



The Creamery, Aber-Arad
Dairy Partners Limited

Noise Impact Assessment

18th June 2024
Revision 1





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Revision History

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Executive Summary

This document, a Noise Impact Assessment (NIA), has been written to assess the level of noise emissions generated by the site on noise-sensitive receptors (NSRs) in the surrounding area.

The level of impact is determined by assessing against several guidelines including BS 4142:2014+A1:2019 and the "Environmental Permitting: H3 Guidance".

PJA has conducted multiple assessments and BAT Noise Audits at the site since 2020, recognising that the factory is the most significant contributor to background noise levels in the area, but is also a facility which has been operating since 1932.

These assessments have included several multi-day surveys at the site boundary close to the nearest dwellings. However, this assessment is slightly different in that an attempt is made to determine the *true* representative background sound level, measured at a surrogate location, to identify what background sound levels may be *if* the factory were not there. It has not been possible to determine this *true* level previously as the factory is in constant operation and it is not possible to completely switch off all plant.

In summary, background levels reach minimum values of around 23 dB $L_{A90,15min}$ overnight, and 24 dB $L_{A90,1hr}$ during the day.

As discussed in previous BAT Noise Audits, it is difficult to determine the exact specific noise contributions from individual sources, given the variable nature of its operation, with numerous items of fixed plant, machinery, and vehicles operating, at different times of day and night, and at variable loads/capacities. Previous reports have been based upon a) measuring noise levels at source (i.e. 1m in several directions from noise generating plant ¹), b) measuring levels over several days at boundary monitoring positions in the direction of NSRs 1 and 2, and c) using 3D noise map modelling to reflect the results of a) and b) to then predict the noise emissions at the affected receptors (including the individual contributions from each noise source, to help determine which are most significant and thus where mitigating actions would be best targeted).

The latest set of noise monitoring conducted (in June 2024) at the three receptor properties has enabled PJA to more accurately confirm the *overall* noise output from the site, i.e. the overall specific noise level during a worst-case 1-hour daytime and 15-minute night-time period at the residential properties.

In this case, rating levels when compared against background sound levels if the factory were not generating any noise, are as much as 42 dB above the minimum background sound during the daytime, and 43 dB above during the night-time, when the receptor is affected by noise sources involving idling HGVs (Milk Tankers and ETP Tankers).

Nonetheless, even when considering just noise from fixed plant during more 'typical' periods, rating levels are still up to 32 – 33 dB above minimum background levels.

1 - The complexity of the site means that it is not realistically/practically possible to conduct a full detailed set of sound power measurements in accordance with the Method Implementation Document.

Recent changes to the LNG Tanker refilling system also increase rating noise levels to up to 38 dB above minimum daytime background noise levels during the short periods when it is operating.

BS 4142:2014+A1:2019 indicates that a rating level that is 10 dB above the background sound level is an indicator of a likely significant adverse impact, depending on the context.

The results, therefore, suggest a significant adverse impact, as expected and as previously reported, when assessing in accordance with BS 4142:2014+A1:2019.

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1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed by Dairy Partners Limited to undertake a Noise Impact Assessment to assess the level of noise emissions generated by the site (The Creamery, Aber-Arad, Newcastle Emlyn, SA38 9DQ) on noise-sensitive receptors (NSRs) in the surrounding area.

The NIA has been produced in accordance/with reference to:

- The Method Implementation Document (MID) for BS 4142;
- the Environment Agency (EA) publication '*Environmental; permitting: H3 Horizontal Guidance for Noise Part 2 – Noise Assessment and Control*' document;
- BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*', which assesses the risk of adverse impact of noise pollution from a sound source (or sources) of a commercial or industrial nature (i.e., mechanical/electrical plant);

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in **Appendix A**.

2.0 Site and Development Description

The site is located at grid reference SN 31539 40206 in Aber-Arad, Newcastle Emlyn, with the main entrance to the site off the B4333 along the south boundary. The facility is on the outskirts of the town with residential receptors along the south and west boundaries, with some slightly further to the north. In the wider sense, the dairy site is adjoined by commercial premises to its northeast (builders' yard) and west (Antur Teifi Business Park). To its east is positioned a residential dwelling, with further then located to the south, separated from the creamery by the public highway (B4333).

The development is a dairy processing facility that produces cheese (and has done since 1932), operating for 24 hours a day, 365 days a year, with many items of plant running continuously throughout this. This includes heavy goods vehicles coming in and out of site around the clock, and an average batch cycle of approximately 35 hours (28 hours production, 7 hours cleaning). The site includes a range of production and service buildings, circulation and hard standing storage areas, as well as other areas used in the general management of product and waste derived from the process undertaken at the plant.

The location of the site and the nearest 'noise-sensitive receptors' (NSRs) are shown in **Figure 2.1**. These receptors, on the south, east, and western boundaries, are the most exposed to noise. Dwellings are situated to the north/north-west, but noise is generated on the south and east side of the site and thus these are considered to be well screened from noise compared to those receptors highlighted in the figure.

A site plan of the facility is shown in **Figure 2.2**.

Figure 2.3 shows the wider area and the location of the baseline monitoring position, in a 'surrogate location', as described in **Section 4.1**.

It is noted that since the first issue of this report, the LNG refilling process has undergone changes, with a change of supplier and the reverting back to a noisier process that has previously been improved to a near silent level. PJA noted that a Heras fencing based noise barrier (approx. 1.8m tall) had been partially erected locally around the re-fuelling process (i.e. within 3m of it), and long parts of the south site boundary. A very large and wide stack of wooden pallets had also been placed along parts of the south boundary albeit this is believed to be variable in nature.

Figure 2.1 – Aerial view of the site and surrounding area

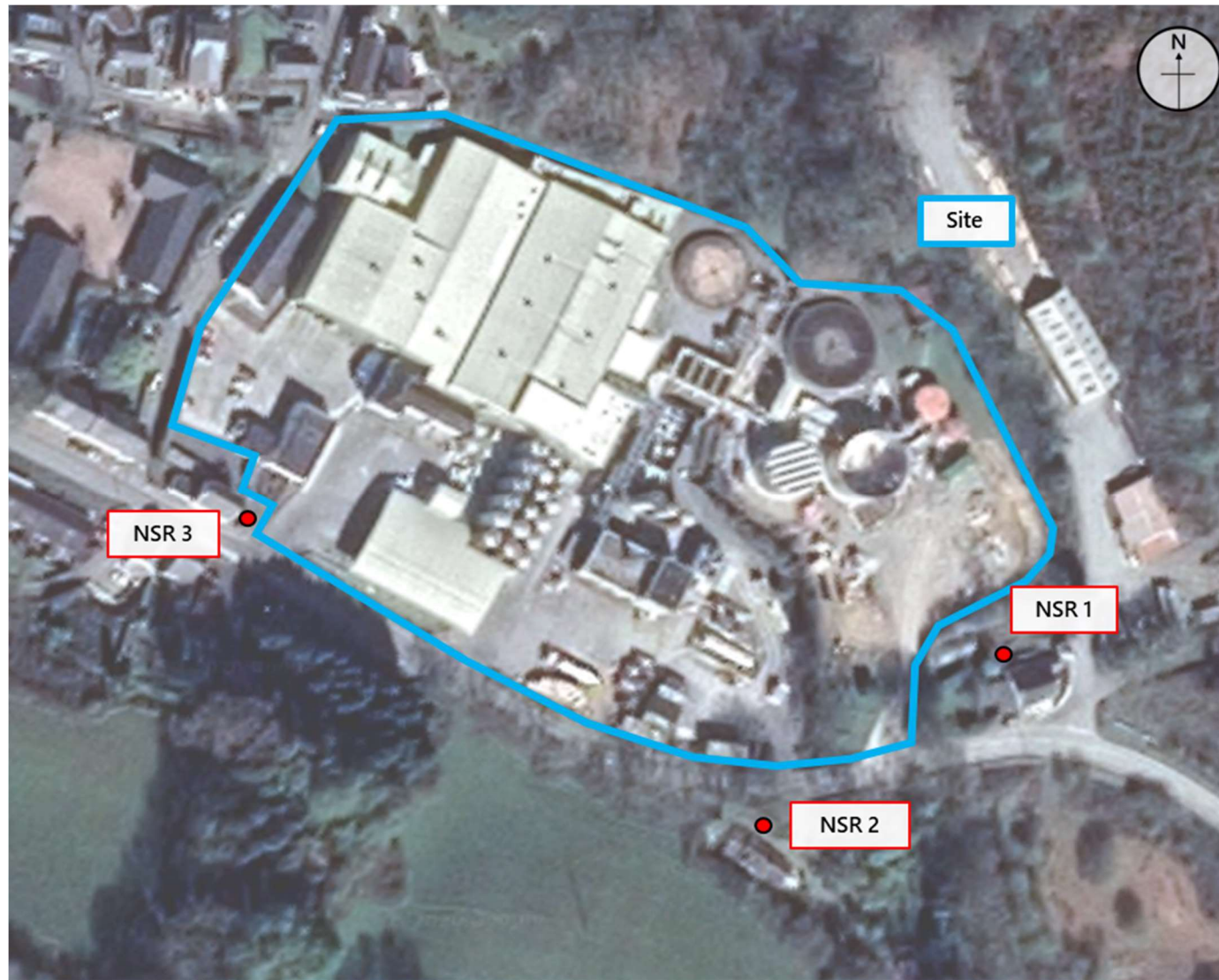


Figure 2.2 – Site plan

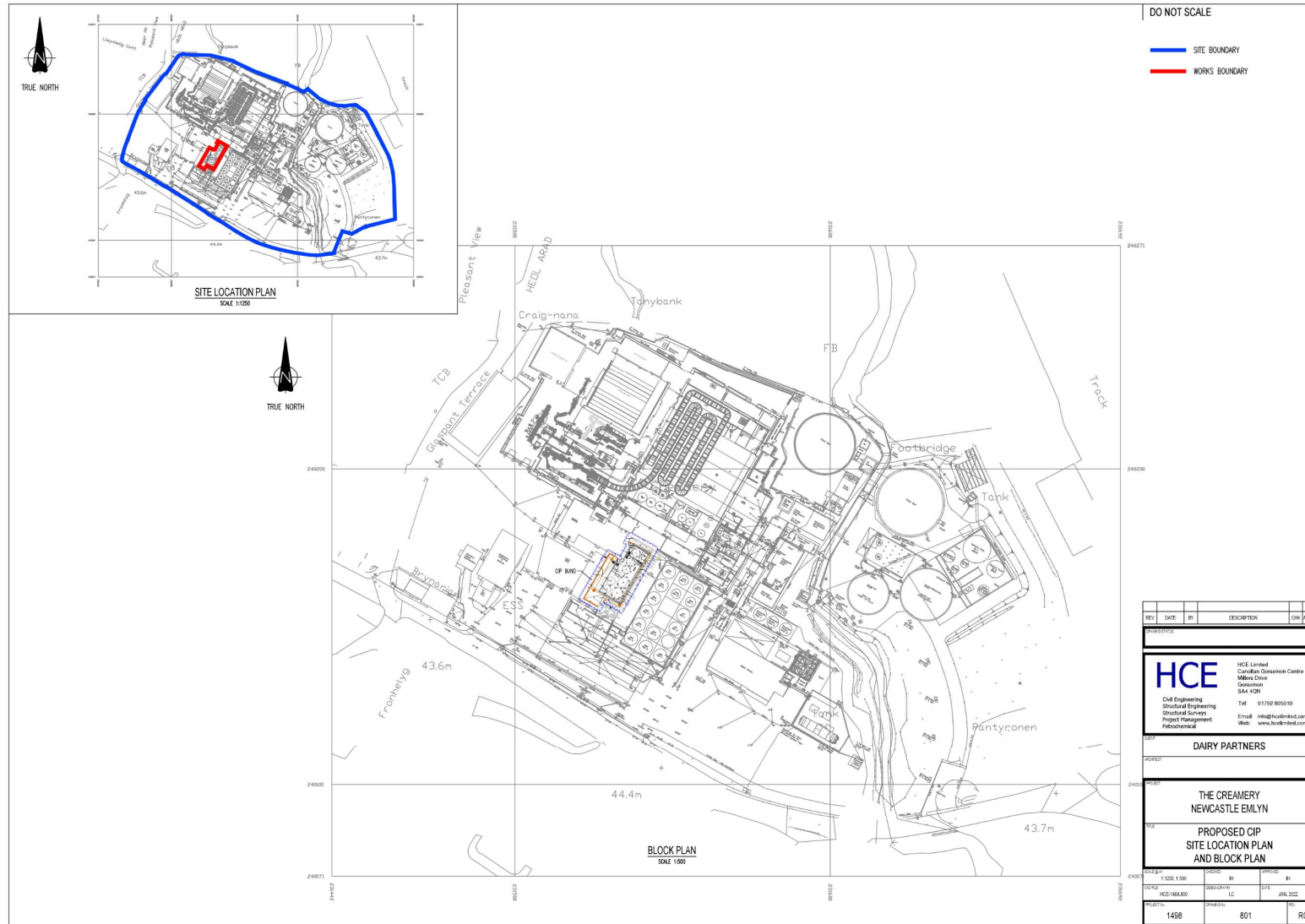


Figure 2.3 – Location of the surrogate monitoring position



3.0 Guidelines and Standards

3.1 Horizontal Guidance Note for Noise Assessment and Control

The purpose of the *Horizontal Guidance Note for Noise Assessment and Control* is to provide supplementary information, relevant to all sectors, to assist in preventing and minimising emissions of noise as described in the Sector Guidance Notes (or the General Sector Guidance Note).

The guidance is in two parts:

Part 1 – Regulation and Permitting – outlines the main considerations relating to the setting of Permit conditions and subsequent regulation of noise. Part 1 is aimed primarily at the information needs of regulators.

Part 2 – Noise Assessment and Control – describes the principles of noise measurement and prediction and the control of noise by design, by operational and management techniques and abatement technologies. Outline methods of noise control are provided such as:

- use of inherently quieter processes;
- selection of inherently quiet plant or “low-noise options”;
- site layout to maximise natural screening, screening by buildings and separation distances;
- the orientation of directional noise sources away from sensitive receptors; and
- noise barriers or bunding.

3.2 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 ‘*Methods for rating and assessing industrial and commercial sound*’ is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations within the context of the existing sound environment.

The method is based on assessing the predicted noise emissions from plant against the existing background sound levels at NSRs. The predicted emissions are termed as a ‘rating level’, which is the specific sound level from plant, plus ‘penalties’ which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

Appendix B explains the methodology in further detail.

4.0 Noise Survey

4.1 Background Noise Survey

PJA attended the site and surrounding area to conduct a baseline noise survey between Thursday the 20th and Monday the 24th of July 2023, inclusive of the weekend.

The purpose of this exercise was to determine background sound levels that can be considered representative of those experienced by the nearest residential receptors.

Given that it has been impossible on previous site visits to determine a 'true' background sound level (without influence from noise emissions from the Dairy Partners facility) through measuring at the site boundaries close to the nearest dwellings, this exercise has been based upon monitoring conducted at a 'surrogate' location, following the process recommended within BS 4142:2014+A1:2019.

Figure 2.3 shows the location of this surrogate position, with a sound level meter and microphone installed on a tripod at a height of approximately 1.5m above ground, within the wooded area, overlooking the main road.

This location was chosen for several reasons. Firstly, to be within around 10m of the B4333, which is the main noise source (other than the factory) that affects baseline noise levels at the receptors, which are a similar distance back from this road. Secondly, it needed to be a sufficient distance away from the factory so that noise emissions from it were imperceptible. And finally, this appeared to be a discrete position that could be safely accessed, without trespassing.

The sound level meter was set to log noise levels over continuous 15-minute averaging periods with a 1-second time history rate. The monitoring equipment was left unattended for the majority of the survey except for a short period around the installation and collection of the equipment.

The following noise indices were recorded (amongst others):

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered as a good representation of the average ambient sound level;
- $L_{AFmax,T}$: The maximum A-weighted noise level during the measurement period T and the best representation of short high noise levels 'events' – i.e., emergency services sirens;
- $L_{A90,T}$: The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the representative background noise level – or noise levels from continuous noise sources such as plant; and
- $L_{A10,T}$: The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level' and a good representation of traffic noise contributions.

Appendix C.1 contains further information on the methodology of the survey, including photographs taken from site; the equipment used; and the weather conditions at the time of the survey.

Noise levels at the monitoring location are dominated by road traffic along the B4333.

A graph of the measured noise levels across the entire monitoring period is given in **Figure 4.1** overleaf.

Table 4.1 summarises the results across the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively, accumulated across the several days that the survey spanned over. **Figure 4.2** presents histograms of the measured L_{A90} values.

It can be seen that minimum values of 24 dB $L_{A90,1hr}$ and 23 dB $L_{A90,15min}$ during the daytime and night-time periods are reached respectively.

Table 4.1 – Summary of measured noise levels

Time Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,1hr}$ (dB)	57	41	53	52	55	52
	$L_{AFMax,1hr}$ (dB)	81	62	N/A	72	76	71
	$L_{A90,1hr}$ (dB)	49	24	N/A	35	34	34
Night-time (23:00 – 07:00)	$L_{Aeq,15min}$ (dB)	55	32	47	44	45	44
	$L_{AFMax,15min}$ (dB)	80	44	N/A	64	62	64
	$L_{A90,15min}$ (dB)	51	23	N/A	31	24	29

Figure 4.1 – Graph of measured noise levels from the surrogate monitoring position

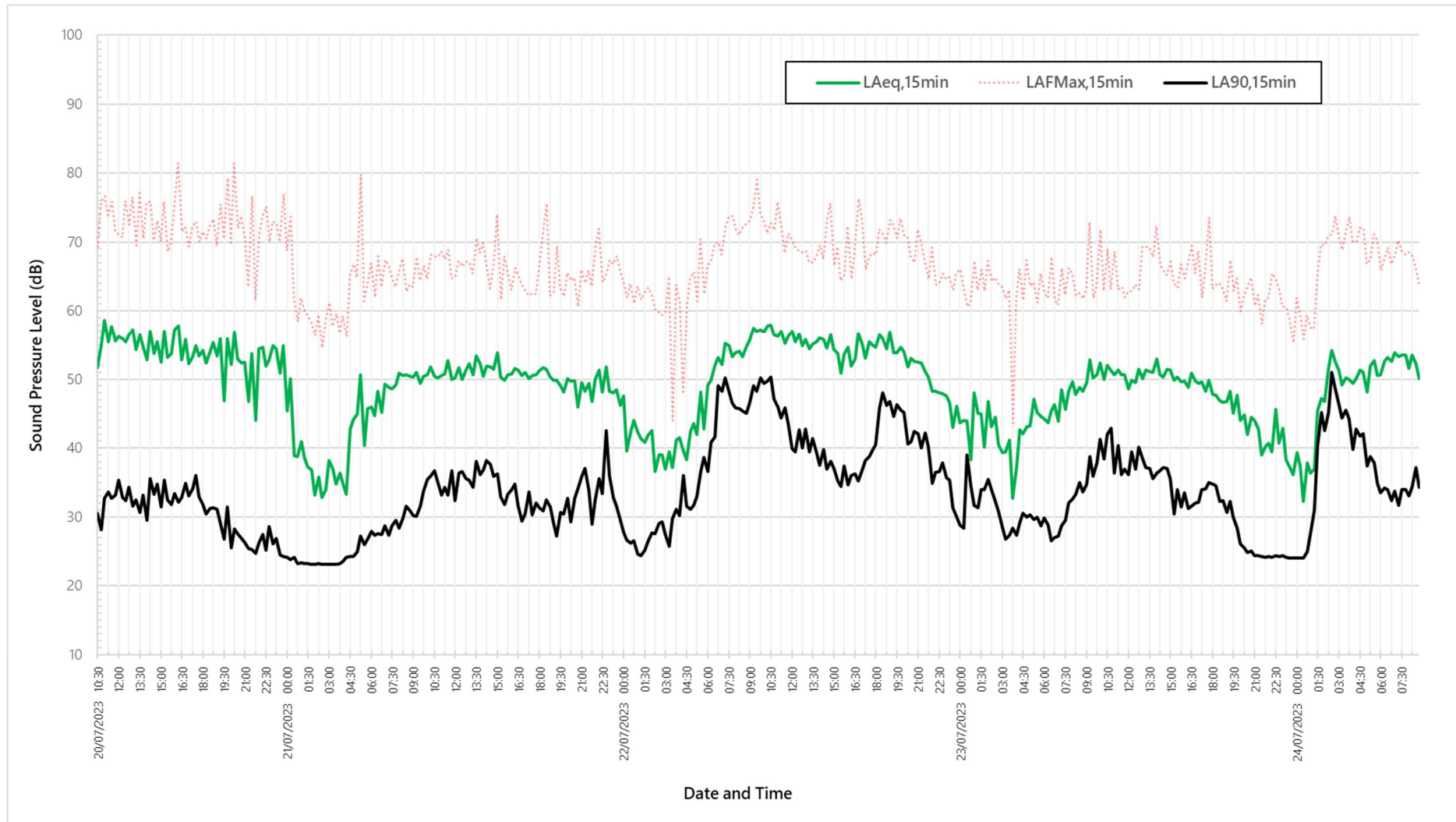
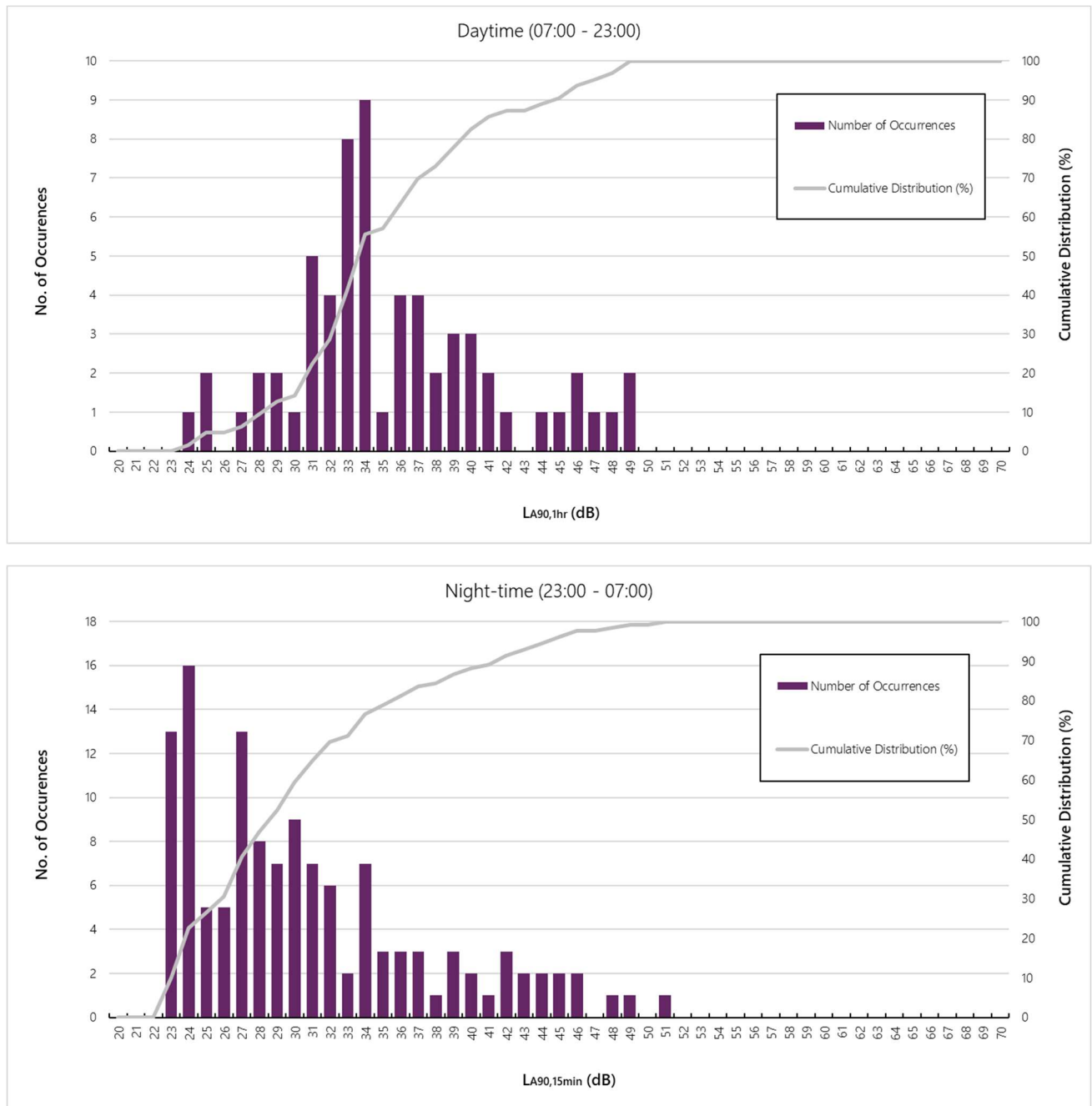


Figure 4.2 – Histograms of measured L_{A90} values from the noise survey



4.2 Receptor Noise Survey

PJA attended the site and surrounding area to conduct further noise monitoring directly at the three nearest 'noise-sensitive receptors' (NSRs) shown in **Figure 2.1**:

- **Position P1 / NSR 1** – within the garden of the property, ≈21m from the B4333, ≈7m from the nearest façade of the dwelling, and at a height of ≈1.8m, a position agreed with the resident.
- **Position P2 / NSR 2** – within the front garden of the property, ≈11m from the B4333, ≈4.5m from the nearest façade of the dwelling, and at a height of ≈1.8m, a position agreed with the resident and representatives of NRW.
- **Position P3 / NSR 3** – on the shared boundary between Dairy Partners and the residents' property, ≈7m from the B4333, ≈1m from the nearest upper floor window of dwelling, and at a height of ≈4m.

These monitoring positions are shown overleaf in **Figure 4.3**.

PJA were able to obtain access to monitor at these positions between the mornings of Tuesday the 4th and Monday the 10th of June 2024.

The purpose of this exercise was to determine specific noise levels (generated by the Dairy Partners facility) at the affected properties.

Previous surveys have been conducted on the Dairy Partner site boundaries in the directions of these receptors as access was not previously obtainable, thus this represents the first survey conducted within the curtilage of the affected properties.

The sound level meter was set to log noise levels over continuous 5-minute averaging periods with a 1-second time history rate. These shorter measurements were utilised to allow any intermittency in noise generation (which is inherent with the site in question) to be captured more easily than longer 15-minute or 1-hour averaging periods.

The monitoring equipment was left unattended for the majority of the survey except for the morning of the 4th when the surveyor remained on site whilst surveying other areas including the refilling of an LNG tanker.

Appendix C.2 contains further information on the methodology of the survey, including photographs taken from site; the equipment used; and the weather conditions at the time of the survey.

Figure 4.3 – Monitoring positions during the June 2024 survey



4.2.1 Position P1 / NSR 1

A graph of the measured noise levels across the entire monitoring period at position P1 is given in **Figure 4.4** overleaf.

Table 4.2 summarises the results across the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively, accumulated across the several days that the survey spanned over.

Figure 4.5 presents histograms of the measured $L_{A90,5min}$ values, indicating minimum values of 48 dB and 46 dB during the day and night-time periods respectively.

Several spikes/increases can be noted in **Figure 4.4**:

- Most notably on weekday mornings between around 06:10 and 06:25, where levels increase to around 65 – 66 dB $L_{A90,5min}$ / a maximum of 67 dB $L_{Aeq,15min}$. This is understood to be from the filling of an ETP tanker (HGV) on the east side of site.
- At the beginning of the survey and at around 09:00 – 10:30 on the 7th, due to refilling of an LNG tanker (HGV), which was observed by the surveyor on the morning of the 4th. A continuous ‘whirr’ can be heard at the monitoring position from the operation, with an alarm sounding for between 1 and 2 seconds every 3 minutes. $L_{A90,5min}$ levels fluctuate between 52 and 53 dB when the process is occurring, compared to 50 – 51 dB in the 30-minutes before and after.
- Background levels are generally very consistent at levels of around 48 to 51 dB $L_{A90,5min}$, particularly 49 – 50 dB, with a consistent hum of noise heard from the fixed plant at the Dairy Partners site such as the Glycol Chillers and Production Hall high level exhausts.
- Increases in ambient ($L_{Aeq,5min}$) levels at around 04:15 every morning, believed to be caused by birdsong.

Table 4.2 – Summary of measured noise levels – position P1 (NSR 1)

Time Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,5min}$ (dB)	61	49	52	52	52	52
	$L_{AFMax,5min}$ (dB)	88	51	N/A	62	60	62
	$L_{A90,5min}$ (dB)	53	48	N/A	50	50	50
Night-time (23:00 – 07:00)	$L_{Aeq,5min}$ (dB)	67	48	54	52	50	50
	$L_{AFMax,5min}$ (dB)	79	51	N/A	58	52	56
	$L_{A90,5min}$ (dB)	66	46	N/A	49	49	49

Figure 4.4 – Graph of measured noise levels – position P1 (NSR 1)

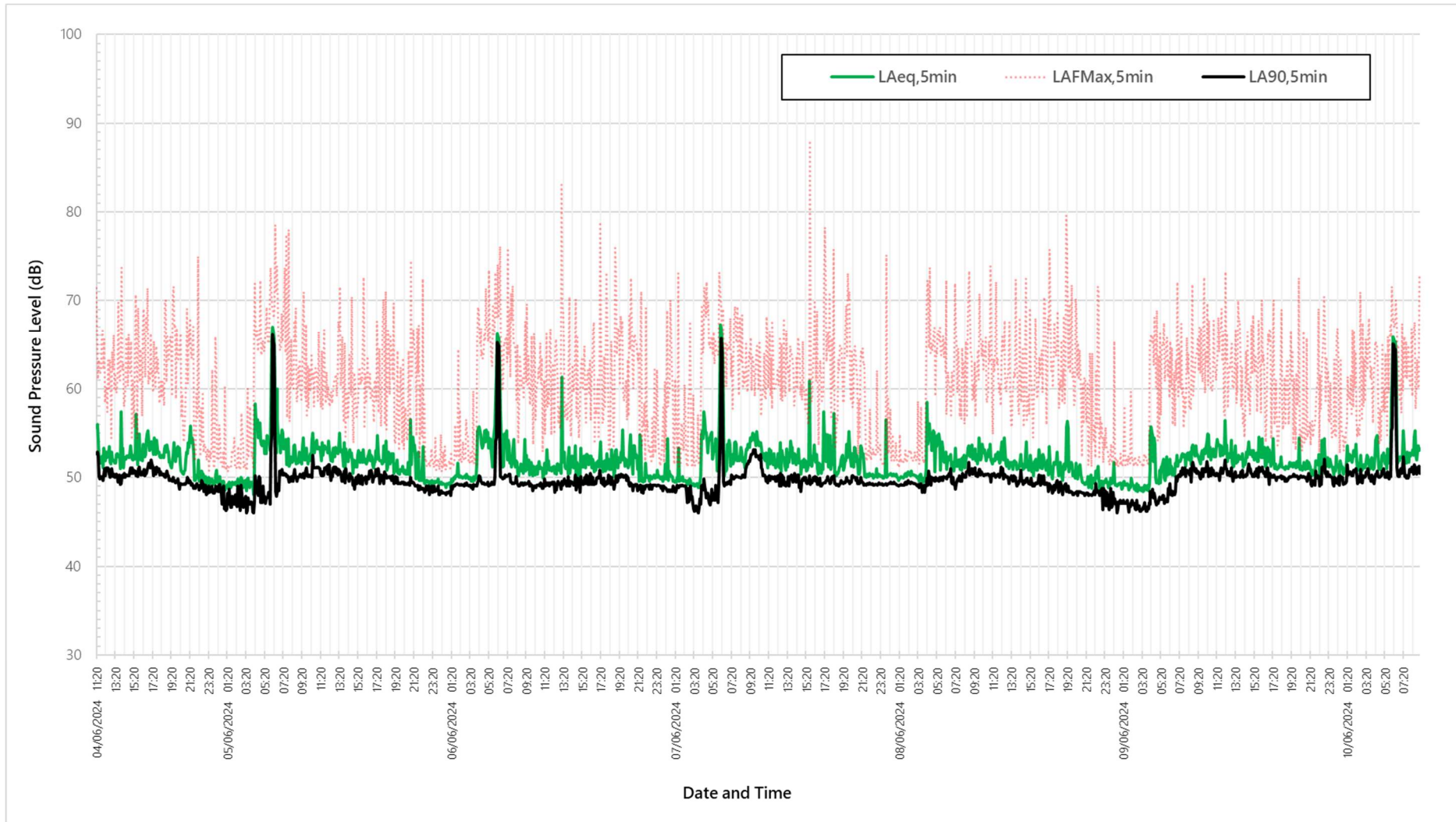
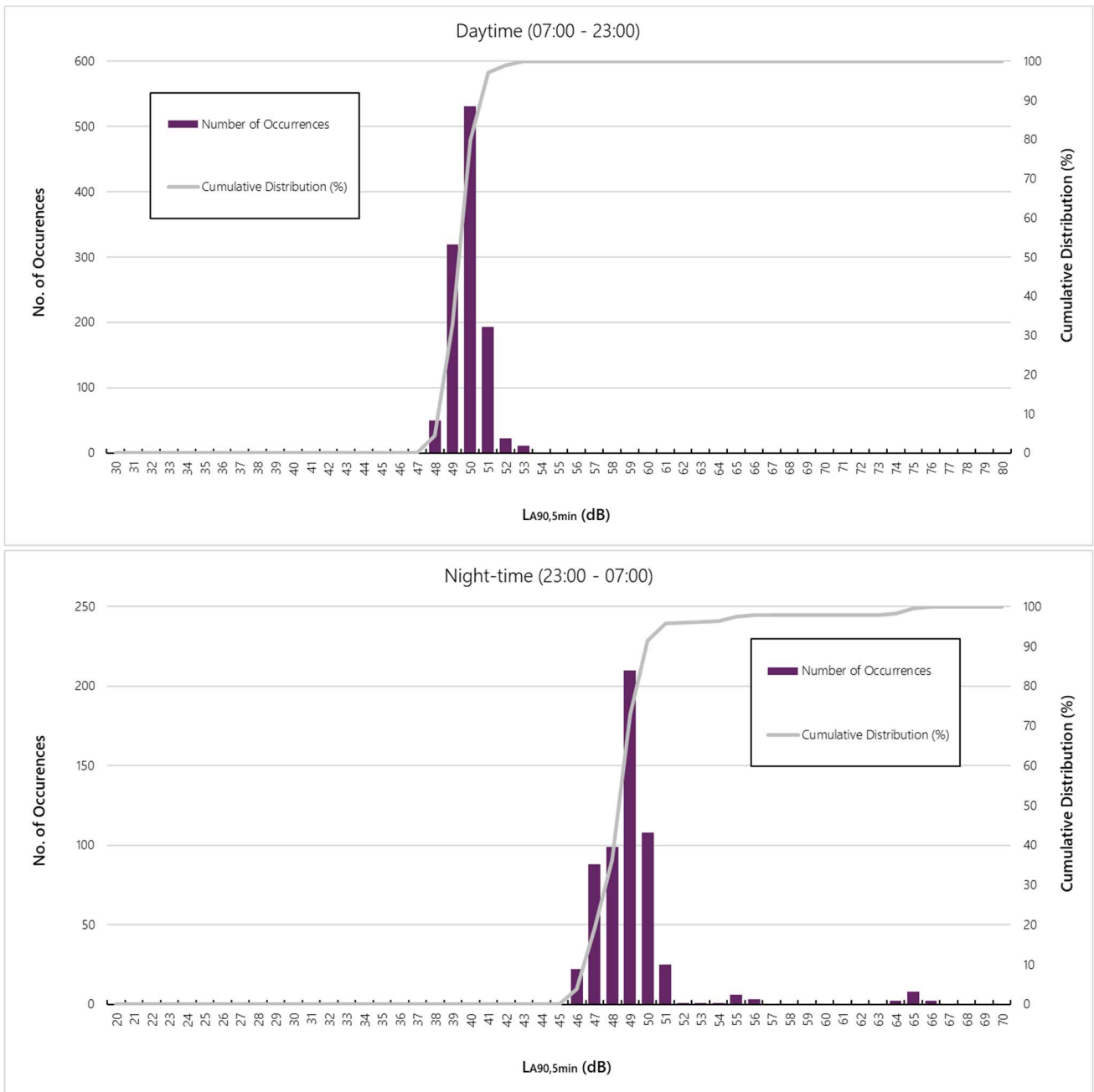


Figure 4.5 – Histograms of measured $L_{A90,5min}$ values – position P1 (NSR 1)



4.2.2 Position P2 / NSR 2

A graph of the measured noise levels across the entire monitoring period at position P2 is given in **Figure 4.6** overleaf.

Table 4.3 summarises the results across the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively, accumulated across the several days that the survey spanned over.

Figure 4.7 presents histograms of the measured $L_{A90,5min}$ values, indicating minimum values of 42 dB during the day and night-time periods respectively.

Several spikes/increases can be noted in **Figure 4.6** which are very similar to those described for Position P1:

- Most notably on weekday mornings between around 06:10 and 06:25, where levels increase to around 64 – 66 dB $L_{A90,5min}$ / a maximum of 66 dB $L_{Aeq,15min}$. This is understood to be from the filling of an ETP tanker (HGV) on the east side of site.
- At the beginning of the survey from 10:00 – 11:30 on the 4th and at around 09:00 – 10:30 on the 7th, due to refilling of an LNG tanker (HGV), which was observed by the surveyor on the morning of the 4th. A continuous ‘whirr’ can be heard at the monitoring position from the operation, with an alarm sounding for between 1 and 2 seconds every 3 minutes. $L_{A90,5min}$ levels fluctuate between 49 and 51 dB when the process is occurring, compared to 46 – 48 dB in the 30-minutes before and after.
- Background levels are generally consistent, with noise from fixed plant plateauing at 42 dB $L_{A90,5min}$. Levels are generally around 43 – 48 dB $L_{A90,5min}$ during the daytime, a little more variable than those at position P1 due to the closer proximity to the Milk Tanker pumping area (faintly audible), the road, and because of the temporary screening on the boundary / general position relative to the area around the chillers (more screened than position P1).
- Increases in ambient ($L_{Aeq,5min}$) levels at around 04:15 every morning, believed to be caused by birdsong.

Table 4.3 – Summary of measured noise levels – position P2 (NSR 2)

Time Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,5min}$ (dB)	66	44	54	52	52	52
	$L_{AFMax,5min}$ (dB)	89	46	N/A	66	63	65
	$L_{A90,5min}$ (dB)	51	42	N/A	46	47	46
Night-time (23:00 – 07:00)	$L_{Aeq,5min}$ (dB)	68	43	52	48	44	47
	$L_{AFMax,5min}$ (dB)	90	45	N/A	59	46	60
	$L_{A90,5min}$ (dB)	66	42	N/A	45	43	44

Figure 4.6 – Graph of measured noise levels – position P2 (NSR 2)

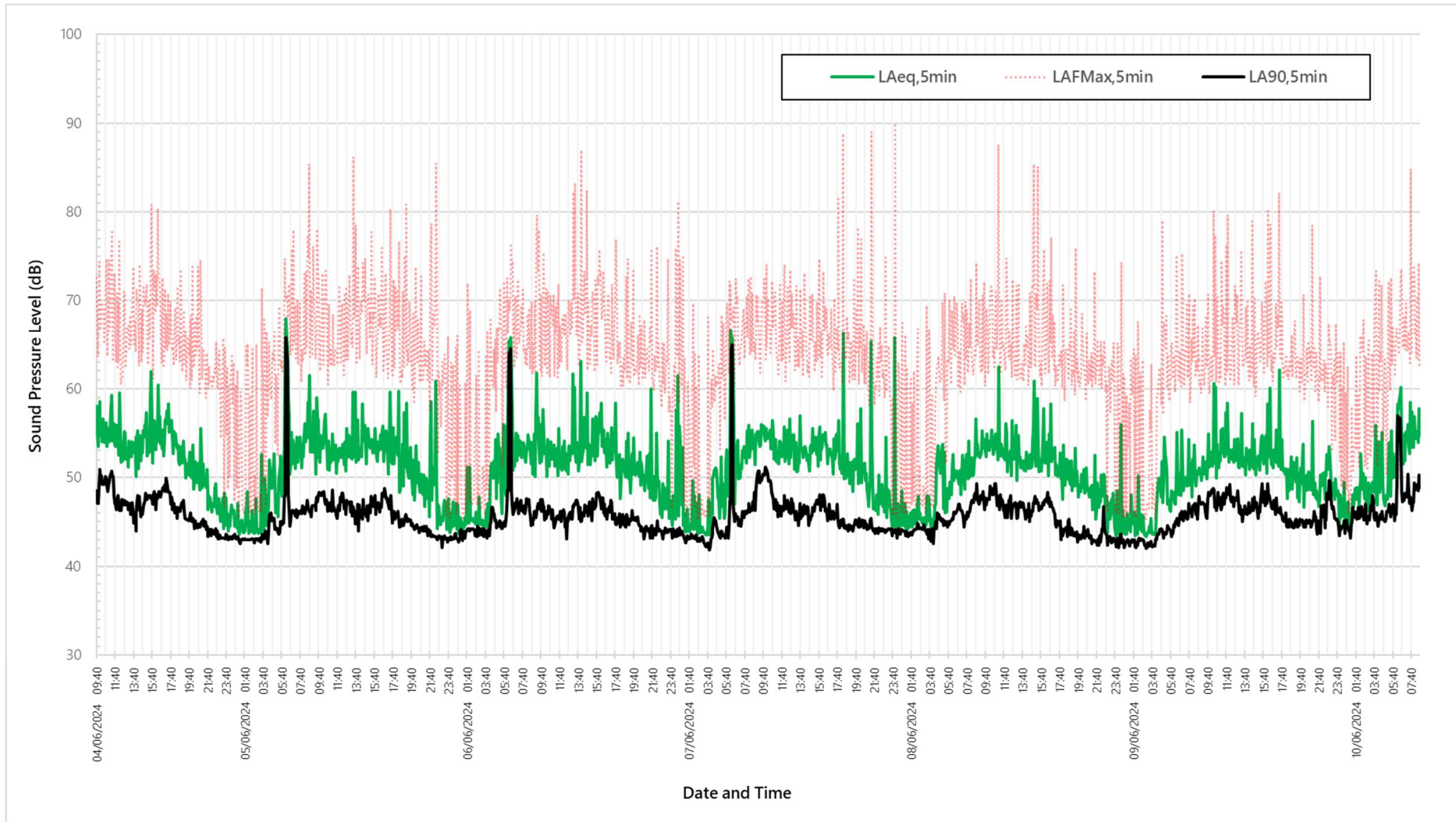
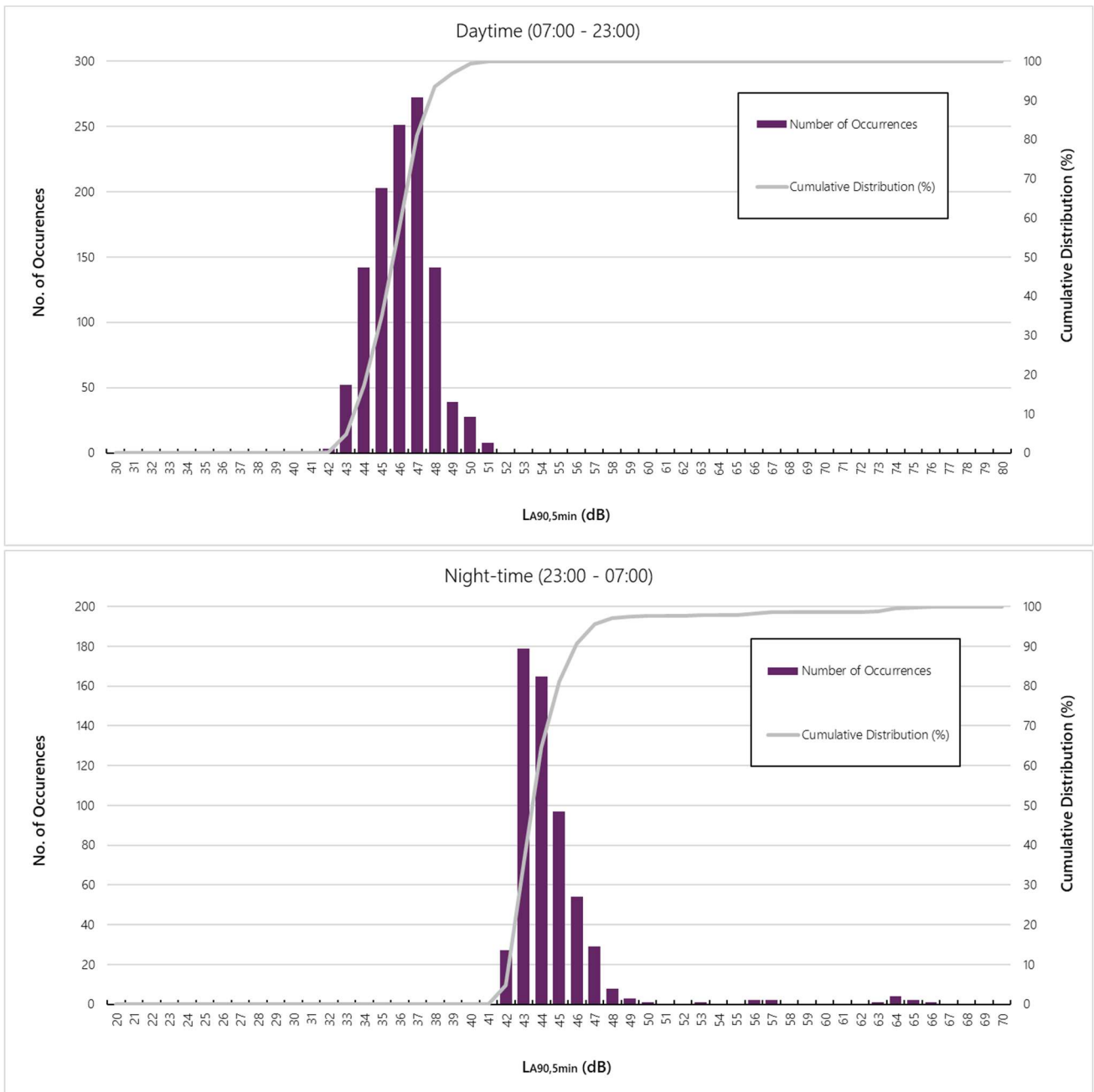


Figure 4.7 – Histograms of measured $L_{A90,5min}$ values – position P2 (NSR 2)



4.2.3 Position P3 / NSR 3

A graph of the measured noise levels across the entire monitoring period at position P3 is given in **Figure 4.8** overleaf.

Table 4.4 summarises the results across the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively, accumulated across the several days that the survey spanned over.

Figure 4.9 presents histograms of the measured $L_{A90,5min}$ values, indicating minimum values of 45 dB during the day and night-time periods respectively.

The noise climate at position P3 is notably different to the other two monitoring positions due to the dominance of noise generated by the idling of Milk Tankers whilst pumping, as seen by the fluctuation in noise levels during the daytime, regularly reaching above 60 dB $L_{A90,5min}$ to a maximum of 66 dB $L_{A90,5min}$, with a highest 1-hour daytime ambient noise level of 65 dB $L_{Aeq,1hr}$ (during Milk Tanker operations), a night-time 15-minute ambient noise level of 66 dB $L_{Aeq,15min}$ (given that Milk Tanker operations appear to begin at around 06:00).

Background levels plateau at 45 dB $L_{A90,5min}$ albeit caused by a different combination of fixed plant noise compared to the other two positions, i.e. plant such as the Glycol Chillers, Production Hall Exhausts, Cooling Tower and associated pumps, and ETP Plant, are significantly quieter at position P3. There is, however, a transformer compound located close to the monitoring position / the affected dwelling which is believed to be a more significant contributor, along with likely to a lesser extent, other Production Hall exhausts on the west side of site, despite not being particularly perceptible by the surveyor stood at ground floor level.

Table 4.4 – Summary of measured noise levels – position P3 (NSR 3)

Time Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,5min}$ (dB)	70	47	61	59	63	60
	$L_{AFMax,5min}$ (dB)	96	50	N/A	72	69	72
	$L_{A90,5min}$ (dB)	66	45	N/A	54	47	55
Night-time (23:00 – 07:00)	$L_{Aeq,5min}$ (dB)	67	46	55	51	47	49
	$L_{AFMax,5min}$ (dB)	85	47	N/A	63	48	64
	$L_{A90,5min}$ (dB)	65	45	N/A	48	46	46

Figure 4.8 – Graph of measured noise levels – position P3 (NSR 3)

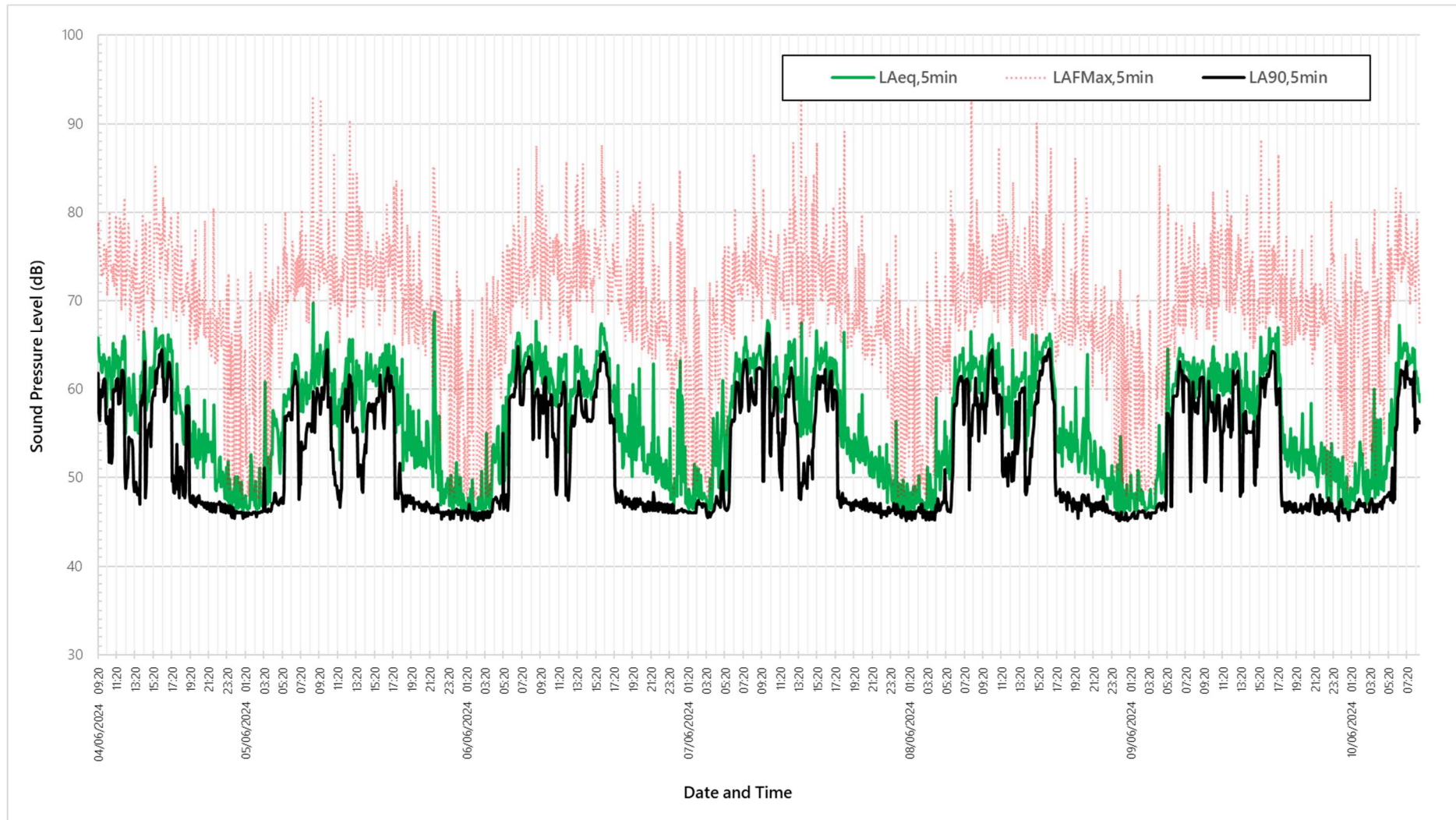
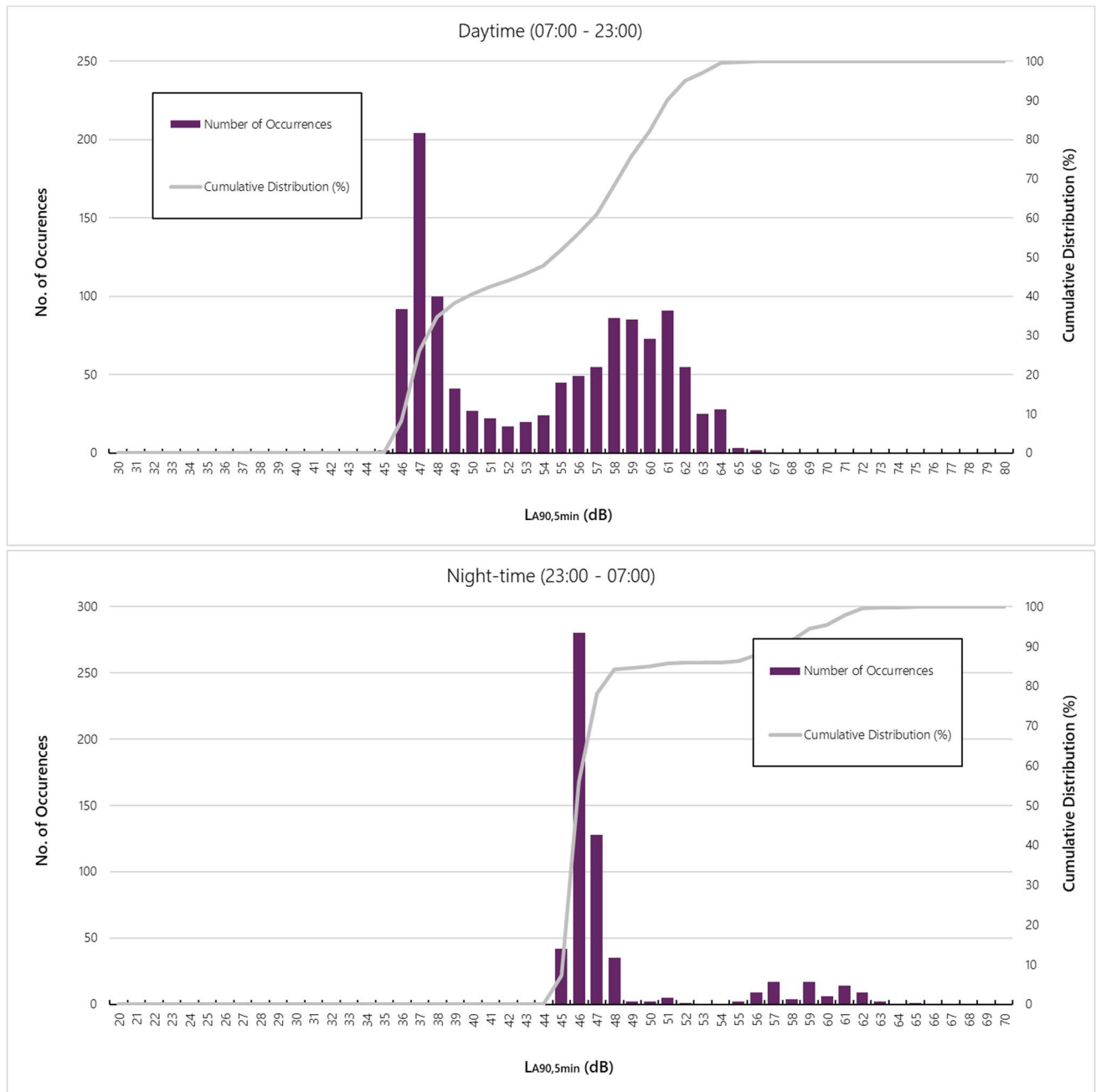


Figure 4.9 – Histograms of measured $L_{A90,5min}$ values – position P3 (NSR 3)



5.0 Assessment

The assessment has been undertaken in accordance with BS 4142:2014+A1:2019. The following summarises the main steps of action in the assessment method:

- a representative background sound level $L_{A90,Tr}$ is determined based on the results of the environmental noise survey;
- the specific sound level L_s generated by the proposed plant is predicted outside of the windows of neighbouring noise-sensitive windows in the area;
- the rating level $L_{Ar,Tr}$ is determined by the application of any ‘penalties’ which adjust for characteristic features of the sound which may be perceptible and potentially cause annoyance at each NSR;
- the predicted rating level $L_{Ar,Tr}$ is compared to the $L_{A90,Tr}$ and the guidance of BS 4142:2014+A1:2019 and other residential noise guidelines.

5.1 Background Sound Levels

In accordance with BS 4142:2014+A1:2019, the predicted rating level should be assessed against a ‘representative’ background sound level. This is commonly determined through the results of a baseline sound survey, as has been done here.

BS 4142:2014+A1:2019 states that *“in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.”* BS 4142:2014+A1:2019 further states that *“a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value”*.

As a worst-case assessment, it is appropriate to take the minimum values of $L_{A90,15min}$ measured during the survey to be the representative background sound level – as listed in **Table 5.1**.

Table 5.1 – Derived representative background sound level $L_{A90,T}$ at nearby NSRs

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,T}$ (dB)
1m outside of the windows of neighbouring noise-sensitive buildings / 1.5m above ground within the boundary of residential properties	Daytime (07:00 to 23:00) T = 1-hour	24
	Night-time (23:00 – 07:00) T = 15-mins	23

5.2 Predicted Rating Noise Levels

PJA has conducted several noise monitoring exercises and noise audits for the facility since September 2020. This includes the most recent version of the BAT (Best Available Techniques) Audit, issued alongside the 1st version of this report issued in July 2023. As shown in that report and its previous iterations, it is difficult to determine the exact specific noise contributions from individual sources, given the variable nature of its operation, with numerous items of fixed plant, machinery, and vehicles operating, at different times of day and night, and at variable loads/capacities.

Previous reports have been based upon a) measuring noise levels at source (i.e. 1m in several directions from noise generating plant ²), b) measuring levels over several days at boundary monitoring positions in the direction of NSRs 1 and 2, and c) using 3D noise map modelling to reflect the results of a) and b) to then predict the noise emissions at the affected receptors (including the individual contributions from each noise source, to help determine which are most significant and thus where mitigating actions would be best targeted).

The latest set of noise monitoring conducted (in June 2024) at the three receptor properties has enabled PJA to more accurately confirm the *overall* noise output from the site, i.e. the overall specific noise level during a worst-case 1-hour daytime and 15-minute night-time period at the residential properties.

5.2.1 NSR 1

The results of the survey suggest that the worst-case 1-hour daytime period for noise emissions from the Dairy Partners site is when an LNG Tanker is on site and refilling.

As described in **Section 2.0**, this process had been mitigated to an almost silent level, but has reverted back to a previously used noisy process after a change in LNG supplier, which generates a continuously loud whine for around 90-minutes ³ (≈ 83 dB $L_{Aeq,1hour}$ at 1m from the loudest point on the vehicle), with an alarm (≈ 93 dB $L_{Aeq,1sec}$ at 1m from the alarm) sounding for 1 – 2 seconds every 3-minutes.

During the worst-case 1-hour daytime period, specific noise levels from the site appear to be in the order of 53 dB $L_{S,1hr}$, dropping to around 50 dB $L_{S,1hr}$ when the LNG Tanker is not present (indicating a specific noise contribution from the LNG operation of around 50 dB, through the process of decibel subtraction). Noise emissions outside of the LNG operations occur from a combination of fixed plant (i.e. Glycol Chillers/Pumps, Cooling Tower and associated pumps, Production Hall exhausts) and HGVs on site (i.e. idling of Milk Tankers whilst pumping on the forecourt).

During a worst-case 15-minute night-time period, the most significant noise source measured in *the latest* survey was from ETP Tankers being pumped early in the morning, between around 06:10 and 06:25 for a period of 15-minutes (and thus a 100% 'on-time').

A worst-case night-time specific noise level of 67 dB $L_{S,15min}$ occurs during the pumping process, compared to specific noise levels from fixed plant of closer to 49 dB $L_{S,15min}$ for the majority of the night.

2 - The complexity of the site means that it is not realistically/practically possible to conduct a full detailed set of sound power measurements in accordance with the Method Implementation Document.

3 - Thus 100% on-time for a 1-hour assessment period.

Albeit based upon discussions with Dairy Partners, and having previously seen ETP Tankers operating later in the day on all other visits/surveys conducted by PJA, it is believed that the early hours operation may be a short term anomaly due to a recent issue that is undergoing maintenance with the ETP.

If the ETP pumping process were taken to be a daytime process, based on an 'on-time' of 15-minutes, that is, 25% of a 1-hour daytime assessment period, and thus subtracting 6 dB as a correction, the worst-case specific daytime noise level would be ≈ 61 dB $L_{S,1hr}$. However, PJA has previously observed ETP pumping processes occurring for up to 30-minutes, i.e. 50% of the assessment period, which would result in a higher specific level of ≈ 64 dB $L_{S,1hr}$.

In accordance with BS 4142:2014+A1:2019, a rating level penalty should be applied to the specific noise level to obtain the rating level should the noise contain distinctive characteristics such as tonality, impulsivity, intermittency, or is generally distinguishable from other noise sources. This is done using the 'subjective method' described in Section 9.2 of the Method Implementation Document for BS 4142.

PJA suggests that a highly perceptible tonal quality can be heard from the alarm of the LNG process, as well as a highly perceptible quality from the Glycol Chiller plant at all times, and thus a 6 dB penalty should be added to both daytime and night-time assessment periods when this plant is clearly audible.

The LNG alarm is also clearly intermittent in nature, and thus a further 3 dB penalty is applied to the daytime period when the LNG is clearly audible.

On the other hand, during periods when the ETP Tanker pumping is the dominant noise source, this is believed to be at a level that would mask other noise emissions effectively, i.e. any tonality from the LNG alarm or Chillers, or intermittency from the LNG alarm, would not be perceptible when the ETP Tanker is pumping, and thus no penalty would apply.

The ETP Tanker is *not* considered to be intermittent during the daytime despite operating for around 15 – 30 minutes in every hour, based on interpreting the guidance in Section 9.2 of the Method Implementation Document for BS 4142.

PJA does not believe there to be any significant noises that are noticeably impulsive in nature at the receptors, and thus no penalty is added for impulsivity.

Table 5.2 summarises the predicted rating levels at NSR 1 against the representative background sound level during the daytime and night-time periods. This provides different scenarios based on the LNG refilling process either being 'on' or 'off', and based on whether the ETP Tanker pumping process were to occur during the night (observed during the latest survey) or daytime (as observed on all previous surveys).

Table 5.2 – Predicted rating levels at NSR 1

Period	Scenario	Specific Sound Level $L_{Aeq,T}$ (dB)	Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Minimum Background Sound Level $L_{A90,T}$ (dB)	Difference (dB)
Daytime (07:00 to 23:00) T = 1-hour	During ETP Tankers Pumping	64	0	64	24	+40
	During LNG Refilling	53	+9	62		+38
	Typical Noise Emissions	50	+6	56		+32
Night-time (23:00 – 07:00) T = 15-mins	During ETP Tankers Pumping	67	0	67	23	+44
	Typical Noise Emissions	50	+6	56		+33

5.2.2 NSR 2

The survey results suggest that similar balance of noise sources affects NSR 2, i.e. the LNG Tanker refilling, the ETP Tanker pumping, and a general hum (to a lesser extent) of fixed plant noise from the rest of the site, with some additional variation due to the screening provided by temporary barriers on the south boundary and buildings within the site (i.e. NSR 2 is slightly less exposed to the Chillers and Production Hall Exhausts), but with closer proximity to the Milk Tanker pumping area.

During the worst-case 1-hour daytime period, specific noise levels from the site appear to be up to 51 dB $L_{S,1hr}$, dropping to around 48 dB $L_{S,1hr}$ when the LNG Tanker is not present (indicating a specific noise contribution from the LNG operation of around 48 dB, through the process of decibel subtraction).

During a worst-case 15-minute night-time period, the most significant noise source measured from ETP Tankers being pumped early in the morning results in a specific noise level of 66 dB $L_{S,15min}$, occurring during the pumping process, compared to specific noise levels from fixed plant of closer to 43 - 46 dB $L_{S,15min}$ for the majority of the night. If the ETP pumping process were taken to be a daytime process, based on an 'on-time' of 30-minutes, the worst-case specific daytime noise level would be ≈ 63 dB $L_{S,1hr}$.

In terms of rating level penalties, a highly perceptible tonal quality can be heard from the alarm of the LNG process (6 dB penalty), and a 'clearly' perceptible quality from the Glycol Chiller plant at all other times (4 dB penalty).

The LNG alarm is also clearly intermittent in nature, and thus a further 3 dB penalty is applied to the daytime period when the LNG is clearly audible.

On the other hand, during periods when the ETP Tanker pumping is the dominant noise source, as per the description in the previous subsection, no penalty would apply.

PJA again does not believe there to be any significant noises that are noticeably impulsive in nature at the receptors, and thus no penalty is added for impulsivity.

Table 5.3 summarises the predicted rating levels at NSR 2 against the representative background sound level during the daytime and night-time periods.

Table 5.3 – Predicted rating levels at NSR 2

Period	Scenario	Specific Sound Level $L_{Aeq,T}$ (dB)	Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Minimum Background Sound Level $L_{A90,T}$ (dB)	Difference (dB)
Daytime (07:00 to 23:00) T = 1-hour	During ETP Tankers Pumping	63	0	63	24	+39
	During LNG Refilling	51	+9	60		+36
	Typical Noise Emissions	48	+4	52		+28
Night-time (23:00 – 07:00) T = 15-mins	During ETP Tankers Pumping	66	0	66	23	+33
	Typical Noise Emissions	46	+4	50		+27

5.2.3 NSR 3

The balance of noise sources affecting NSR 3 is significantly different to NSRs 1 and 2.

The survey results show high specific noise levels that are dominated by the idling of Milk Tankers whilst pumping, of up to 65 dB $L_{Aeq,1hr}$ during the daytime, and 66 dB $L_{Aeq,15mins}$ during the night-time. PJA believes it a reasonable assumption that daytime levels could also reach 66 dB.

When no Milk Tankers are present, specific noise levels were typically around 45 – 47 dB $L_{Aeq,1hr}$ / $L_{Aeq,15mins}$, from a combination of fixed plant.

In terms of rating level penalties, tonality does not appear to be a factor when Milk Tankers are present. At other times, a 2 dB penalty is considered applicable as a worst-case for 'just' perceptible tonality from the Glycol Chillers.

As per the previous descriptions regarding intermittency, the Milk Tankers appear to pump for long enough and have only one cycle of 'on' and 'off', i.e. they do not repeatedly turn on and off every few minutes, they simply operate typically for less than 1-hour on a vehicle by vehicle basis. No intermittency penalty is applied.

PJA again does not believe there to be any significant noises that are noticeably impulsive in nature at the receptors, and thus no penalty is added for impulsivity.

Table 5.4 summarises the predicted rating levels at NSR 3 against the representative background sound level during the daytime and night-time periods.

Table 5.4 – Predicted rating levels at NSR 3

Period	Scenario	Specific Sound Level $L_{Aeq,T}$ (dB)	Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Minimum Background Sound Level $L_{A90,T}$ (dB)	Difference (dB)
Daytime (07:00 to 23:00) T = 1-hour	During Milk Tankers Pumping	66	0	66	24	+42
	Typical Noise Emissions	47	+2	49		+25
Night-time (23:00 – 07:00) T = 15-mins	During Milk Tankers Pumping	66	0	66	23	+43
	Typical Noise Emissions	47	+2	49		+26

5.3 Analysis

BS 4142:2014+A1:2019 indicates that a rating level that is 10 dB above the background sound level is an indicator of a likely significant adverse impact, depending on the context.

In this case, rating levels when compared against background sound levels if the factory were not generating any noise, are as much as 42 dB above the minimum background sound during the daytime, and 43 dB above during the night-time, when the receptor is affected by noise sources involving idling HGVs (Milk Tankers and ETP Tankers).

Nonetheless, even when considering just noise from fixed plant during more 'typical' periods, rating levels are still up to 32 – 33 dB above minimum background levels.

Recent changes to the LNG Tanker refilling system also increase rating noise levels to up to 38 dB above minimum daytime background noise levels.

The results suggest a significant adverse impact, as expected and as previously reported, when assessing in accordance with BS 4142:2014+A1:2019.

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10 ⁻⁵ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4000Hz (4kHz). This is roughly equal to the range of frequencies on a piano. Frequency is often divided into ('first') octave bands for analysis, with the range above considered within 7 octave bands with centre frequencies at 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz and 4 kHz. 'Third' octave bands split this further into smaller frequency bands. This is typically only referenced in assessment of tonality of a noise source by identifying peaks (tones) in the frequency spectrum, i.e., when applying a rating penalty for tonality within a BS 4142:2014+A1:2019 assessment.
L _{Aeq,T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
L _{A90,T}	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
L _{A10,T}	The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level';
L _{AFmax,T}	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Noise Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B - BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations within the context of the existing sound environment.

B.1 - Definitions

BS 4142:2014+A1:2019 provides the following definitions which are relevant at this pre-construction stage of assessment:

- **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 interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- **Rating Level, L_{Ar,T_r} :** Specific sound level plus any adjustment for the characteristic features of the sound.
- **Reference Time Interval, T_r :** Specified interval over which the specific sound level is determined. This is 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).
- **Specific Sound Level, $L_s = L_{Aeq,T_r}$:** Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
- **Specific Sound Source:** Sound source being assessed.

The BS 4142:2014+A1:2019 definition of sound of an industrial and/or commercial nature includes "sound from fixed installations which comprise mechanical and electrical plant and equipment". The scope of BS 4142:2014+A1:2019 is not intended for sound from the passage of vehicles on public roads; people; and 'other sources falling within the scopes of other standards or guidance'.

B.2 - Specific Sound Level

The specific sound level L_s is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r , of 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).

B.3 - Rating Level

The rating level L_{Ar,T_r} is the specific sound level L_s plus any 'penalties' which account for the characteristic features of the sound.

BS 4142:2014+A1:2019 provides the following with respect to the application of penalties to account for "the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention".

- **Tonality** – For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for

a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible;

- **Impulsivity** – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible;
- **Intermittency** – When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied; and
- **Other Sound Characteristics** – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

PJA consider the word 'perceptible' to be important, and variable depending on the context of a site. For example at a site with a relatively high background sound level of 50 dB(A), an 'impulsive' sound source with a specific sound level of 30 dB(A) at a NSR is unlikely to be perceptible and should probably not be penalised.

B.4 - Background Sound Level

BS 4142:2014+A1:2019 states that "in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods." BS 4142:2014+A1:2019 further states that "a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value". Hence BS 4142:2014+A1:2019 does not provide a 'black and White' method of obtaining the assessment level for background sound $L_{A90,T}$. Note that it is standard practice that the $L_{A90,T}$ is determinable from the results of a baseline sound survey conducted at positions representative of sound levels at the nearest or worst affected NSRs.

B.5 - Assessment of Adverse Impact

The assessment of adverse impact contained in BS 4142:2014+A1:2019 is undertaken by comparing the rating level $L_{Ar,Tr}$, to the measured representative background sound level $L_{A90,T}$ outside the sensitive receptor location. The significance of the impact of an industrial or commercial sound source depends on both the margin by which the rating level $L_{Ar,Tr}$ exceeds the background sound level $L_{A90,T}$ and the context in which the sound occurs. It is therefore essential to place the sound in context.

But in general, "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." However, if the rating level does exceed the background sound level, "a difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context", and "a difference of around +10 dB or more is likely to be an indication of a significant adverse impact depending on the context."

Appendix C – Noise Survey Methodology

C.1 – July 2023 Survey

C.1.1 – Survey Equipment

The monitoring equipment used for the baseline noise survey is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter had been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrator had been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

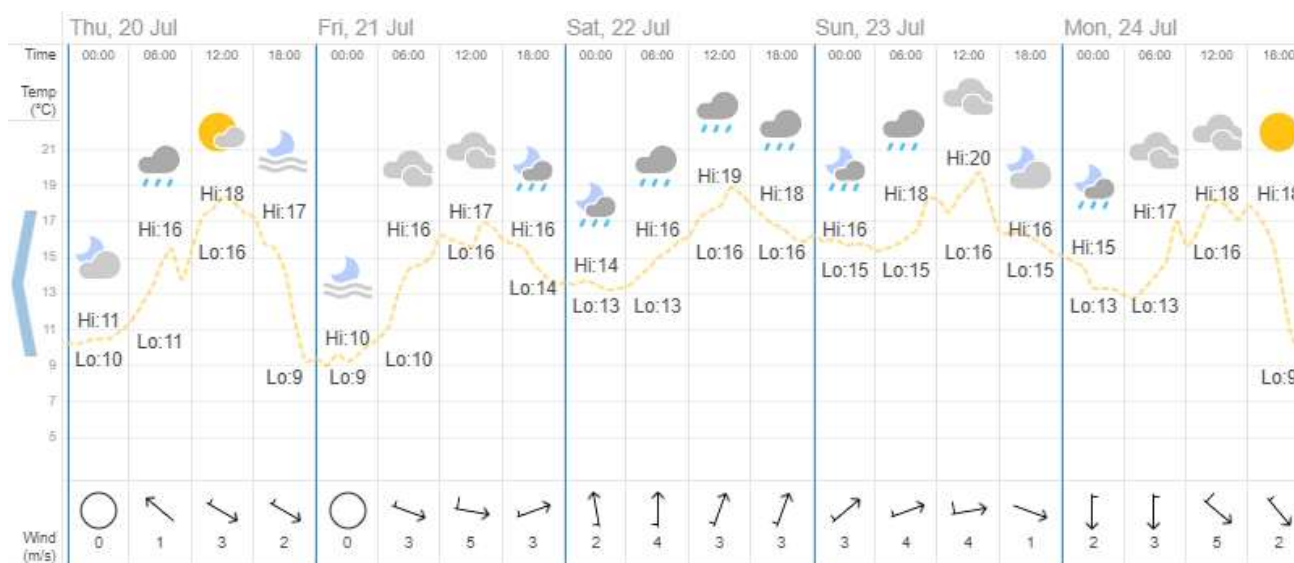
Table C.1 – Equipment used for the noise survey in July 2023

Name	Serial Number	Last Calibrated	Calibration Due
SVAN 949 Class 1 Sound Level Meter	9719	Nov-21	Nov-23
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	May-23	May-24

C.1.2 – Meteorological Conditions

During the survey, weather conditions included intermittent periods of rain. Wind speeds were generally mild up to a maximum of 5 ms⁻¹. The microphone was fitted with a weather protection kit/windshield. These weather conditions are suitable for the measurement of environmental noise in accordance with BS 7445 'Description and Measurement of Environmental Noise'. The weather conditions are sourced from <https://www.timeanddate.com/weather/@2641676/historic?month=7&year=2023>.

Figure C.1 – Meteorological conditions during the survey in July 2023



C.1.3 – Photos

Figure C.2 – Photographs of the monitoring position in July 2023



C.2 – June 2024 Survey

C.2.1 – Survey Equipment

The monitoring equipment used for the noise survey conducted in June 2024 is detailed in the table below. The sound level meters were calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meters had been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrator had been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

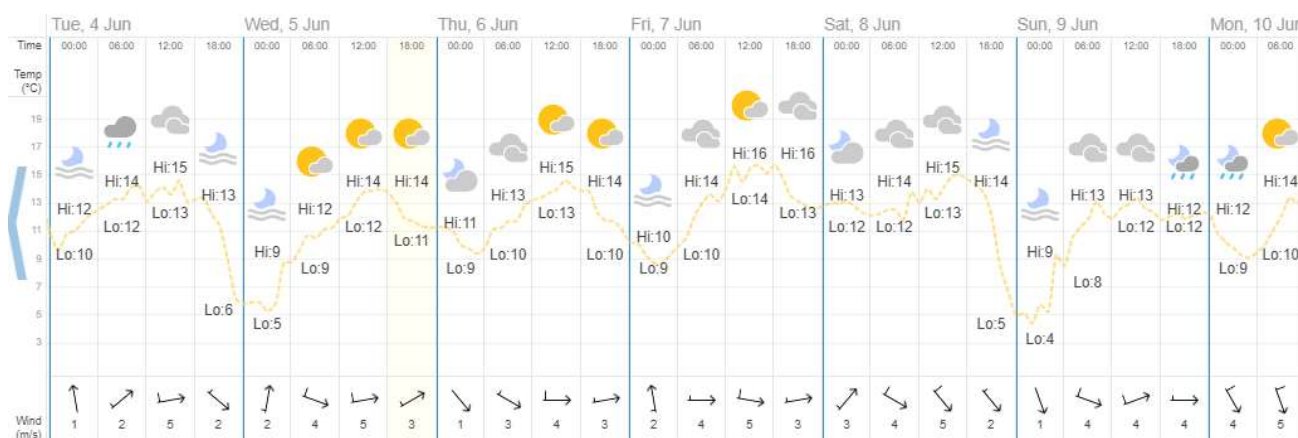
Table C.2 – Equipment used for the noise survey in June 2024

Name	Serial Number	Last Calibrated	Calibration Due
SVAN 949 Class 1 Sound Level Meter	9720	Jan-24	Jan-26
SVAN 949 Class 1 Sound Level Meter	9719	Jan-24	Jan-26
SVAN 957 Class 1 Sound Level Meter	28043	Jan-24	Jan-26
SVAN 971A Class 1 Sound Level Meter	113251	Jun-23	Jun-25
Casella CEL 120-1 Class 1 Acoustic Calibrator	3864607	Feb-24	Feb-25

C.2.2 – Meteorological Conditions

During the survey, weather conditions included intermittent periods of rain. Wind speeds were generally mild up to a maximum of 5 ms⁻¹. The microphone was fitted with a weather protection kit/windshield. These weather conditions are suitable for the measurement of environmental noise in accordance with BS 7445 'Description and Measurement of Environmental Noise'. The weather conditions are sourced from <https://www.timeanddate.com/weather/@2641676/historic?month=6&year=2024>.

Figure C.3 – Meteorological conditions during the survey in June 2024



C.2.3 – Photos

Figure C.4 – Photographs of the monitoring position at 'NSR 1' in June 2024



Figure C.5 – Photographs of the monitoring position at 'NSR 2' in June 2024



Figure C.6 – Photographs of the monitoring position at 'NSR 3' in June 2024



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