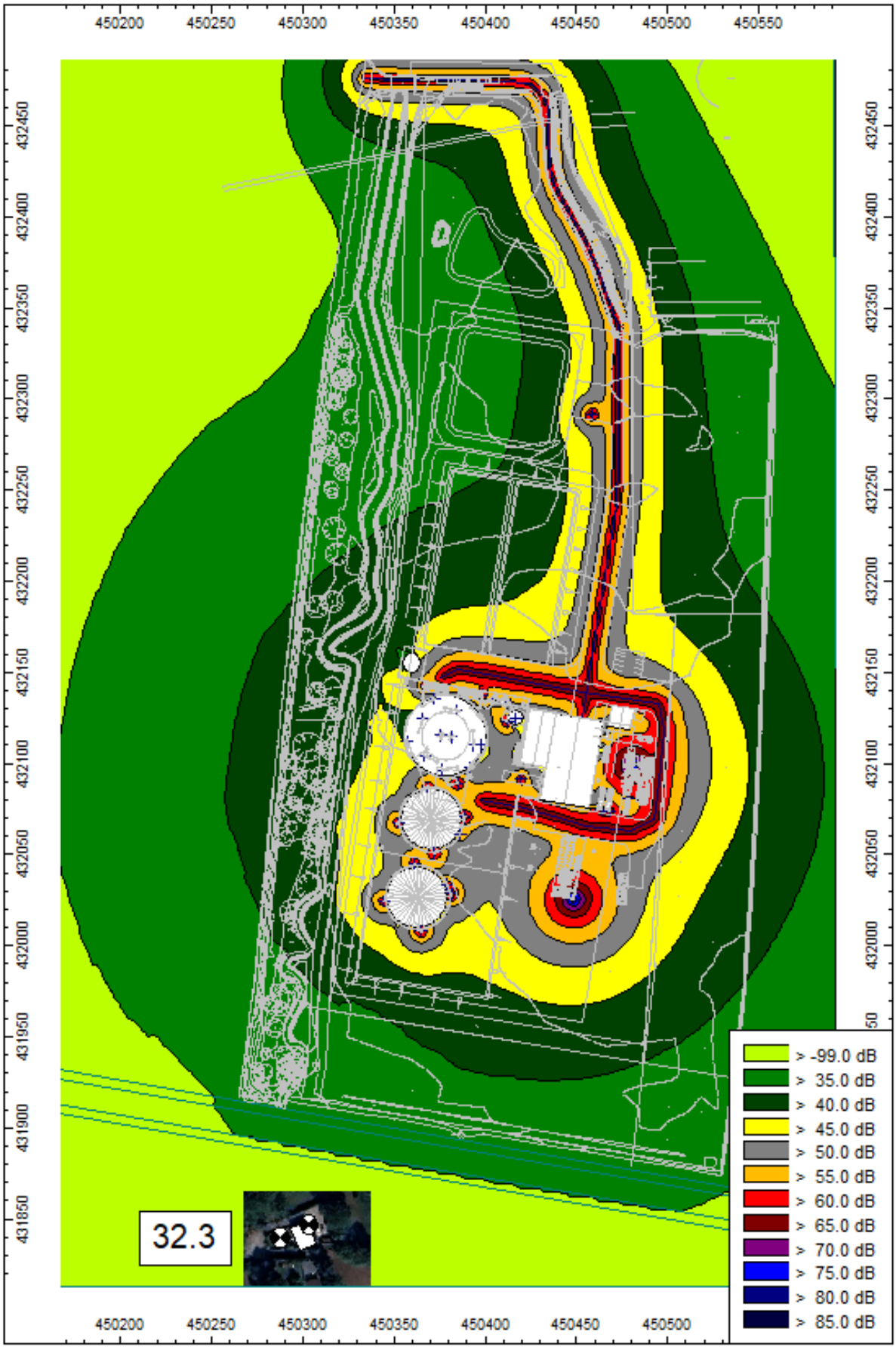
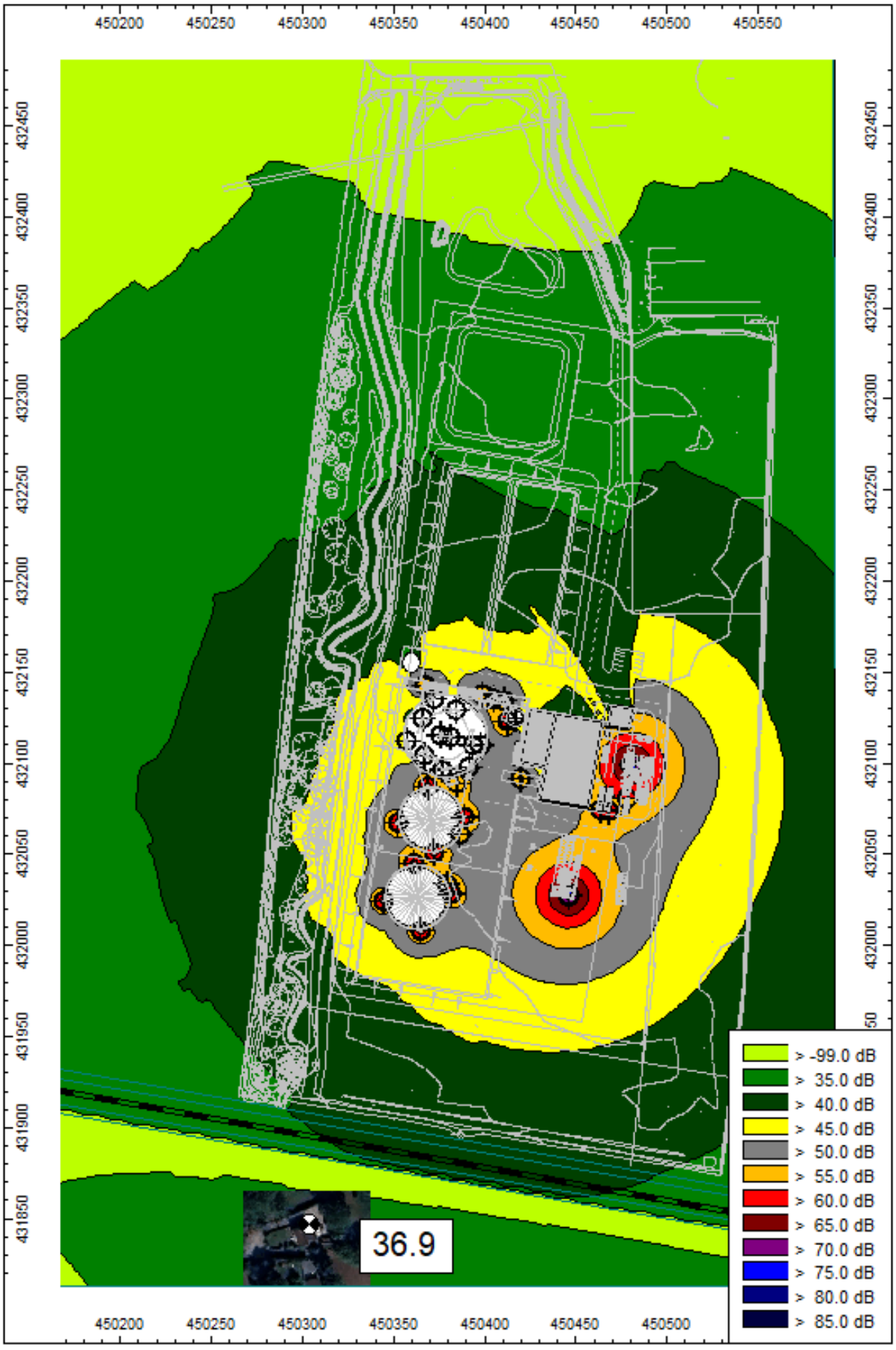


Figure B-2: Night-time L_{Aeq} Noise Contour Plot



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