Appendix I: Noise Impact Assessment

Binn Farm Solar & BESS

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Acronyms and Abbreviations

NSR	Noise Sensitive Receptor
NMP	Noise Monitoring Position
dB	Decibel
PKC	Perth and Kinross Council
BESS	Battery Energy Storage System
BPM	Best Practicable Means
CEMP	Construction Environmental Management Plan
BEPS	Binn Eco Park Solar
BEPB	Binn Eco Park BESS
ABESP	Abernethy Battery Energy Storage Project

1. Noise

1.1 Executive Summary

1.1.1 This assessment considers potential noise impacts from the Proposed Development on nearby noise sensitive receptors (NSRs). Noise impacts were assessed against the criteria outlined in BS4142 and Local Authority guidance.

1.1.2 A baseline noise survey was conducted at two noise monitoring positions (NMPs) and determined that the baseline noise environment is influenced from anthropogenic noise sources and industrial sounds at the nearby facilities to the north.

1.1.3 Operational noise from the Proposed Development has been predicted in noise modelling software CadnaA and it was found that the worst-case operational noise level at NSRs is below the representative daytime background and therefore noise impacts are not significant, and no additional mitigation is required.

1.1.4 Operational noise from the Proposed Development is less than the representative prevailing night-time background level and therefore noise impacts are not significant, and no additional mitigation is required.

1.1.5 As no additional mitigation is required, residual effects remain unchanged and are not significant.

1.2 Introduction

1.2.1 This assessment considers the potential effects of the Proposed Development on receptors sensitive to noise during the operational phase. Vibration associated with the Proposed Development will be negligible at sensitive receptors, given that the construction of solar and battery energy storage system (BESS) developments does not require the use of heavy plant and there are no significant sources of vibration during the operational phase, therefore assessment of vibration has been scoped out.

1.2.2 The scope of this assessment has comprised:

- Consultation with Perth and Kinross Council (PKC) Environmental Health Department via an Environmental Impact Assessment (EIA) screening opinion, to agree appropriate scope for the assessment (refer to **Table 1** for details);
- Baseline survey to characterise existing noise levels;
- Prediction of operational noise levels in modelling software CadnaA;
- Evaluation of predicted noise levels during operation of the Proposed Development against the adopted criteria; and
- Specification of appropriate mitigation (if required).

1.2.3 Noise emissions from the operational phase of the Proposed Development will predominantly arise from the BESS element. The solar array will utilise inline

inverters, rather than centralised large inverters; inline inverters produce very little to no noise.

1.2.4 This Technical Assessment report is supported by the following Figures and Appendices:

- **Figure 1** – Site Location, Noise Monitoring Positions and Noise Sensitive Receptors;
- **Annex 1** – Baseline data and analysis; and
- **Annex 2** – Third Octave Predicted Noise Levels.

1.3 Legislation, Policy and Guidance

1.3.1 Relevant legislation and guidance documents have been reviewed and considered as part of this assessment. Documents of relevance are summarised below.

1.3.2 In lieu of any specific legislation, assessing the effect of operation of such a development must draw on information from a variety of sources. This assessment makes reference to several British Standards, official planning policy and advice notes and national guidance.

1.3.3 For a development of this nature, there is no specific all-encompassing legislation relating to the standards associated with noise emission/effects. Noise legislation, where it does exist, tends to be either EU-derived and focussed on specific items of noise-emitting plant or on more general nuisance, such as that addressed by the provisions of the Environmental Protection Act 1990 (UK Government, 1990).

Legislation

Environmental Protection Act 1990

1.3.4 Section 79 of the Environmental Protection Act 1990 defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area and, where a complaint of statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

1.3.5 The Act also defines the concept of “Best Practicable Means” (BPM):

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

1.3.6 Section 80 of the Environmental Protection Act 1990 provides local planning authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence. It is a potential defence against failure to comply with an abatement notice where BPM were used to prevent or counteract the effects of the nuisance.

Planning Policy

1.3.7 The Planning Statement associated with this application sets out the planning policy framework that is relevant to the EIA. This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes, the PKC Local Development Plan (LDP) and other relevant guidance. Of relevance to the assessment presented within this chapter, regard has been had to the following policies:

NPF4:

1.3.8 NPF4 - Policy 11:

"a) Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported. These include:

iii. energy storage, such as battery storage and pumped storage hydro;

…

v. solar arrays;

…

e) In addition, project design and mitigation will demonstrate how the following impacts are addressed:

i. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;"

1.3.9 NPF4 – Policy 23:

"Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely."

1.3.10 PKC LDP Policy 33:

"Proposals for the utilisation, distribution and development of renewable and low-carbon sources of energy will be supported subject to the following factors being taken into account:

…

(a) residential amenity of the surrounding area (including noise and shadow flicker)"

Guidance

Planning Advice Note PAN 1/2011: Planning and noise

1.3.11 PAN 1/2011 (Scottish Government, 2011), sets out a series of noise issues for planning authorities to consider when making decisions on planning applications. A Technical Advice Note (TAN) on Assessment of Noise (Scottish Government, 2011) has been published to accompany PAN 1/2011. In Annex 1 of the TAN are codes of practice for the assessment of various sources of noise. BS4142 is identified as appropriate guidance for the evaluation of industrial and commercial noise sources.

1.3.12 The TAN recommends that the daytime period includes the hours 07:00 – 23:00 and the night-time period 23:00 – 07:00.

1.3.13 The TAN suggests that equivalent continuous noise level over a time period, T ($L_{Aeq,T}$), is a good general purpose index for environmental noise; this index is commonly referred to as the "ambient" noise level. It further notes that road traffic noise is commonly evaluated using the $L_{A10,18hr}$ level, and the $L_{A90,T}$ index is used to describe the "background" noise level.

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

1.3.14 BS4142:2019 describes methods for rating and assessing sound from industrial or commercial premises. The methods detailed in the standard use outdoor sound levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

1.3.15 The standard provides methods for determining the following:

- Rating levels for sources of industrial and commercial sound;
- Ambient, background and residual sound levels; and
- The audibility of tones in sound: 1/3 octave method.

1.3.16 These may be used for assessing sound from proposed, new, modified or additional sources of sound of a commercial or industrial nature or to assess the suitability of introducing a receptor near an existing commercial or industrial site.

1.3.17 The standard makes use of the following terms:

- Ambient sound level, L_a = $L_{Aeq,T}$ – the equivalent continuous sound pressure level of the totally encompassing sound in a given situation at a given time, usually from multiple sources, at the assessment location over a given time interval, T.
- Background sound level, $L_{A90,T}$ – the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 percent of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

- Specific sound level, L_s = $L_{Aeq,Tr}$ – the equivalent continuous sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- Rating level, $L_{Ar,Tr}$ – the specific sound level plus any adjustment for the characteristic features of the sound.
- Residual sound level, L_r = $L_{Aeq,T}$ – the equivalent continuous sound pressure level at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, over a given reference time interval, T.

1.3.18 The standard determines the degree of noise impact by comparison of the background noise level at Noise Sensitive Receptors (NSRs) in the absence of the industrial or commercial facility (the specific source) with the ambient sound level when the specific source is operational.

1.3.19 Where characteristics such as tones, intermittency or impulsivity are present in the noise emissions of the specific source and perceptible at the receptor, the standard requires that "penalties" be added to the specific sound level to account for the increased annoyance that these can cause.

1.3.20 The following evaluation impact significance identifiers are provided in the standard, in which the difference between the specific sound level and measured background level are considered:

- the greater the difference, the greater the magnitude of impact;
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context;
- the lower the rating level, relative to the measured background level, the less likely that the specific sound source will have an adverse (or significant adverse) impact; and
- where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

1.3.21 The standard also makes the following comments:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

1. *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.

3. The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- *facade insulation treatment;*
- *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- *acoustic screening."*

1.3.22 Whilst the latest revision of BS 4142 does not provide definition of low or very low background and rating levels the previous (1997) version considered that background levels of 30 dBA and rating levels of 35 dBA could be considered low.

1.3.23 Numerous studies by Moorhouse, Berry, Flindell, etc for the Health Protection Agency and for Defra (referenced within the Further Reading Section of BS 4142) and supported by the recent Association of Noise Consultants Working Group report on BS4142 application (Association of Noise Consultants, March 2020) conclude that impacts at rating levels below 35 dB are unlikely.

1.3.24 At night, particularly, where potential sleep disturbance is the key issue, a rating level of below 35 dB results in internal levels significantly below the BS 8233 guideline values.

ISO 9613; Attenuation of sound during propagation outdoors, Part 1 and Part 2

1.3.25 ISO 9613 1&2 describe a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

1.4 Consultation

1.4.1 **Table 1** provides details of consultations undertaken with relevant regulatory bodies, together with action undertaken by the Applicant in response to consultation comments.

Table 1: Consultation Relevant to Noise and Vibration

Consultee	Key Consultee Comments	Application Action
Perth and Kinross Council (PKC) (31 July 2025)	PKC EIA screening opinion submitted.	Screening Opinion received 31st July 2025 confirming that an EIA is not required.
PKC (28th August 2025)	PKC screening response received, dated 28th August 2025 for Application Reference: 25/01164/SCRN. Key points relating to noise and vibration are detailed below. Section (e) Pollution and nuisances PKC consideration: "*Will the development cause noise and vibration or release of leachates, light, heat energy or electromagnetic radiation during construction or operation or decommissioning?*" PKC description: "*Construction phase could provide a source of noise."* PKC Significance of Impact: *"Low Potential to be significant given proximity to residential receptors but any impact could be controlled by conditions*." PKC consideration: "*Will the development cause noise and vibration or release of light, heat energy or electromagnetic radiation?*" Specifically, "*from construction or operational traffic?*" and PKC description: "*Noise and vibration during construction and operation*." PKC Significance of Impact "*Could have an impact on residential amenity/neighbouring land use depending on hours associated with construction traffic and facility maintenance, but unlikely given distance from nearest* ***residential receptors (sic)***."	Undertake a noise assessment following PKC planning guidance and policies. Submit report in support of planning application.

1.5 Assessment Methodology and Significance Criteria

Study Area

1.5.1 The Study Area considered in this assessment encompasses the land within the Proposed Development boundary and the nearest residential NSRs which may be impacted upon by noise emissions from the site.

1.5.2 Noise levels due to the Proposed Development at more distant NSRs will be lesser than at the closest NSRs, therefore compliance with criteria at the closest NSRs will entail compliance at those more distant.

Receptors Requiring Assessment

1.5.3 The nearest residential noise sensitive receptors (NSRs) to the Proposed Development have been identified and are described in **Table 2** and are shown in **Figure 1**.

Table 2: NSRs considered in this assessment

NSR ID	Description	X	Y
NSR1	Residential – Milden Road, KY14 7SR	317303.63	712221.43
NSR2	Residential - Balvaird	318237.40	712741.31

Desk Study

Prediction of Operational Noise Levels

1.5.4 Noise levels potentially generated by the Proposed Development have been predicted at identified representative NSRs within noise modelling software CadnaA, using the propagation method set out in ISO9613. The model assumes soft ground conditions, with absorption set to G=1.0, except for the BESS compound which is set to G=0 (hard ground), and the land containing the PV panels is set to G=0.6 (mixed ground). The model considers screening provided by local topography in the form of 1 m resolution digital terrain mapping (DTM) data. A typical air temperature of 10°C and relative humidity of 70% have been assumed within the model.

1.5.5 Although the exact equipment specification and technology provider is unknown at this time, the Applicant has confirmed that the CATL EnerC+ battery unit and PE GEN3 Inverter are appropriate for use as indicative items of plant for this assessment.

- Inverters, 2 no. – Power Electronics HEMK/PCSK GEN3 INVERTER, Sound Optimised, total modelled Sound Power Level 83.6 dB(A) per unit
- Batteries, 4 no. – CATL Ener C+, total modelled Sound Power Level 80.3 dB(A) per unit
- Transformers, 1 no. within the BESS and 5 within the solar array – total modelled Sound Power Level 79.7 dB(A) per unit

1.5.6 The batteries and inverters have been modelled as 3D objects, with their noise emissions coming from area sources and vertical area sources which represent the tops and sides of the units. Transformers have been modelled as point sources.

1.5.7 For the source data of the transformers, we have applied spectral data for a transformer, obtained during noise monitoring of an operational BESS site. Noise test reports for the batteries and inverter have been supplied by the manufacturer,

and verification modelling undertaken in which the test scenario for each item of equipment has been recreated in CadnaA.

1.5.8 In the verification modelling, receivers have been placed at the same locations as the reported microphone positions. The reported 1/3 octave-band sound power levels of the equipment have been entered as source data, and where necessary the sound power levels of the individual area sources/vertical area sources have been adjusted equally in each frequency band so that the predicted sound pressure levels at the receivers match as closely as possible to the reported sound pressure levels during the tests.

1.5.9 NSRs have been modelled as a receiver placed on the closest approach to the Proposed Development.

1.5.10 The sound power levels for the BESS equipment are shown in **Table 3** as octave-band data. The octave band spectra have been normalised within the model to the A-weighted sound power level, following the verification exercise.

Table 3: Sound Power Levels

Item	Octave Band Sound Power Level (centre frequency in Hz), dB								Normalised Sound Power Level, dB(A)
	63	125	250	500	1k	2k	4k	8k	
CATL EnerC+	75.3	78.6	79.7	77.8	76.5	71.7	67.2	67.0	80.3
PE Gen3 Inverter	80.5	91.5	78.5	71.0	70.1	68.7	69.3	68.4	83.6
Transformer	31.3	44.3	31.8	34.3	28.6	21.0	12.9	1.3	79.7

1.5.11 The actual model of battery and inverter plant installed will depend on the outcome of a tendering process. This assessment therefore considers representative candidate plant, noting that the installed plant may be different. Battery and inverter technology is currently developing at a rapid pace, and noise is often a primary constraint in the UK market. Technology providers are therefore delivering units with increasingly improved noise performance. It is therefore reasonable to assume that by the time the Proposed Development is ready to build, following planning consent and becoming operational, quieter plant than the candidate considered in this assessment will be available.

Rating Levels

1.5.12 BS4142 requires consideration of potential character corrections that may be applied to noise from the BESS. When determining whether any character corrections should apply to the Specific Level for deriving the Rating Level, in accordance with BS4142, this assessment notes the following:

- the 1/3 octave spectral data at each receptor have been tested for potential tonal components in accordance with the third octave method referenced in BS4142 and found to be non-tonal (see **Annex 2**);
- operation of the BESS will not result in impulsive characteristics;
- the operational profile of the BESS was considered;

- the site will produce noise only whilst the batteries are charging or discharging and will be effectively silent at other times. Charging and discharging occurs for periods of >1 hour at a time, i.e. reasonably prolonged, and greater than the BS4142 reference periods for daytime and night-time;
- it is therefore considered that noise from the site will not have intermittent characteristics; and,
- on the basis of the above, no corrections have been applied, and the Rating Level is therefore equal to the predicted Specific Level.

Baseline Noise Survey

1.5.13 SLR Consulting undertook a baseline survey between Friday 13th June 2025 and Wednesday 18th June 2025, encompassing weekday and weekend periods. Monitoring was undertaken in accordance with BS 4142 and BS 7445, using Rion NL-52 Class I integrating sound level meters (SLM). Conditions were mainly calm and dry at the time of the survey, with intermittent precipitation periods. Any non-compliant weather periods were omitted from the collected datasets.

1.5.14 The SLMs were within their laboratory calibration period, and a calibration check was performed before and after each measurement, with no drift in calibration noted.

1.5.15 Monitoring was undertaken at two noise monitoring positions (NMPs) to characterise the noise environments at the NSRs.

- NMP1, at the western boundary of the site, representative of NSR1
- NMP2, at the north-eastern boundary of the site, representative of NSR2

1.5.16 Unattended long-term measurements were undertaken for a period of approximately six days.

1.5.17 The long term NMPs were located at the closest points of the site to the NSRs and were positioned to provide security for the monitoring equipment. Observations by the surveyor confirmed that the NMPs were suitably representative of the noise environment at the NSRs.

1.5.18 The monitoring positions are shown in **Figure 1**.

1.5.19 **Table 4** presents a summary of the results of the baseline survey. Further details of the measured baseline noise are presented in **Annex 1**.

Table 4: Measured sound levels

NMP	Period	$L_{Aeq,T}$ dB	$L_{Amax,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB
Daytime					
NMP1	12:30 13/06/2025 – 13:15 15/06/2025	49	87	47	37
NMP2	14:02 13/06/2025 - 11:47 18/06/2025	49	89	44	36
Night					

NMP	Period	$L_{Aeq,T}$ dB	$L_{Amax,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB
NMP1	23:00 13/06/2025 - 07:00 15/06/2025	44	71	40	30
NMP2	23:00 13/06/2025 - 07:00 18/06/2025	46	86	38	32

1.5.20 Statistical analysis examining the cumulative distribution of the measured background sound levels, L_{A90}, has been undertaken in order to derive a representative background sound level (see **Annex 1**) at each NSR.

Table 5: Representative background sound level

NMP/NSR	Daytime, $L_{A90,T}$, dB	Night-time, $L_{A90,T}$, dB
NMP1 / NSR1	37	30
NMP2 / NSR2	36	32

Assessment of Likely Significance

1.5.21 Noise impacts have been determined with reference to BS4142 guidance. The specific noise level resulting from the operation of the Proposed Development has been predicted at identified representative NSRs.

1.5.22 The guidance contained within Technical Advice Note to PAN 1/2011 has been used to adopt an appropriate set of significance criteria. The receptor sensitivity criteria considered in this assessment are presented in **Table 6**.

Table 6: NSR Sensitivity

Receptor Sensitivity	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise.	Residential, quiet outdoor recreational areas, schools and hospitals.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.	Offices and restaurants.
Low	Receptors where distraction or disturbance from noise is minimal.	Buildings not occupied, factories and working environments with existing levels of noise.

1.5.23 This assessment considers all identified NSRs to be of high sensitivity, given that they are residential dwellings.

1.5.24 The significance of operational noise from the Proposed Development has been determined based on the guidance contained within BS4142, i.e. by consideration of the difference between the rating level and the prevailing background sound levels, with respect to context and the resulting sound levels in absolute terms.

1.5.25 The impact magnitudes associated with operational noise from the Proposed Development are presented in **Table 7**.

Table 7: Noise Impact Magnitude

Difference, d, Between Rating Level ($L_{Ar,Tr}$) and Background Sound Level (L_{A90})	BS4142 Guidance	Adopted Impact Magnitude
d >+10	Indication of significant adverse impact	High
d >+5, ≤10	Indication of adverse impact	Medium
d ≤+5, >0	Indication of no adverse Impact	Low
d ≤0	Indication of low impact	Negligible
Where the rating level ($L_{Ar.Tr}$) is below 35dB the impact magnitude is classified as 'Low' or lesser, regardless of the relationship to the background noise level.		
Where predicted internal levels at NSRs are below NR20 with windows open impact magnitude is classified as low.		

1.5.26 The effect significance for operational noise has been determined by consideration of both the receptor sensitivity and the impact magnitude according to the matrix detailed in **Table 8**.

Table 8: Effect Significance Matrix

Impact Magnitude	Receptor Sensitivity		
	High	**Medium**	**Low**
High	Major	Moderate	Minor
Medium	Moderate	Minor	Negligible
Low	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible

1.5.27 Effects with a significance of moderate and major are considered **significant**. Effects with a significance of negligible and minor are considered **not significant**.

Requirements for Mitigation

1.5.28 Mitigation will be specified where significant adverse effects are identified.

Assessment of Residual Effect Significance

1.5.29 Where mitigation is proposed, residual effect significance has also been determined with reference to the adopted noise criteria following specification of appropriate mitigation.

Assessment of Cumulative Effects

1.5.30 A review of the study area, including recent planning history, and consultation with PKC has identified three developments within 5 km of the Proposed Development, either in operation or in planning at the time of assessment (September 2025), summarised in **Table 9**.

Table 9: Potential Cumulative Developments within 5 km

Site Name	Development Type	Reference and Status	Approximate Distance and Direction from Site
Binn Eco Park Solar **(BEPS)**	5 MW solar PV installation	21/00705/FLL Consented	1 km north
Binn Eco Park BESS **(BEPB)**	Installation of 10 MW BESS and associated works	21/00834/FLL Consented	1 km north
Abernethy Battery Energy Storage Project **(ABESP)**	Installation of a 64.9MW battery energy storage system and associated infrastructure (ECU00005044)	25/00545/ECU36 Decision in Principle	5 km north-north-east

Limitations to Assessment

1.5.31 The assessment of operational noise impacts associated with the Proposed Development has been undertaken adopting representative source noise levels for batteries, inverters and transformers. The actual plant installed will be subject to the outcome of the tendering process, however, the equipment chosen will be selected to ensure compliance with the adopted noise criteria outlined in this assessment.

1.6 Scope of the Assessment

Impacts Scoped Out of Assessment

1.6.1 It is considered that construction noise impacts may be minimised by appropriate controls on working hours, specification of appropriate plant and methods and implementation of best practices and, therefore, the prediction and evaluation of construction noise is scoped out.

1.6.2 No significant sources of vibration are expected, and therefore further consideration of vibration during the construction and operational phases has been scoped out.

Environmental Measures Embedded into the Development Proposals

1.6.3 The Applicant is committed to meeting appropriate noise limits, during the construction and decommissioning phase and the operational phase.

1.6.4 Appropriate noise limits for construction noise have been derived from measured baseline data, in accordance with methods provided in BS5228 as follows:

- Daytime (07:00 – 18:00) and Saturdays (08:00 – 13:00) – 65 dB $L_{Aeq,T}$;
- Evenings and weekends (19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00 – 23.00 Sundays) – 55 dB $L_{Aeq,T}$; and
- Night-time (23:00 – 07:00) – 45 dB $L_{Aeq,T}$.

1.6.5 The limits detailed above will inform the Construction Environmental Management Plan (CEMP). Construction and environmental management plans are introduced

in Section 4: The Proposed Development of the Supporting Environmental Information (SEI) Report and will be secured via a condition in agreement with PKC.

1.6.6 Inverters for the solar array will be in-line inverters, rather than large, centralised inverters. In-line inverters produce little to no noise emissions.

1.7 Assessment of Potential Effects

Construction Effects

1.7.1 As noted above, noise impacts during the construction phase will be limited by the implementation of a CEMP. Compliance with the noise limits will result in construction phase noise effects being **not significant**.

Operational Effects

1.7.2 The predicted operational noise levels are provided and evaluated against BS4142 criteria in **Table 10**. Following the details provided in Planning Condition 12 for cumulative project Ref: 25/00545/ECU36 predicted operational noise levels are considered in the context:

"*Noise from the battery storage facility shall not exceed $L_{A90,15min}$ background noise level plus 5dB(A) when measured at any residential property in accordance with BS4142:2014 including any relevant penalties for tonality, impulsivity, intermittency, or other sound characteristics, when measured at any residential property in accordance with BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound*."

Table 10: Evaluation of Operational Noise Levels

NSR ID	Predicted Specific Noise Level, dB $L_{Aeq,T}$	Character correction, rationale	Derived rating level, $dBL_{Ar,Tr}$	Limiting rating noise level, $dBL_{Ar,Tr}$, (background +5 dB)	Comparison with criterion, (predicted level minus limiting level), dB(A)
Daytime period (1hr)					
NSR1	26	0, no tonality, intermittency or impulsivity	26	42	-16
NSR2	24		24	41	-17
Night-time period (15 mins)					
NSR1	29	0, no tonality, intermittency or impulsivity	29	35	-6
NSR2	25		25	37	-12

1.7.3 Predicted rating levels are below the BS 4142 criteria of background +5 dB at all receptors and the initial assessment of impacts, with reference to **Table 7**, indicates a low impact.

1.7.4 Predicted rating levels are also substantially below 35 dB and, with reference to **Table 7**, this also indicates a **negligible impact**.

1.7.5 Following the details provided in Planning Condition 11 for cumulative project Ref: 25/00545/ECU36 predicted operational noise levels are considered in the context of a NR20 target maximum noise level for bedrooms during the night-time period in **Table 11** and

1.7.6 **Table** 12, representing NSR1 and NSR2 respectively.

1.7.7 Façade corrections of +2 dB have been included within the predicted facade levels, and an open window has been assumed.

Table 11: Evaluation of predicted night-time internal noise levels, NSR1

	Octave Band Level, dB						
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Predicted Façade Level	33.6	34.4	26.4	26.1	26.2	20.0	7.7
Open Window reduction	15	15	15	15	15	15	15
Predicted Internal Level	18.6	19.4	11.4	11.1	11.2	5.0	-7.3
NR 20 curve	51.3	39.4	30.6	24.3	20	16.8	14.4
Margin of Compliance	-32.7	-20.0	-19.2	-13.2	-8.8	-11.8	-21.7

Table 12: Evaluation of predicted night-time internal noise levels, NSR2

	Octave Band Level, dB						
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Predicted Façade Level	31.5	34.5	24.4	22.9	21.3	13.8	-1.1
Open Window reduction	15	15	15	15	15	15	15
Predicted Internal Level	16.5	19.5	9.4	7.9	6.3	-1.2	-16.1
NR 20 curve	51.3	39.4	30.6	24.3	20	16.8	14.4
Margin of Compliance	-34.8	-19.9	-21.2	-16.4	-13.7	-18.0	-30.5

1.7.8 The predicted level due to operation of the facility within bedrooms meets the target NR20 level at each octave band by a substantial margin.

1.7.9 As demonstrated in **Table 11** and

1.7.10 **Table** 12, the operation of the facility meets the PKC criteria (based on similar approved schemes) for a night-time indoor noise limit of NR20. This assessment therefore considers that noise from the operation of the facility will have low impact.

1.7.11 This assessment therefore considers that noise impacts will be **not significant**.

Decommissioning Effects

1.7.12 As noted above, noise impacts during the decommissioning phase will be limited by the implementation of a CEMP. Compliance with the noise limits will result in decommissioning phase noise effects being **not significant**.

1.8 Mitigation

1.8.1 The assessment has demonstrated that the Proposed Development will meet the PKC criteria, therefore no additional mitigation is proposed.

1.9 Assessment of Residual Effects

Construction

1.9.1 No requirement for specific additional mitigation has been determined for the construction phase, therefore no additional mitigation is proposed, and residual effects remain unchanged and are **not significant**.

Operation

1.9.2 No specific additional mitigation has been determined to be required for the operational phase; therefore, no additional mitigation is proposed, and residual effects remain unchanged and are **not significant**.

1.10 Assessment of Cumulative Effects

1.10.1 Cumulative developments which were operational within the study area during the baseline sound survey have been considered as they form part of the existing soundscape.

1.10.2 Details of approved schemes within a 5 km radius are provided in **Table 9**.

1.10.3 The ABESP site is located approximately 5 km north of the proposed Binn Farm Solar and BESS site. This site is not considered to have a cumulative impact on the identified receptors due to separation distance and screening from intervening topography.

1.10.4 The BEPS site is around 1 km north of the proposed Binn Farm Solar and BESS site. The main infrastructure including PV panels and transformers associated with the BEPS scheme are located >1.5 km north of cumulative receptor NSR1 and NSR2. Due to the significant separation distance between the identified NSRs and BEPS, combined with screening provided from existing industrial buildings and topography, any cumulative effects from operational noise would be expected to be negligible.

1.10.5 The BEPB site is some 1 km north of the proposed Binn Farm Solar and BESS site. The NSR closest to the BEPB site is NSR2, at approximately 800 m to the nearest BEPB noise sources. Due to the significant screening from the intervening terrain

through Glen Wood and the large separation distance any cumulative effects from operational noise would be expected to be negligible.

1.11 Summary

1.11.1 Information on noise and vibration within the noise and vibration study area was collected through desktop review, site surveys and consultation.

1.11.2 Overall, it is concluded that there will be no likely significant residual effects arising from the Proposed Development during the construction, operational and maintenance or decommissioning phases.

1.11.3 Cumulative effects at NSRs from the approved or proposed schemes within a 5km search area were considered to be negligible.

1.11.4 Mitigation during construction will be secured within the CEMP. Mitigation measures for operational noise are not considered necessary.

1.12 References

BSI Publications. 2019. “BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.”

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BSI Publications. 2014. “BS8233:2014 Guidance on sound insulation and noise reduction in buildings.”

ISO. 1993. “ISO 9613 Acoustics - Attenuation of sound during propagation outdoors, Part 1: Calcualtion of the absorption of sound by the atmosphere, Part2: General method of calculation.”

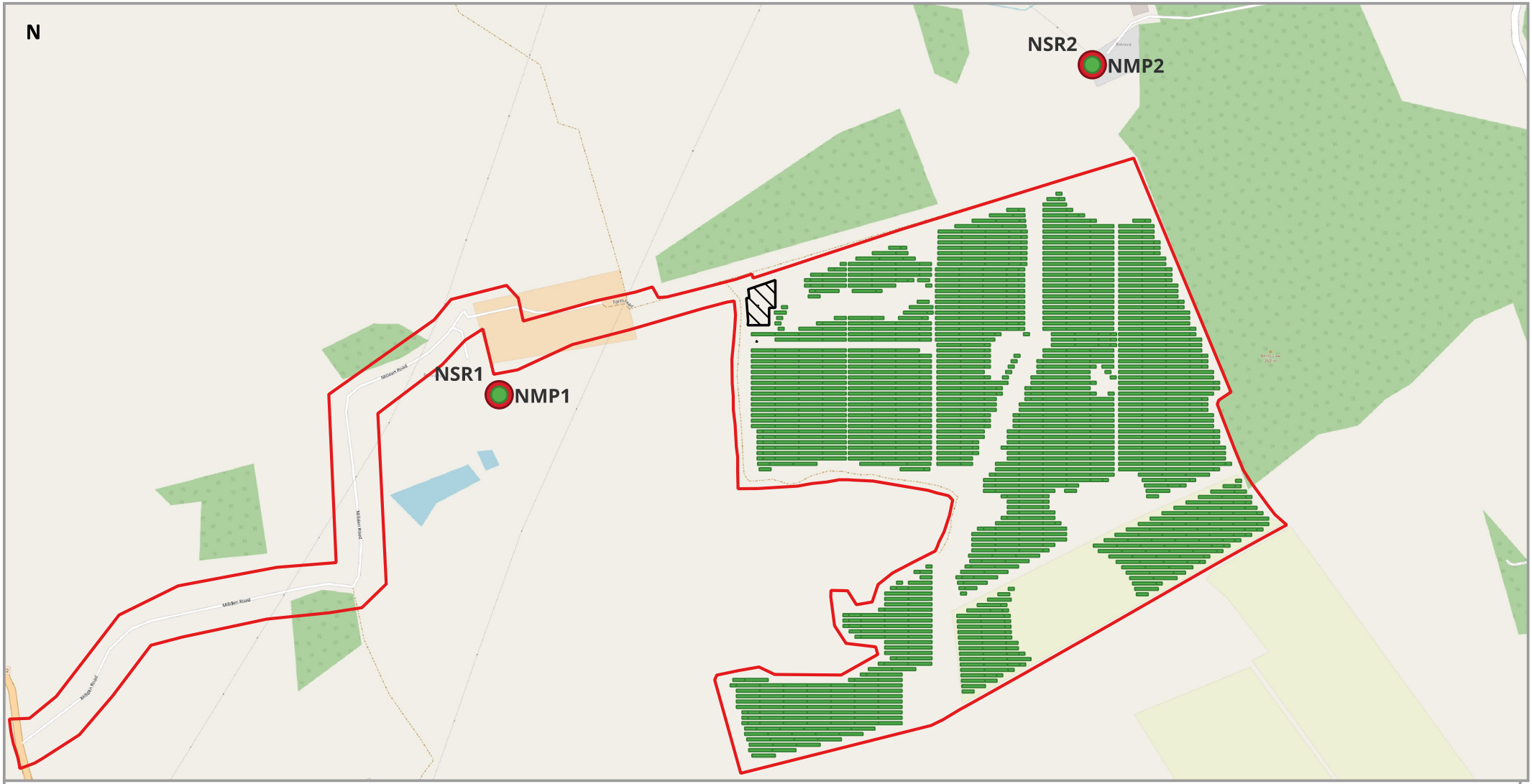
Scottish Government. 2024. *National Planning Framework 4.* Scottish Government.

Scottish Government. 2011. *Planning Advice Note 1, PAN1/2011.* Scottish Government.

Association of Noise Consultants Good Practice Working Group, BS4142:2014+A1:2019 Technical Note, 2020

Perth and Kinross Council (2019). Perth and Kinross Local Development Plan 2, Adopted 29 November 2019.

Figure



KEY

- NMPs
- BinnFarm_AUXTransformers
- Site_Boundary_Extension
- NSRs
- BinnFarm_SolarPV
- BinnFarm_BESSCompound

Coordinate System: OSGB86
Projection: Transverse Mercator

Service Layer Credits:
Contains OS data © Crown Copyright and database rights 2019

0 0.01 0.02 0.03 0.04 kilometres

Scale @ A4: 1:8,553.288488

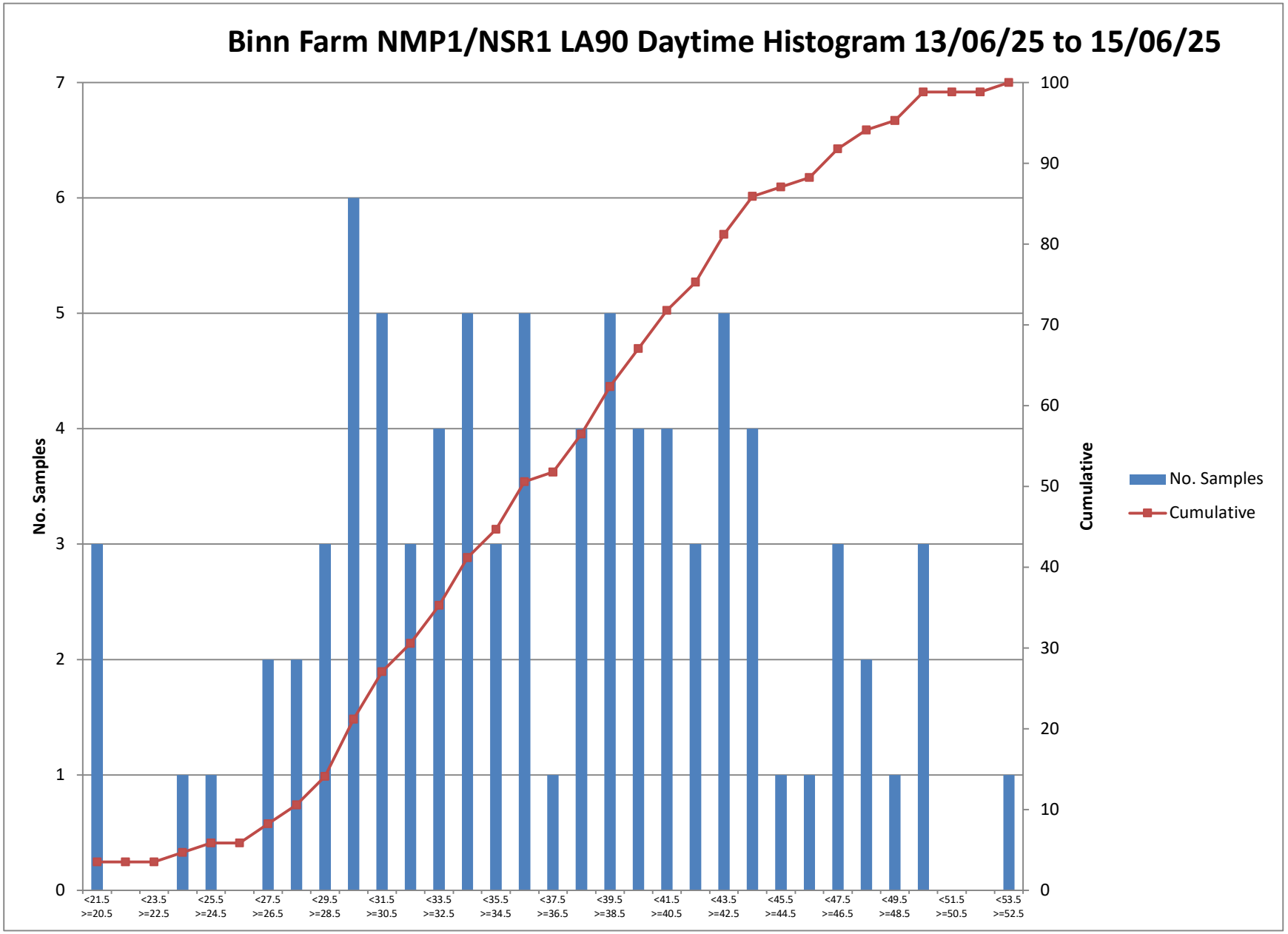
Binn Farm Solar & BESS EIA
Noise Impact Assessment Proposed Layout

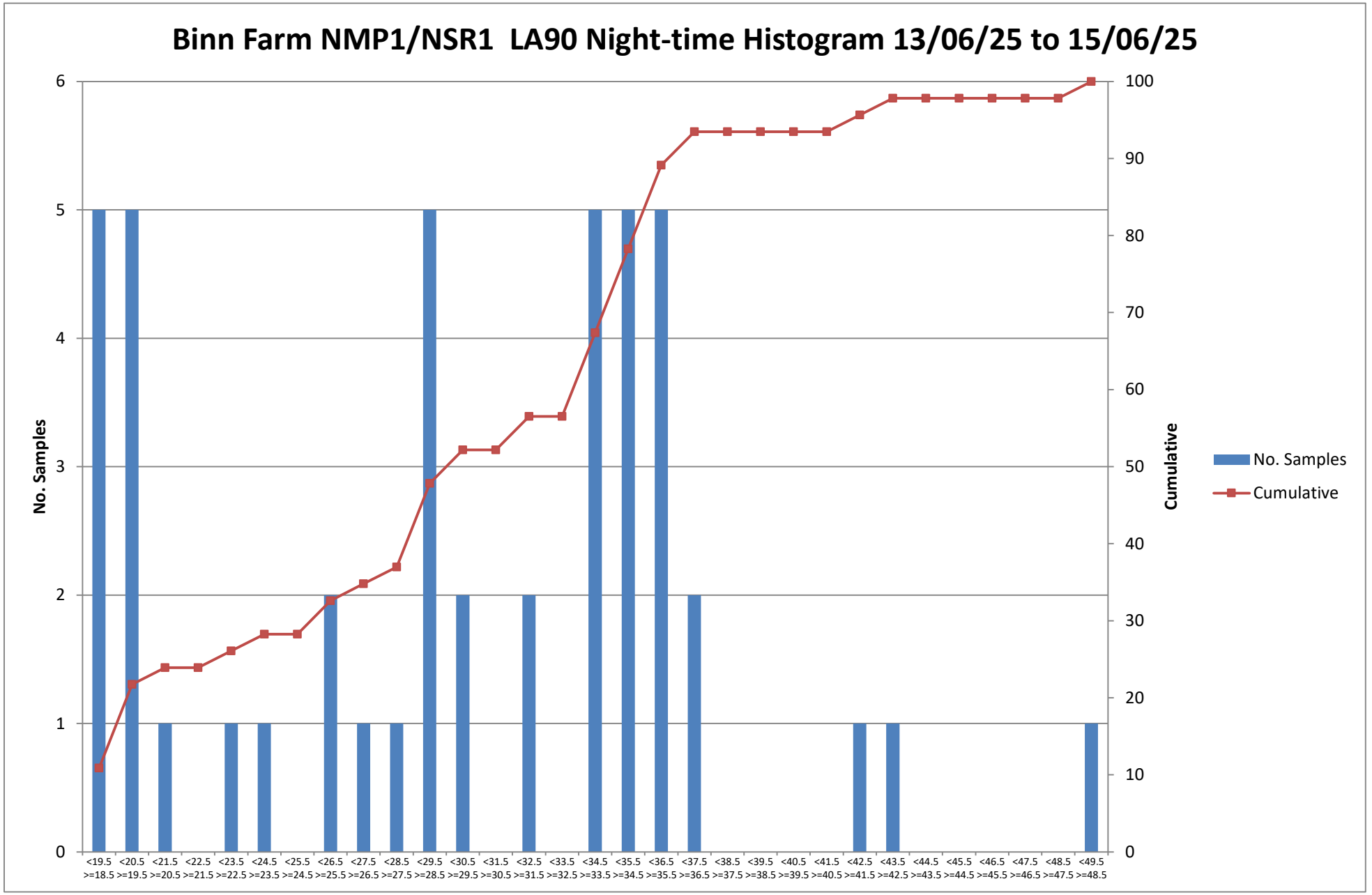
SLR

Figure 1 Proposed Layout with NSRs, NMPs

Date:	Lead:	Review:	Version:
13/11/2025	DC	DC	v1.0

Annex 1 - Baseline Data and Analysis


Binn Farm NMP1/NSR1 LA90 Daytime Histogram 13/06/25 to 15/06/25
No. Samples
Cumulative
0
1
2
3
4
5
6
7
0
10
20
30
40
50
60
70
80
90
100
<21.5 >=20.5
<23.5 >=22.5
<25.5 >=24.5
<27.5 >=26.5
<29.5 >=28.5
<31.5 >=30.5
<33.5 >=32.5
<35.5 >=34.5
<37.5 >=36.5
<39.5 >=38.5
<41.5 >=40.5
<43.5 >=42.5
<45.5 >=44.5
<47.5 >=46.5
<49.5 >=48.5
<51.5 >=50.5
<53.5 >=52.5
No. Samples
Cumulative


Binn Farm NMP1/NSR1 LA90 Night-time Histogram 13/06/25 to 15/06/25
No. Samples
Cumulative
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
80
90
100
<19.5 >=18.5
<20.5 >=19.5
<21.5 >=20.5
<22.5 >=21.5
<23.5 >=22.5
<24.5 >=23.5
<25.5 >=24.5
<26.5 >=25.5
<27.5 >=26.5
<28.5 >=27.5
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<30.5 >=29.5
<31.5 >=30.5
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<44.5 >=43.5
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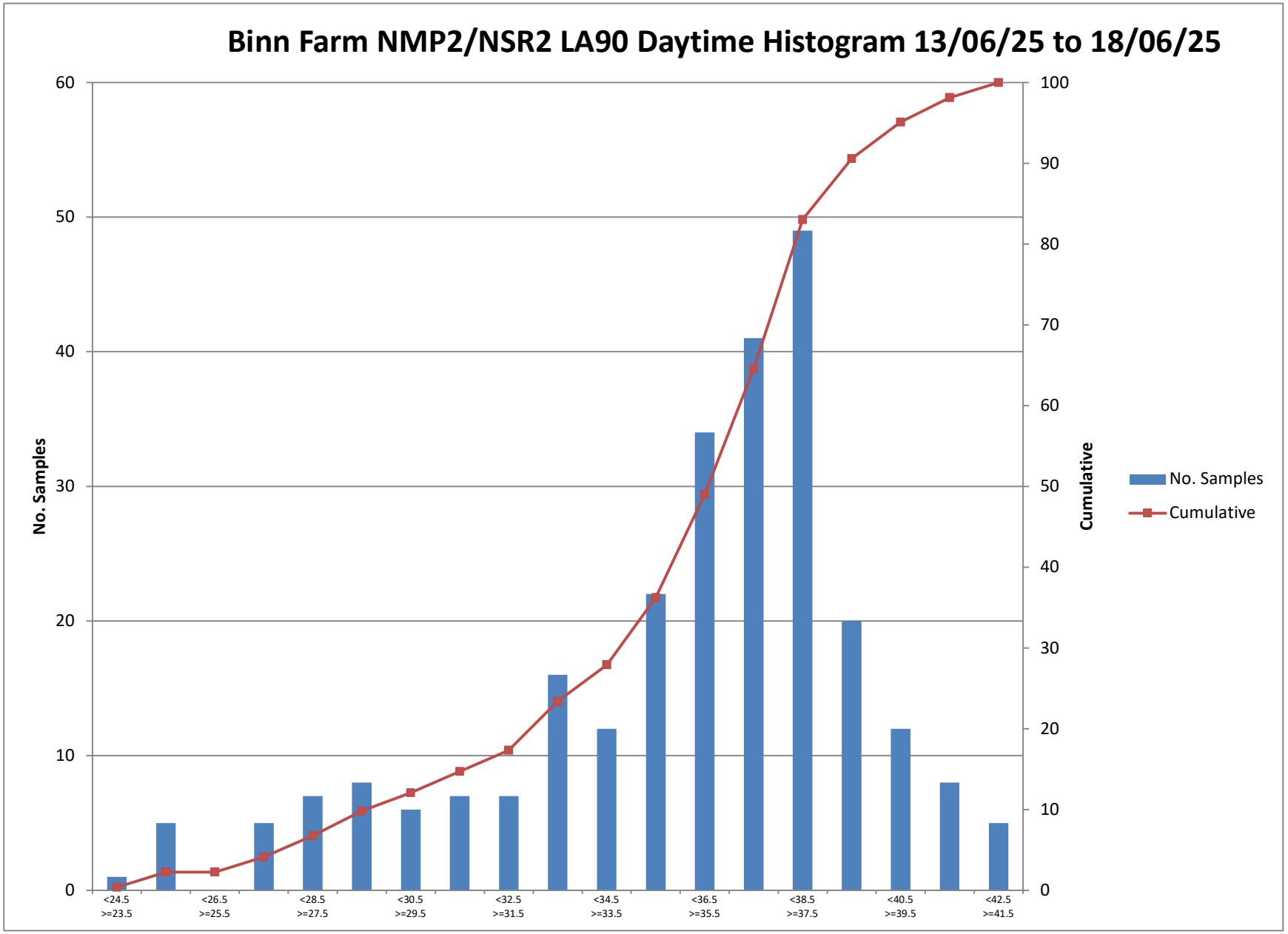
<48.5 >=47.5
<49.5 >=48.5
No. Samples
Cumulative


Binn Farm NMP2/NSR2 LA90 Daytime Histogram 13/06/25 to 18/06/25
No. Samples
Cumulative
0
10
20
30
40
50
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0
10
20
30
40
50
60
70
80
90
100
<24.5 >=23.5
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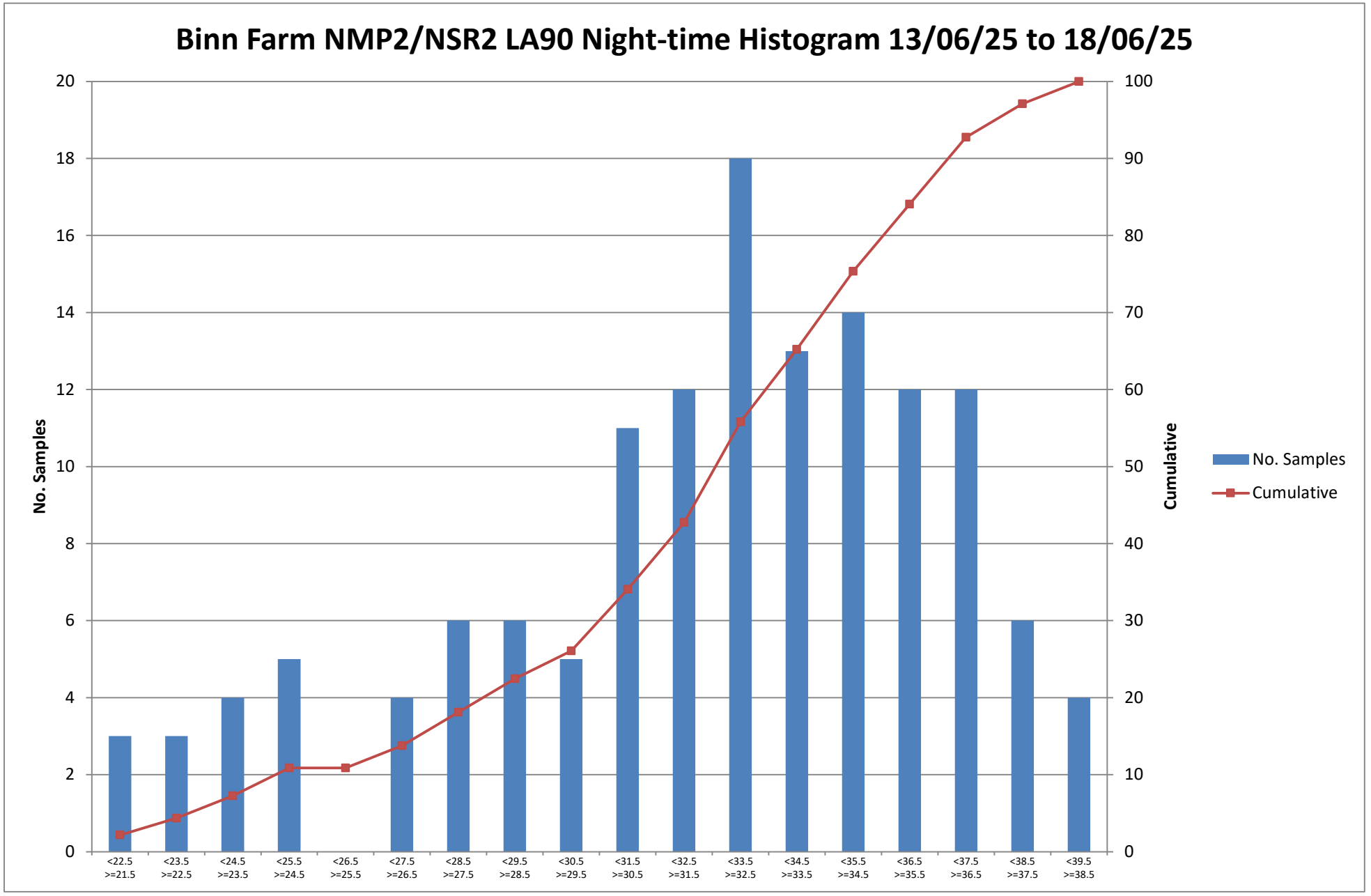
<32.5 >=31.5
<34.5 >=33.5
<36.5 >=35.5
<38.5 >=37.5
<40.5 >=39.5
<42.5 >=41.5
No. Samples
Cumulative


Binn Farm NMP2/NSR2 LA90 Night-time Histogram 13/06/25 to 18/06/25
No. Samples
Cumulative
No. Samples
Cumulative
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60
70
80
90
100
<22.5 >=21.5
<23.5 >=22.5
<24.5 >=23.5
<25.5 >=24.5
<26.5 >=25.5
<27.5 >=26.5
<28.5 >=27.5
<29.5 >=28.5
<30.5 >=29.5
<31.5 >=30.5
<32.5 >=31.5
<33.5 >=32.5
<34.5 >=33.5
<35.5 >=34.5
<36.5 >=35.5
<37.5 >=36.5
<38.5 >=37.5
<39.5 >=38.5

Annex 2 - Third Octave Predicted Noise Levels

NSR1 Daytime

	15dB								8dB					5dB												
	25 to 125								160 to 400					500 to 10,000												
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
paste here:	37.9	35.6	32.5	30.5	27.6	27.8	32.2	28.4	23.7	18.9	17.7	14.8	16.2	17.1	16.8	20.3	18.8	16.4	14.7	11.3	7.9	2.6	-4.3	-11.9	-24.8	-42.5	-71.1
left		-2.3	-3.1	-2	-2.9	0.2	4.4	-3.8	-4.7	-4.8	-1.2	-2.9	1.4	0.9	-0.3	3.5	-1.5	-2.4	-1.7	-3.4	-3.4	-5.3	-6.9	-7.6	-12.9	-17.7	-28.6
right	2.3	3.1	2	2.9	-0.2	-4.4	3.8	4.7	4.8	1.2	2.9	-1.4	-0.9	0.3	-3.5	1.5	2.4	1.7	3.4	3.4	5.3	6.9	7.6	12.9	17.7	28.6	
Condition	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
A weighted	-7	-4	-2	0	1	5	13	12	10	8	9	8	11	14	15	20	19	17	16	13	9	4	-3	-11	-25	-44	-74
Correction A-wt	-44.7	-39.4	-34.6	-30.2	-26.2	-22.5	-19.1	-16.1	-13.4	-10.9	-8.6	-6.6	-4.8	-3.2	-1.9	-0.8	0	0.6	1	1.2	1.3	1.2	1	0.5	-0.1	-1.1	-2.5
Linear	**37.9**	**35.6**	**32.5**	**30.5**	**27.6**	**27.8**	**32.2**	**28.4**	**23.7**	**18.9**	**17.7**	**14.8**	**16.2**	**17.1**	**16.8**	**20.3**	**18.8**	**16.4**	**14.7**	**11.3**	**7.9**	**2.6**	**-4.3**	**-11.9**	**-24.8**	**-42.5**	**-71.1**

TONES

	NSR1 Night-time																										
	15dB								8dB					5dB													
	25 to 125								160 to 400					500 to 10,000													
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
paste here:	37.7	35.4	32.4	30.4	27.7	27.9	32.3	28.8	23.9	22.8	21.9	19.1	20.6	21.6	21.4	22.7	21.5	19.4	17.6	14.5	11.5	6.7	0.3	-6.8	-19.1	-36.0	-64.5
left		-2.3	-3	-2	-2.7	0.2	4.4	-3.5	-4.9	-1.1	-0.9	-2.8	1.5	1	-0.2	1.3	-1.2	-2.1	-1.8	-3.1	-3	-4.8	-6.4	-7.1	-12.3	-16.9	-28.5
right	2.3	3	2	2.7	-0.2	-4.4	3.5	4.9	1.1	0.9	2.8	-1.5	-1	0.2	-1.3	1.2	2.1	1.8	3.1	3	4.8	6.4	7.1	12.3	16.9	28.5	
Condition	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
A weighted	-7	-4	-2	0	2	5	13	13	11	12	13	13	16	18	20	22	22	20	19	16	13	8	1	-6	-19	-37	-67
Correction A-wt	-44.7	-39.4	-34.6	-30.2	-26.2	-22.5	-19.1	-16.1	-13.4	-10.9	-8.6	-6.6	-4.8	-3.2	-1.9	-0.8	0	0.6	1	1.2	1.3	1.2	1	0.5	-0.1	-1.1	-2.5
Linear	**37.7**	**35.4**	**32.4**	**30.4**	**27.7**	**27.9**	**32.3**	**28.8**	**23.9**	**22.8**	**21.9**	**19.1**	**20.6**	**21.6**	**21.4**	**22.7**	**21.5**	**19.4**	**17.6**	**14.5**	**11.5**	**6.7**	**0.3**	**-6.8**	**-19.1**	**-36**	**-64.5**

TONES

NSR2 Daytime

	15dB								8dB					5dB												
	25 to 125								160 to 400					500 to 10,000												
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
paste here:	34.6	32.3	29.1	28.4	25.5	26.2	33.2	25.9	21.8	17.4	15.9	13.1	13.4	15.2	14.6	16.9	15.7	13.2	11.3	7.7	4.3	-2.1	-10.5	-20.7	-38.8	-66.5	-80.2
left		-2.3	-3.2	-0.7	-2.9	0.7	7	-7.3	-4.1	-4.4	-1.5	-2.8	0.3	1.8	-0.6	2.3	-1.2	-2.5	-1.9	-3.6	-3.4	-6.4	-8.4	-10.2	-18.1	-27.7	-13.7
right	2.3	3.2	0.7	2.9	-0.7	-7	7.3	4.1	4.4	1.5	2.8	-0.3	-1.8	0.6	-2.3	1.2	2.5	1.9	3.6	3.4	6.4	8.4	10.2	18.1	27.7	13.7	
Condition	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	25Hz	**31.5Hz**	**40Hz**	**50Hz**	**63Hz**	**80Hz**	**100Hz**	**125Hz**	**160Hz**	**200Hz**	**250Hz**	**315Hz**	**400Hz**	**500Hz**	**630Hz**	**800Hz**	**1kHz**	**1.25kHz**	**1.6kHz**	**2kHz**	**2.5kHz**	**3.15kHz**	**4kHz**	**5kHz**	**6.3kHz**	**8kHz**	**10kHz**
A weighted	-10	-7	-6	-2	-1	4	14	10	8	7	7	7	9	12	13	16	16	14	12	9	6	-1	-10	-20	-39	-68	-83
Correction A-wt	-44.7	-39.4	-34.6	-30.2	-26.2	-22.5	-19.1	-16.1	-13.4	-10.9	-8.6	-6.6	-4.8	-3.2	-1.9	-0.8	0	0.6	1	1.2	1.3	1.2	1	0.5	-0.1	-1.1	-2.5
Linear	**34.6**	**32.3**	**29.1**	**28.4**	**25.5**	**26.2**	**33.2**	**25.9**	**21.8**	**17.4**	**15.9**	**13.1**	**13.4**	**15.2**	**14.6**	**16.9**	**15.7**	**13.2**	**11.3**	**7.7**	**4.3**	**-2.1**	**-10.5**	**-20.7**	**-38.8**	**-66.5**	**-80.2**

TONES

	NSR2 Night-time																									
	15dB								8dB					5dB												
	25 to 125								160 to 400					500 to 10,000												
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
paste here:	34.3	32.0	28.8	28.2	25.3	26.2	33.4	26.2	22.3	21.4	19.3	16.5	17.0	18.7	18.2	18.0	16.7	14.2	11.6	8.0	4.6	-1.8	-10.2	-20.3	-38.4	-66.1	-80.2
left		-2.3	-3.2	-0.6	-2.9	0.9	7.2	-7.2	-3.9	-0.9	-2.1	-2.8	0.5	1.7	-0.5	-0.2	-1.3	-2.5	-2.6	-3.6	-3.4	-6.4	-8.4	-10.1	-18.1	-27.7	-14.1
right	2.3	3.2	0.6	2.9	-0.9	-7.2	7.2	3.9	0.9	2.1	2.8	-0.5	-1.7	0.5	0.2	1.3	2.5	2.6	3.6	3.4	6.4	8.4	10.1	18.1	27.7	14.1	
Condition	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	25Hz	**31.5Hz**	**40Hz**	**50Hz**	**63Hz**	**80Hz**	**100Hz**	**125Hz**	**160Hz**	**200Hz**	**250Hz**	**315Hz**	**400Hz**	**500Hz**	**630Hz**	**800Hz**	**1kHz**	**1.25kHz**	**1.6kHz**	**2kHz**	**2.5kHz**	**3.15kHz**	**4kHz**	**5kHz**	**6.3kHz**	**8kHz**	**10kHz**
A weighted	-10	-7	-6	-2	-1	4	14	10	9	11	11	10	12	16	16	17	17	15	13	9	6	-1	-9	-20	-39	-67	-83
Correction A-wt	-44.7	-39.4	-34.6	-30.2	-26.2	-22.5	-19.1	-16.1	-13.4	-10.9	-8.6	-6.6	-4.8	-3.2	-1.9	-0.8	0	0.6	1	1.2	1.3	1.2	1	0.5	-0.1	-1.1	-2.5
Linear	**34.3**	**32**	**28.8**	**28.2**	**25.3**	**26.2**	**33.4**	**26.2**	**22.3**	**21.4**	**19.3**	**16.5**	**17**	**18.7**	**18.2**	**18**	**16.7**	**14.2**	**11.6**	**8**	**4.6**	**-1.8**	**-10.2**	**-20.3**	**-38.4**	**-66.1**	**-80.2**

TONES