



FIVE
ESTUARIES
OFFSHORE WIND FARM

FIVE ESTUARIES
OFFSHORE WIND FARM
PRELIMINARY ENVIRONMENTAL
INFORMATION REPORT

VOLUME 5, ANNEX 9.1: ONSHORE
AIRBORNE NOISE BASELINE NOISE
SURVEY

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A	Feb-23	Final for PEIR	BOW Acoustics	GoBe	VE OWFL

In general, field survey data used to inform the Five Estuaries Offshore Wind Farm PEIR were gathered specifically for the Project. However, in instances where the North Falls Offshore Wind Farm Project held pertinent survey data and reports, these have been provided to the Five Estuaries Offshore Wind Farm Project for use in the PEIR.

This annex includes information that has been provided by the North Falls Offshore Wind Farm Project for use by the Five Estuaries Offshore Wind Farm Project. It should be noted that all relevant technical information is included in the Five Estuaries Offshore Wind Farm Project PEIR, regardless of initial source.



Five Estuaries Offshore Wind Farm Limited
Five Estuaries Offshore Wind Farm – Onshore Airborne Noise
Baseline Noise Survey

Project Number: 22111

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1 Introduction

- 1.1.1 Bow Acoustics has been appointed by SLR Consulting Limited on behalf of Five Estuaries Offshore Wind Farm Limited to conduct an airborne noise and vibration assessment of the onshore elements of the proposed Five Estuaries Offshore Wind Farm (hereafter VE). This report describes the baseline noise surveys undertaken for the assessment and is written to be appended to the Noise and Vibration chapter of the Preliminary Environmental Impact Report (PEIR).
- 1.1.2 The study area for the noise and vibration assessment of the onshore elements of VE is separated into three main areas:
- the Landfall, where the offshore export cables are brought ashore and jointed to the onshore export cables in the Transition Joint Bays (TJBs);
 - the Export Cable Corridor (ECC); and
 - the Onshore Substation (OnSS).
- 1.1.3 Baseline noise surveys were undertaken to inform the assessments for the Landfall and OnSS. Surveys were carried out in July 2022 by Royal HaskoningDHV (RHDHV) as part of the assessment for North Falls Offshore Wind Farm, which has infrastructure proposed in close proximity to VE. Further surveys were carried out at the end of September through to the start of October 2022 by Bow Acoustics to supplement these data. This report presents the details for both sets of surveys.
- 1.1.4 Consultation was carried out with Essex County Council and Tendring District Council prior to the surveys being carried out and locations and general approach was agreed with all parties.
- 1.1.5 A glossary of terminology is provided in Appendix A.

2 Overview

2.1 Consultation

- 2.1.1 Consultation was carried out with Essex County Council and Tendring District Council through the PPA. The general approach to the assessment and survey, including locations was detailed in a letter dated 28 July 2022, a meeting on 4 August 2022 and a further letter dated 30 August 2022. An email from Tendring District Council was received on the 1 August 2022 agreeing to the details set out in the letter dated 28 July 2022. A further email was received from Tendring District Council on the 5 September 2022 agreeing to the details of the letter dated 30 August 2022.
- 2.1.2 The agreed approach uses baseline noise data measured in July 2022 for the North Falls Offshore Wind Farm project and in September and October 2022 on behalf of Five Estuaries.

2.2 Relevant Guidance

British Standard 4142

- 2.2.1 British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142)⁽¹⁾ provides a method for rating the likelihood of complaint from industrial and commercial operations. It describes a measurement procedure, as summarised below.
- 2.2.2 At the beginning and end of every measurement session a field calibration check is to be carried out at one or more frequencies. If a difference in calibration values of more than 0.5 dB is noted the results of the measurements should be treated with caution.
- 2.2.3 An outdoor measurement location should be chosen that will be representative of the ambient and background sound levels at the assessment location(s). Measurements should be made at a height of 1.2 m to 1.5 m above ground level and at least 3.5 m from any reflecting surface other than the ground. Measurements at other heights are permitted, but appropriate corrections for any façade reflections must be made. Appropriate precautions should be made against wind-induced noise passing across the microphone, rain falling on the microphone and any electromagnetic interference.
- 2.2.4 Weather conditions that could affect measurements should be recorded. For unattended surveys a logging meteorological station should be used. Wind speeds and directions are to be recorded and caution is to be applied to any data obtained during wind speeds of greater than 5m/s. Temperature is also to be recorded at the start and end of the measurement period.
- 2.2.5 The measurement time interval should be sufficient to obtain a representative value of the background sound level for the period of interest. BS 4142 considers impacts during the daytime: 0700 hours to 2300 hours, and the night-time: 2300 hours to 0700 hours. The measurement time interval is not normally less than 15 minutes.
- 2.2.6 In determining the representative background noise level, which forms the basis for assessment of impacts, BS 4142 advises that there is no single background sound level as it is a fluctuating parameter. Guidance is provided of how to obtain a representative background sound level through a process of statistical analysis and that the selected value should not automatically be assumed to be the minimum, modal or mean values.

British Standard 5228

- 2.2.7 Annex G of British Standard 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' (BS 5228)⁽²⁾ provides guidance on appropriate measurement methods. It focuses on the monitoring of noise emitted from a construction site for the purpose of assessing compliance with noise control targets. Whilst this does not apply to this

assessment at this stage, general advice is provided on the appropriateness of the instrumentation that should be used for the survey.

- 2.2.8 Recommendation is made to measure sound using an instrument system designed to determine equivalent continuous A-weighted sound pressure levels. Preferably, the sound level meter should conform to Type 1 of BS 7580-1:1997, or Class 1 of BS EN 61672-1:2003, both of which would enable a measurement uncertainty of less than 1 dB.

British Standard 7445

- 2.2.9 British Standard 7445:2003 'Description and measurement of environmental noise' (BS 7445)⁽³⁾ provides details of the instrumentation and measurement techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level (L_{Aeq}). Part 2 of BS 7445 replicates International Standards Organisation (ISO) 1996-2.

2.3 Project Information

- 2.3.1 The study area for the noise and vibration assessment of the onshore elements of VE, to which this baseline noise survey supports, is separated into three main areas. These areas are set out below and discussed in more detail subsequently.

- The Landfall;
- The ECC; and
- The OnSS.

The Landfall

- 2.3.2 The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in the TJBs.

- 2.3.3 The main assessment will consider noise and vibration impacts during the construction phase only for this area. Therefore, the aim of the baseline noise survey is to determine typical ambient noise levels during the periods of assessment set out in BS 5228-1. These are:

- Night-time – 2300 hours to 0700 hours every night of the week;
- Evening and weekends – 1900 to 2300 hours weekdays, 1300 to 2300 hours Saturdays and 0700 to 2300 hours Sundays; and
- Daytime and Saturdays – 0700 to 1900 hours weekdays and 0700 to 1300 hours Saturdays.

The ECC

- 2.3.4 The ECC connects the Landfall to the OnSS at Little Bromley. The main cable route will have a length of approximately 20 km and will require the use of trenchless crossing techniques. The cable will be buried under ground.

- 2.3.5 The main assessment will consider noise and vibration impacts during the construction phase only for this area. Due to the scale of the ECC area baseline noise surveys would not be feasible; therefore, the assessment will assume the most stringent noise limits in place of limits based on a noise survey.

The OnSS

- 2.3.6 The OnSS will be located in one of two search areas, referred to as SSA West and SSA East. For the noise assessment SSA West was separated into two areas SSA1, to the north of Ardleigh Road and SSA2 to the south of Ardley Road. SSA East is not separated and is referred to as SSA3 in this Annex. SSA1 has an area of just under 45 ha and is situated north east of the existing substation near the junction of Little Bromley Road, Ardleigh Road and Grange Road. SSA2 has an area of just over 60 ha and is situated south of SSA1, south east of the existing

substation. SSA3 has an area of approximately 120 hectares and is situated north of the section of the A120 that runs between Little Bentley and Horsley Cross.

2.3.7 The main assessment will consider noise and vibration impacts during the construction phase and noise impacts during the operation of the substation. Therefore, the aim of the baseline noise survey is to determine typical ambient noise levels during the periods of assessment set out in BS 5228-1, to inform the construction assessment. Typical background noise levels, as defined by the L_{A90} parameter, will be used to inform the operational noise assessment using the BS 4142 assessment periods:

- Daytime – 0700 to 2300 hours every day of the week; and
- Night-time – 2300 to 0700 hours every night of the week.

3 Baseline Noise Survey Methodology

3.1 Measurement Locations

3.1.1 Background sound levels were measured at a total of 14 locations. Three locations around the Landfall area, and 11 around the OnSS, split into: four around SSA1, three around SSA2 and four around SSA3. The coordinates of the survey locations are set out in Table 1 and locations illustrated in Figure 1 through to Figure 3. Further details are provided in Appendix B of the survey locations, including photographs.

Table 1: Noise Monitoring Locations

ID	Description	Area	Easting	Northing
LF1	To the east of dwellings off Church Lane, Great Holland, approximately 1.6 km north of Landfall.	Landfall	622002	219278
LF2	Finton Golf Course, north east of number 1 green and south of dwellings on Linkside.	Landfall	623253	219263
LF3	Frinton Golf Course, adjacent to the carpark and to the rear of the gardens of dwellings on Second Avenue.	Landfall	623316	218954
S1-1	Hollywell Farm	OnSS (SSA1)	609148	229057
S1-2	Badley Hall	OnSS (SSA1)	607190	228928
S1-3	Mayfields Farm	OnSS (SSA1)	607494	229514
S1-4	Grange Farm	OnSS (SSA1)	608736	230032
S2-1	Normans Farm	OnSS (SSA2)	608423	228518
S2-2	Hall Farm barn conversion	OnSS (SSA2)	609034	227876
S2-3	Fields between Lilleys Farm and Barlon House	OnSS (SSA2)	608189	227712
S3-1	Branham Hall	OnSS (SSA3)	610235	228356
S3-2	Welhams Farm	OnSS (SSA3)	610934	226915
S3-3	Abbots Hall	OnSS (SSA3)	612083	227632
S3-4	New Hall	OnSS (SSA3)	611472	228270

- 3.1.2 The noise survey at the three Landfall locations, the four SSA1 locations (S1-1 to S1-4) and S2-1, were carried out by the North Falls noise team, RHDHV. The remaining six locations were surveyed by Bow Acoustics. Survey locations were agreed with Essex County Council and Tendring District Council prior to the them taking place.
- 3.1.3 All data, either captured by RHDHV or Bow Acoustics, was reviewed and processed as described by Section 9.7 of Volume 3, Chapter 9: Airborne Noise and Vibration of the PEIR.
- 3.1.4 At all monitoring locations, the microphone was placed 1.5 m above the ground in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, in accordance with BS 4142. Care was taken to avoid influence from any localised noise sources close to the monitoring position, that would otherwise be unrepresentative of the noise climate at the assessment location.

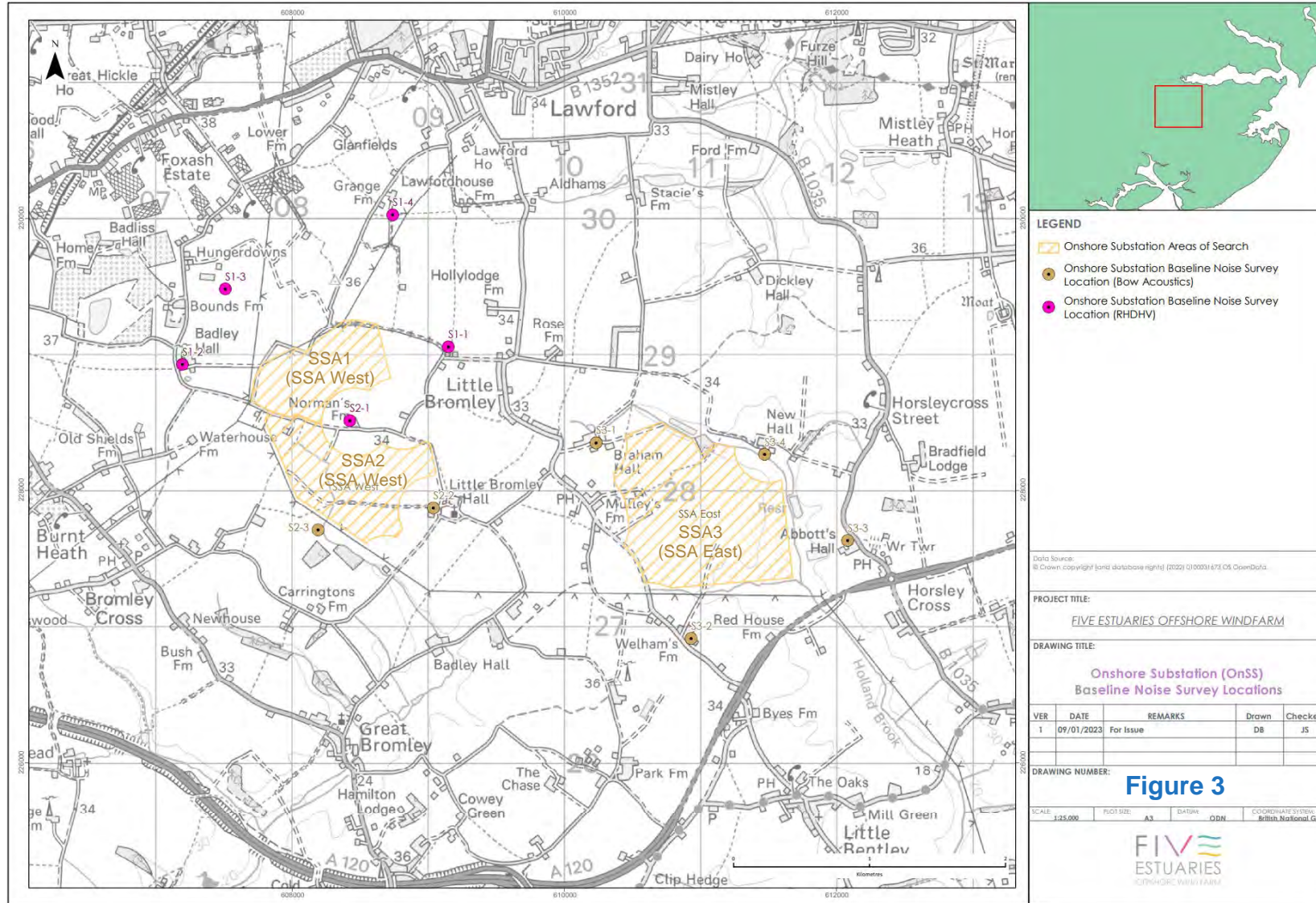
Figure 1: Overview of Noise Survey Locations



Figure 2: Landfall Noise Monitoring Locations



Figure 3: OnSS Noise Survey Locations



3.2 Instrumentation

3.2.1 The equipment used for the survey comprised either a Rion NL-52, or a Norsonic 140 logging sound level meter, both of which confirm to Class 1 of BS EN 61672-1:2003. Table 2 lists the equipment used. Field calibrations were undertaken at the deployment and collection of each sound level meter, see Appendix B for further details.

Table 2: Noise Monitoring Equipment

ID	Equipment	Serial Number	Calibrated
LF1	Rion NL-52 Class 1 sound level meter	864983	30/09/2020
LF2	Rion NL-52 Class 1 sound level meter	864982	30/09/2020
LF3	Rion NL-52 Class 1 sound level meter	898320	26/10/2021
S1-1	Norsonic 140 Class 1 sound level meter	1403342	01/07/2021
S1-2	Norsonic 140 Class 1 sound level meter	1405219	06/07/2021
S1-3	Rion NL-52 Class 1 sound level meter	864982	30/09/2020
S1-4	Rion NL-52 Class 1 sound level meter	864983	30/09/2020
S2-1	Norsonic 140 Class 1 sound level meter	1406177	23/07/2020
S2-2	Rion NL-52 Class 1 sound level meter	586907	28/07/2022
S2-3	Rion NL-52 Class 1 sound level meter	586905	20/05/2022
S3-1	Rion NL-52 Class 1 sound level meter	620864	22/09/2022
S3-2	Rion NL-52 Class 1 sound level meter	610193	09/02/2022
S3-3	Rion NL-52 Class 1 sound level meter	1143558	11/01/2022
S3-4	Rion NL-52 Class 1 sound level meter	620867	10/05/2022

3.2.2 Outdoor enhanced windshield systems were used to reduce wind induced noise on the microphones and provide protection from rain. These windshield systems were supplied by the sound level meter manufacturer and maintain the required performance of the whole measurement system when fitted.

3.2.3 In addition, weather conditions during the surveys were monitored using a Davis professional weather station that samples data every 2.5 seconds and averages over the same 15 minute period as the sound level meters. Multiple parameters are captured, including those relevant to a noise survey:

- Temperature;
- Wind speed;
- Wind direction; and
- Rainfall.

3.3 Survey Method

3.3.1 All surveys carried out were classed as long-term, unattended surveys and were carried out by a competent expert. The exact duration that sound was measured at each location varied, further details are provided in Table 3. The soundscape and contributing sources were observed during each visit to set up and collect equipment. Measurements were carried out in accordance with BS 7445.

Table 3: Noise Survey Duration

ID	Start time	End time	Duration
LF1	07/07/22 12:00	08/07/22 12:30	1 day
LF2	07/07/22 13:15	08/07/22 13:30	1 day
LF3	07/07/22 13:15	08/07/22 13:15	1 day
S1-1	07/07/22 16:15	19/07/22 07:30	11 days, 15 hours
S1-2	07/07/22 19:15	18/07/22 21:00	11 days, 2 hours
S1-3	08/07/22 17:30	20/07/22 09:30	11 days, 16 hours
S1-4	08/07/22 15:45	20/07/22 10:15	11 days, 19 hours
S2-1	07/07/22 16:45	18/07/22 22:45	11 days, 6 hours
S2-2	26/09/22 15:30	03/10/22 11:30	6 days, 20 hours
S2-3	26/09/22 16:15	03/10/22 11:45	6 days, 20 hours
S3-1	26/09/22 11:30	03/10/22 10:00	6 days, 23 hours
S3-2	26/09/22 12:45	03/10/22 10:30	6 days, 22 hours
S3-3	26/09/22 14:15	03/10/22 10:45	6 days, 20 hours
S3-4	26/09/22 14:45	03/10/22 11:00	6 days, 20 hours

3.3.2 The following parameters were recorded continuously every 15 minutes during the surveys:

- L_{Aeq} : The A-weighted equivalent continuous noise level over the measurement period;
- L_{A90} : The A-weighted noise level exceeded for 90% of the measurement period;
- L_{Amax} : The maximum A-weighted noise level during the measurement period.

3.3.3 The internal clocks on all equipment used for monitoring sound and meteorological conditions were synchronised to enable data to be accurately correlated.

3.4 Measurement Uncertainty

3.4.1 The level of uncertainty associated with a measurement of sound level is discussed in BS 4142, and will depend on a number of factors, including:

- the complexity and variability of the acoustic environment and the sources that influence it;
- the locations selected for taking the measurements;
- the number of measurements taken;
- the measurement time intervals;
- the range of times when the measurements have been taken;
- the range of suitable weather conditions during which measurements have been taken;
- the level of rounding of each measurement recorded; and
- the instrumentation used.

3.4.2 Measurement uncertainty was minimised using the following steps:

- measurement locations were representative of the nearest noise-sensitive receptors to the site;
- measurement positions were located away from reflecting surfaces and leaf vegetation;
- a logging period of 15 minutes was used to provide representative background sound levels;
- where possible, the sound measurements included weekday and weekend periods;

- instrumentation was appropriate and in accordance with Section 5 of BS 4142;
- data was recorded to 1 decimal place and only rounded when presenting;
- weather conditions were logged locally to each survey and data recorded during inappropriate conditions were removed from the assessment;
- data were inspected for atypical values and other known events or activity that were considered to result in an unrepresentative level were excluded from the analysis; and
- the survey was undertaken by a competent acoustician with membership of the IOA.

4 Baseline Noise Levels

4.1 General

4.1.1 Appendix C contains full details of the measured noise levels, including time history graphs and histograms of the background noise levels. Set out below is a summary of the data relevant to the various assessments.

4.2 Soundscape

4.2.1 The typical soundscape noted during the set up and collection of equipment is summarised in Table 4.

Table 4: Soundscape at Measurement Locations

ID	Description of soundscape and contributing sources
LF1	Natural sounds including bird song, with distant road traffic and agricultural activity
LF2	Natural sounds including sea breaking and bird song, with distant road traffic and golf activity
LF3	Natural sounds including sea breaking and bird song, with distant road traffic and golf activity
S1-1	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and agricultural activity. Distant noise from a field irrigator and agricultural pump to the south of measurement location was noted during set up only.
S1-2	Natural sounds including bird song, wild animal calls and wind disturbed vegetation, with distant road traffic, aircraft and agricultural activity.
S1-3	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and agricultural activity.
S1-4	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and agricultural activity.
S2-1	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and agricultural activity. Distant noise from an agricultural pump to the west of measurement location was noted during set up only.
S2-2	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and occasional dog barking. Distant noise from an agricultural pump to the south of measurement location was noted during collection only. It is noted that the sound level meter was in the acoustic shadow of the dwelling of the noise from the pump.
S2-3	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic and aircraft.
S3-1	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, aircraft and occasional dog barking.
S3-2	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, agricultural activity and aircraft.
S3-3	A mixture of natural sound and fairly constant road traffic noise, but not intrusive. Natural sources include wind disturbed vegetation and bird song. Noise from aircraft was also noted.
S3-4	Natural sounds including bird song and wind disturbed vegetation, with distant road traffic, agricultural activity and aircraft.

4.3 Baseline Noise for Construction

4.3.1 The ambient noise level, as measured using the L_{Aeq} parameter, informs the construction noise assessments in accordance with BS 5228. The overall L_{Aeq} is the logarithmic average of

remaining data following removal of periods that were considered to be unrepresentative. Analysis is separated into the three relevant BS 5228 assessment periods defined earlier. A summary of the overall ambient noise levels that will be used to inform the construction assessment are presented in Table 5.

Table 5: Baseline Noise Survey Summary – Construction

ID	Ambient Noise Level, dB $L_{Aeq, T}$		
	Daytime and Saturday morning	Evening and Weekends	Night-time
LF1	48	41	28
LF2	43	41	34
LF3	50	41	35
S1-1	41	38	32
S1-2	47	44	35
S1-3	45	42	36
S1-4	44	39	35
S2-1	44	38	34
S2-2	46	40	38
S2-3	46	43	37
S3-1	53	51	44
S3-2	49	50	40
S3-3	54	49	45
S3-4	46	39	35

4.4 Baseline Noise for Operation

4.4.1 Operational noise from VE is limited to that from the OnSS; and therefore, is not relevant to Landfall receptor locations. Such sources of noise are assessed using BS 4142 against the prevailing background. The background level has been defined using the L_{A90} noise parameter and the value presented in the summary table below has been selected based on the histograms presented in Appendix C, in accordance with the guidance provided in BS 4142. All data were inspected and any unrepresentative or extraneous events removed.

Table 6: Baseline Noise Survey Summary – Operation

ID	Background Noise Level, dB $L_{A90, T}$	
	Daytime	Night-time
S1-1	29	21
S1-2	32	25
S1-3	34	24
S1-4	30	22
S2-1	26	23
S2-2	29	26
S2-3	28	24

Background Noise Level, dB L _{A90, T}		
ID	Daytime	Night-time
S3-1	34	28
S3-2	33	26
S3-3	39	29
S3-4	29	23

5 Summary

- 5.1.1 Bow Acoustics has been appointed by SLR Consulting Limited to determine the existing baseline noise climate relevant to the onshore elements of the Five Estuaries Offshore Wind Farm.
- 5.1.2 Baseline noise surveys were carried out in July 2022 by Royal HaskoningDHV as part of the assessment for North Falls Offshore Wind Farm. Further surveys were carried out at the end of September through to the start of October 2022 by Bow Acoustics to supplement these data.
- 5.1.3 This report presents a summary of the baseline noise levels to be used for the assessment of construction and operational noise. Appendix C of this Annex contains full details of the measurement data.

6 References

1. British Standards Institution. 2019. 'British Standard 4142: 2014+A1:2019 Method for rating and assessing industrial and commercial sound'.
2. British Standards Institution. 2014. 'British Standard 5228-1: 2009+A1:2014 Code of practice for noise and vibration control on construction and open sites'.
3. British Standards Institution. 2003. 'British Standard 7445: 2003 Description and measurement of environmental noise'.

A - Appendix

GLOSSARY OF TERMS

Term or abbreviation	Meaning
Ambient noise	All-encompassing noise associated with a given environment, usually a composite of sounds from many sources both far and near, often with no particular sound being dominant
A weighting	A filter that down-weights low frequency and high frequency sound to better represent the frequency response of the human ear when assessing the likely effects of noise on humans. Denoted by a subscript A e.g. L_{Axx}
Background noise	The noise level rarely fallen below in any given location over any given time period, often classed according to daytime or night-time periods.
dB	Abbreviation for decibel, the SI unit normally employed to measure the magnitude of sound.
ECC	Export Cable Corridor, for the purpose of this report this refers to the onshore section of the cable carrying electricity from the TJB to the OnSS.
EIAR	Environmental Impact Assessment Report, the document that summarises the effect a proposed development would have on the environment.
Hertz, Hz	The SI unit normally employed to measure the frequency of a sound, equal to cycles per second of acoustic pressure fluctuations about the atmospheric mean pressure.
IOA	Institute of Acoustics, the professional body responsible for the acoustics industry.
$L_{Aeq,T}$	The abbreviation of the A-weighted equivalent continuous sound pressure level, representing a steady sound level which has the same energy as a time varying sound signal when averaged over the same time interval, T
L_{A10}	The abbreviation of the 10 percentile noise indicator, often used for the measurement of road traffic noise. The noise level exceeded for 10% of the measurement period.
L_{A90}	The abbreviation of the 90 percentile noise indicator, often used for the measurement of background noise. The noise level exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound pressure level measured over the measurement period.
Landfall	The area where the export cables are brought ashore from an offshore wind farm.
Noise	Physically: a regular and ordered oscillation of air molecules that travels away from the source of vibration and creates fluctuating positive and negative acoustic pressure above and below atmospheric pressure. Subjectively: sound that evokes a feeling of displeasure in the environment in which it is heard, and is therefore unwelcomed by the receiver.
OnSS	Onshore Substation, an electrical substation required to enable the onward distribution of electricity generated by the offshore wind farm.
PPA	Planning Performance Agreement enables all parties to be clear about what is required of them at all stages of the planning application process.

Term or abbreviation	Meaning
SSA_n	Substation Search Area <i>n</i> , a potential location for the OnSS, which may be located anywhere in the search area. Presently there are three SSA.
Sound	Physically: a regular and ordered oscillation of air molecules that travels away from the source of vibration and creates fluctuating positive and negative acoustic pressure above and below atmospheric pressure. Subjectively: the sensation of hearing excited by the acoustic oscillations described above (see also 'noise')
Sound Level Meter	An instrument for measuring sound pressure level.
TJB	Transition Joint Bays, the area where the export cables carrying electricity from an offshore wind farm come ashore and are connected with the onshore export cables.
VE	Five Estuaries Offshore Wind Farm

B - Appendix

BASELINE SURVEY DETAILS

B1 Survey Location LF1

B.1.1 Sound level meter coordinates: 622002, 219278

Figure 4: Survey Location LF1



B.1.2 Situated to the north of the Landfall, off Church Lane, Great Holland, in a field adjacent to the dwellings on Church Lane. The sound level meter was installed towards the end of a track approximately 60 m from Church Lane.

Table 7: Equipment Details - LF1

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	864983	30/09/2020	93.9 dB	93.9 dB
Field Calibrator	Rion NL-75	35084983	31/05/2022	n/a	n/a

Figure 5: Photograph from Survey Location LF1 Looking North



Figure 6: Photograph at Survey Location FL1 Looking East



Figure 7: Photograph of Survey Location LF1 Looking South



Figure 8: Photograph of Survey Location LF1 Looking West



B2 Survey Location LF2

B.2.1 Sound level meter coordinates: 623253, 219263

Figure 9: Survey Location LF2



B.2.2 Situated to the north east of the Landfall. Immediately south of dwellings on Linkside and to the west of the rear gardens of properties on Second Avenue, Frinton-on-Sea. The sound level meter was installed in a patch of rough ground approximately 40 m north east of the number 1 green of Frinton Golf Course.

Table 8: Equipment Details – LF2

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	864982	30/09/2020	94.0 dB	93.9 dB
Field Calibrator	Rion NL-75	35084983	31/05/2022	n/a	n/a

Figure 10: Photograph at Survey Location LF2 Looking North



Figure 11: Photograph at Survey Location FL2 Looking East



Figure 12: Photograph of Survey Location LF2 Looking South



Figure 13: Photograph of Survey Location LF2 Looking West



B3 Survey Location LF3

B.3.1 Sound level meter coordinates: 623316, 218954

Figure 14: Survey Location LF3



B.3.2 Situated to the north east of the Landfall, at Frinton Golf Course. The sound level meter was installed adjacent to the overflow carpark, approximately 50 m from the clubhouse.

Table 9: Equipment Details – LF3

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	898320	26/10/2021	93.7 dB	93.6 dB
Field Calibrator	Rion NL-75	35084983	31/05/2022	n/a	n/a

Figure 15: Photograph from Survey Location LF3 Looking North



Figure 16: Photograph at Survey Location FL3 Looking East



Figure 17: Photograph of Survey Location LF3 Looking South



Figure 18: Photograph of Survey Location LF3 Looking West



B4 Survey Location S1-1 Hollywell Farm

B.4.1 Sound level meter coordinates: 609148, 229057

Figure 19: Survey Location S1-1



B.4.2 Situated to the east of SSA1 and to the north west of Little Bromley. The sound level meter was installed on the field margin behind the rear garden area of the dwellings off Ardleigh Road. It is noted that the crop in the field was not harvested during the survey, as can be seen by in Figure 23.

Table 10: Equipment Details – S1-1

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Norsonic 140	1403342	01/07/2021	93.6 dB	93.8 dB
Field Calibrator	Rion NL-74	01020506	05/08/2021	n/a	n/a

Figure 20: Photograph at Survey Location S1-1 Looking North (taken on installation)



Figure 21: Photograph at Survey Location S1-1 Looking East (taken on installation)



Figure 22: Photograph of Survey Location S1-1 Looking South



Figure 23: Photograph of Survey Location S1-1 Looking West (taken on collection)



B5 Survey Location S1-2 Badley Hall

B.5.1 Sound level meter coordinates: 607190, 228928

Figure 24: Survey Location S1-2



B.5.2 Situated to the west of SSA1 and between the villages of Ardleigh and Little Bromley. The sound level meter was installed to the rear of Badley Hall, approximately 10 m from the garden area and 30 m from the main house.

Table 11: Equipment Details – S1-2

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Norsonic 140	1405219	06/07/2021	94.2 dB	93.8 dB
Field Calibrator	Rion NL-74	01020506	05/08/2021	n/a	n/a

Figure 25: Photograph at Survey Location S1-2 Looking North



Figure 26: Photograph at Survey Location S1-2 Looking East



Figure 27: Photograph of Survey Location S1-2 Looking South



Figure 28: Photograph of Survey Location S1-2 Looking West



B6 Survey Location S1-3 Mayfields Farm

B.6.1 Sound level meter coordinates: 607494, 229514

Figure 29: Survey Location S1-3



B.6.2 Situated to the north west of SSA1 and between the villages of Ardleigh and Little Bromley. The sound level meter was installed on the margins of fields within Mayfields Farm, approximately 300 m south east of the farmhouse.

Table 12: Equipment Details – S1-3

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	864982	30/09/2020	93.9 dB	94.0 dB
Field Calibrator	Rion NL-74	01020506	05/08/2021	n/a	n/a

Figure 30: Photograph at Survey Location S1-3 Looking North



Figure 31: Photograph at Survey Location S1-3 Looking East



Figure 32: Photograph of Survey Location S1-3 Looking South



Figure 33: Photograph of Survey Location S1-3 Looking West



B7 Survey Location S1-4 Grange Farm

6.1.1 Sound level meter coordinates: 608736, 230032

Figure 34: Survey Location S1-4



B.7.1 Situated to the north of SSA1 and north west of Little Bromley. The sound level meter was installed on the margins of fields within Grange Farm, approximately 150 m south east of the farmhouse. The adjacent corn field had not been harvested during the survey, as can be seen by comparing Figure 38, which was taken upon set up with Figure 36, which was taken upon collection.

Table 13: Equipment Details – S1-4

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	864982	30/09/2020	93.9 dB	94.0 dB
Field Calibrator	Rion NL-74	01020506	05/08/2021	n/a	n/a

Figure 35: Photograph at Survey Location S1-4 Looking North (taken the other side of the hedge)



Figure 36: Photograph at Survey Location S1-4 Looking East (taken upon collection)



Figure 37: Photograph of Survey Location S1-4 Looking South (taken during setup)



Figure 38: Photograph of Survey Location S1-4 Looking West (taken during setup)



B8 Survey Location S2-1 Normans Farm

B.8.1 Sound level meter coordinates: 608423, 228518

Figure 39: Survey Location S2-1



B.8.2 Situated central to SSA1 and SSA2 and west of Little Bromley. The sound level meter was installed in yard of Normans Farm, approximately 8 m from the corner of a brick barn, 15 m from the garden area and 30 m from the farmhouse. The weather station was located adjacent to the north west corner of the barn and highlighted in Figure 40.

Table 14: Equipment Details – S2-1

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Norsonic 140	1406177	23/07/2020	93.9 dB	93.6 dB
Field Calibrator	Rion NL-74	01020506	05/08/2021	n/a	n/a

Figure 40: Photograph at Survey Location S2-1 Looking North



Figure 41: Photograph at Survey Location S2-1 Looking East



Figure 42: Photograph of Survey Location S2-1 Looking South



Figure 43: Photograph of Survey Location S2-1 Looking West



B9 Survey Location S2-2 Hall Farm Barn Conversion

B.9.1 Sound level meter coordinates: 609034, 227876

Figure 44: Survey Location S2-2 (note satellite image not up to date)



B.9.2 Situated to the south east of SSA2 and south east of Little Bromley. The sound level meter was installed adjacent to Hall Farm barn conversion, to its north. To the south of the dwelling was an irrigation pump that was not running upon set up, but operating when the equipment was collected. The building would have acted as a noise barrier to this source, minimising its influence on the measurements.

Table 15: Equipment Details – S2-2

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	586907	28/07/2022	94.0 dB	94.0 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 45: Photograph at Survey Location S2-2 Looking North



Figure 46: Photograph at Survey Location S2-2 Looking East



Figure 47: Photograph of Survey Location S2-2 Looking South



Figure 48: Photograph of Survey Location S2-2 Looking West



B10 Survey Location S2-3 Fields between Lilleys Farm and Barlon House

B.10.1 Sound level meter coordinates: 608189, 227712

Figure 49: Survey Location S2-3



B.10.2 Situated to the south of SSA2 and north of Great Bromley. The sound level meter was installed approximately half way between Barlon House and Lilleys Farm, just off a farm track. The sound level meter was approximately 500m from both properties.

Table 16: Equipment Details – S2-3

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	586905	20/05/2022	94.0 dB	94.0 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 50: Photograph at Survey Location S2-3 Looking North



Figure 51: Photograph at Survey Location S2-3 Looking East



Figure 52: Photograph of Survey Location S2-3 Looking South



Figure 53: Photograph of Survey Location S2-3 Looking West



B11 Survey Location S3-1 Branham Hall

B.11.1 Sound level meter coordinates: 610235, 228356

Figure 54: Survey Location S3-1



B.11.2 Situated to the north east of SSA3 and east of Little Bromley. The sound level meter was installed in the orchard of Branham Hall, approximately 10 m from the garden and 30 m from the house. A weather station was set up at this location, as highlighted in Figure 55.

Table 17: Equipment Details – S3-1

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	620864	22/09/2022	93.7 dB	94.0 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 55: Photograph at Survey Location S3-1 Looking North



Figure 56: Photograph at Survey Location S3-1 Looking East



Figure 57: Photograph of Survey Location S3-1 Looking South



Figure 58: Photograph of Survey Location S3-1 Looking West



B12 Survey Location S3-2 Welhams Farm

B.12.1 Sound level meter coordinates: 610934, 226915

Figure 59: Survey Location S3-2



B.12.2 Situated to the south of SSA3 and north east of Little Bentley. The sound level meter was installed in the rear garden of Welhams Farm, adjacent to neighbouring property, Craigus. A position was selected that was more sheltered from noise from vehicles using the nearby Bentley Road and more distant A120. Note the photograph shown in Figure 60 also shows an anemometer which belonged to the property owners and is not connected to the noise survey. No data was obtained from this instrument to inform this assessment.

Table 18: Equipment Details – S3-2

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	610193	09/02/2022	93.8 dB	94.1 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 60: Photograph at Survey Location S3-2 Looking North



Figure 61: Photograph at Survey Location S3-2 Looking East



Figure 62: Photograph of Survey Location S3-2 Looking South



Figure 63: Photograph of Survey Location S3-2 Looking West



B13 Survey Location S3-3 Abbots Hall

B.13.1 Sound level meter coordinates: 612083, 227632

Figure 64: Survey Location S3-3



B.13.2 Situated to the east of SSA3 and north of Little Bentley. The sound level meter was installed in an area of amenity adjacent to the rear garden of Abbots Hall. The main garden of Abbots Hall runs up to the B1035, which was noted to have a steady flow of traffic during visits. The selected location was set further back from the B1035, approximately 50 m and approximately 350 m from the A120 which is situated to the south, beyond the farm buildings.

Table 19: Equipment Details – S3-3

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	1143558	11/01/2022	94.0 dB	93.9 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 65: Photograph at Survey Location S3-3 Looking North



Figure 66: Photograph at Survey Location S3-3 Looking East



Figure 67: Photograph of Survey Location S3-3 Looking South



Figure 68: Photograph of Survey Location S3-3 Looking West



B14 Survey Location S3-4 New Hall

B.14.1 Sound level meter coordinates: 611472, 228270

Figure 69: Survey Location S3-4



B.14.2 Situated to the north east of SSA3 and west of Little Bromley. The sound level meter was installed in garden of New Hall, approximately 7 m from a field ditch that was not free-flowing and no outlets visible.

Table 20: Equipment Details – S3-4

Item	Model	Serial No	Factory calibrated	Calibration start	Calibration end
Sound Level Meter	Rion NL-52	620867	10/05/2022	94.0 dB	94.0 dB
Field Calibrator	Rion NL-75	35292145	14/04/2022	n/a	n/a

Figure 70: Photograph at Survey Location S3-4 Looking North



Figure 71: Photograph at Survey Location S3-4 Looking East



Figure 72: Photograph of Survey Location S3-4 Looking South



Figure 73: Photograph of Survey Location S3-4 Looking West



C - Appendix

BASELINE SURVEY RESULTS

- C.1.1 A breakdown of the overall daily noise levels is provided here for the OnSS survey. Data have not been broken down for the Landfall survey as it comprised one 24-hour period only.
- C.1.2 Table 21 provides the daily breakdown of the L_{Aeq} noise levels measured during the BS5228 'Daytime and Saturday morning' periods for the first survey in July 2022 at S1-1 to S1-4, and S2-1. Data measured on Saturday 9th July 2022 during this period have been removed as the Tendring Show was taking place that day. Please note that Table 21 does not include data for 10th and 17th of July as they are Sundays and should not be included in this period. Similarly, data for the same assessment period measured during the second survey at S2-3, S2-4 and S3-1 to S3-4 is provided in Table 24.
- C.1.3 Table 22 presents the daily breakdown of the L_{Aeq} noise levels measured during the BS5228 'Evenings and weekends' period for the first survey in July 2022 at S1-1 to S1-4, and S2-1. Inspection of the data measured during this period of Saturday 9th July 2022 showed no influence of the Tendring Show, which was due to close at 1800 hours, 1 hour before the start of the evening period. Therefore, data from this time has been included. Similarly, data for the same assessment period measured during the second survey at S2-2, S2-3 and S3-1 to S3-4 is provided in Table 25. Note that during Friday 30th September 2022 there was an extended period of unsuitable weather and no data remained after exclusions.
- C.1.4 Table 23 presents the daily breakdown of the L_{Aeq} noise levels measured during the night-time period for the first survey in July 2022 at S1-1 to S1-4, and S2-1. Note that this period is the same for BS5228 and BS 4142 and data can be used with both assessment methods. Close inspection of the data showed a sharp rise in the night-time noise level typically after 0400 hours. This is consistent with the dawn chorus that is prevalent at the time of year of the survey. As this would not be representative for night-time noise levels for the whole year, data measured after 0400 hours was excluded from the night-time. Similarly, data for the same assessment period measured during the second survey at S2-2, S2-3 and S3-1 to S3-4 is provided in Table 26. No dawn chorus was noted during this second survey.
- C.1.5 Any entries that are marked with ^{'A'} denote that data was not recorded during the full measurement period, and any marked with ^{'B'} have been considered to be unrepresentative and removed from the assessment. It was noted that during the July 2022 survey harvesting and crop irrigation was taking place around the area and these factors are thought to be the cause of the majority of unrepresentatively high daily levels.

Table 21: July Ambient Noise Level Breakdown – BS5228 Daytime and Saturday Morning Period

Date	Noise Level, dB L_{Aeq}				
	S1-1	S1-2	S1-3	S1-4	S2-1
Thu 07/07/2022	38 ^A	-	-	-	38 ^A
Fri 08/07/2022	43	45	35 ^A	39 ^A	39
Mon 11/07/2022	43	51 ^B	43	41	45
Tue 12/07/2022	43	51 ^B	45	43	55 ^B
Wed 13/07/2022	42	46	46	43	51 ^B
Thu 14/07/2022	42	45	47	40	49 ^B
Fri 15/07/2022	41	45	44	52 ^B	48
Sat 16/07/2022	40	46	42	42	40
Mon 18/07/2022	42	44	45	50 ^B	41
Tue 19/07/2022	37 ^A	-	44	50 ^B	-
Wed 20/07/2022	-	-	48 ^A	49 ^A	-

Table 22: July Ambient Noise Level Breakdown – BS5228 Evening and Weekends Period

Date	Noise Level, dB LAeq				
	S1-1	S1-2	S1-3	S1-4	S2-1
Thu 07/07/2022	37	41	-	-	37
Fri 08/07/2022	37	41	42	39	39
Sat 09/07/2022	37	41	36	39	35
Sun 10/07/2022	39	44	42	41	42
Mon 11/07/2022	38	50 ^B	39	35	38
Tue 12/07/2022	38	46	41	40	38
Wed 13/07/2022	38	41	44	37	37
Thu 14/07/2022	35	43	38	36	34
Fri 15/07/2022	37	39	40	37	36
Sat 16/07/2022	39	45	42	41	38
Sun 17/07/2022	40	49	43	40	38
Mon 18/07/2022	38	-	42	39	35
Tue 19/07/2022	-	-	43	38	-

Table 23: July Ambient Noise Level Breakdown – Night-time Period

Date	Noise Level, dB LAeq				
	S1-1	S1-2	S1-3	S1-4	S2-1
Thu 07/07/2022	37	40 ^B	-	-	43 ^B
Fri 08/07/2022	32	35	40 ^B	36	41 ^B
Sat 09/07/2022	33	37	43 ^B	35	38 ^B
Sun 10/07/2022	28	32	36	32	35
Mon 11/07/2022	30	36	40	35	36
Tue 12/07/2022	34	37	37	37	39 ^B
Wed 13/07/2022	30	32	38	34	45 ^B
Thu 14/07/2022	29	31	31	32	37
Fri 15/07/2022	32	36	36	36	32
Sat 16/07/2022	32	35	34	33	32
Sun 17/07/2022	31	37	39	31	31
Mon 18/07/2022	32	-	34	33	-
Tue 19/07/2022	-	-	46 ^B	39	-

Table 24: Sept/Oct Ambient Noise Level Breakdown – BS5228 Daytime and Saturday Morning Period

Noise Level, dB L _{Aeq}						
Date	S2-2	S2-3	S3-1	S3-2	S3-3	S3-4
Mon 26/09/2022	42 ^A	40 ^A	51 ^A	47 ^A	56 ^A	44 ^A
Tue 27/09/2022	45	48	53	51	54	44
Wed 28/09/2022	49	43	52	46	53	46
Thu 29/09/2022	44	42	49	51	51	45
Fri 30/09/2022	46	50	55	49	55	47
Sat 01/10/2022	45	49	54	46	54	43
Mon 03/10/2022	48 ^A	44 ^A	54 ^A	51 ^A	54 ^A	48 ^A

Table 25: Sept/Oct Ambient Noise Level Breakdown – BS5228 Evening and Weekends Period

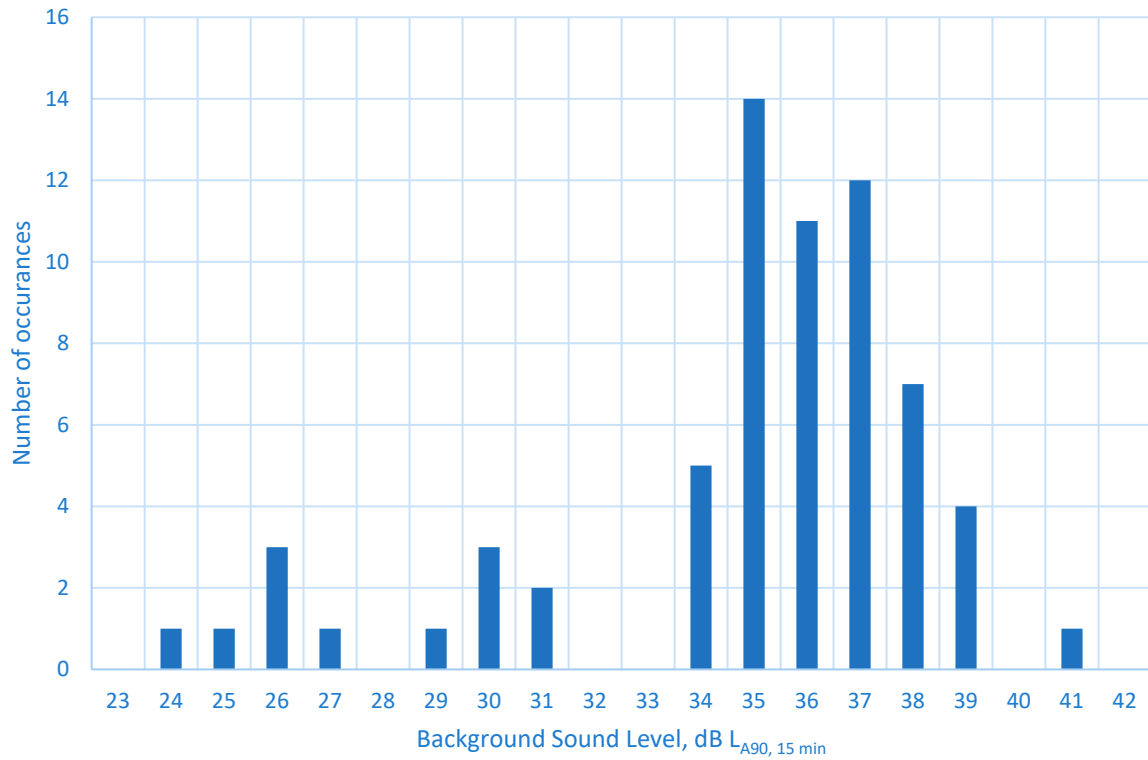
Noise Level, dB L _{Aeq}						
Date	S2-2	S2-3	S3-1	S3-2	S3-3	S3-4
Mon 26/09/2022	38	37	43	46	47	35
Tue 27/09/2022	39	38	45	44	48	36
Wed 28/09/2022	36	36	45	43	48	37
Thu 29/09/2022	39	37	42	44	47	40
Fri 30/09/2022	-	-	-	-	-	-
Sat 01/10/2022	44	49	54	57	52	42
Sun 02/10/2022	40	40	56	44	50	40

Table 26: Sept/Oct Ambient Noise Level Breakdown – Night-time Period

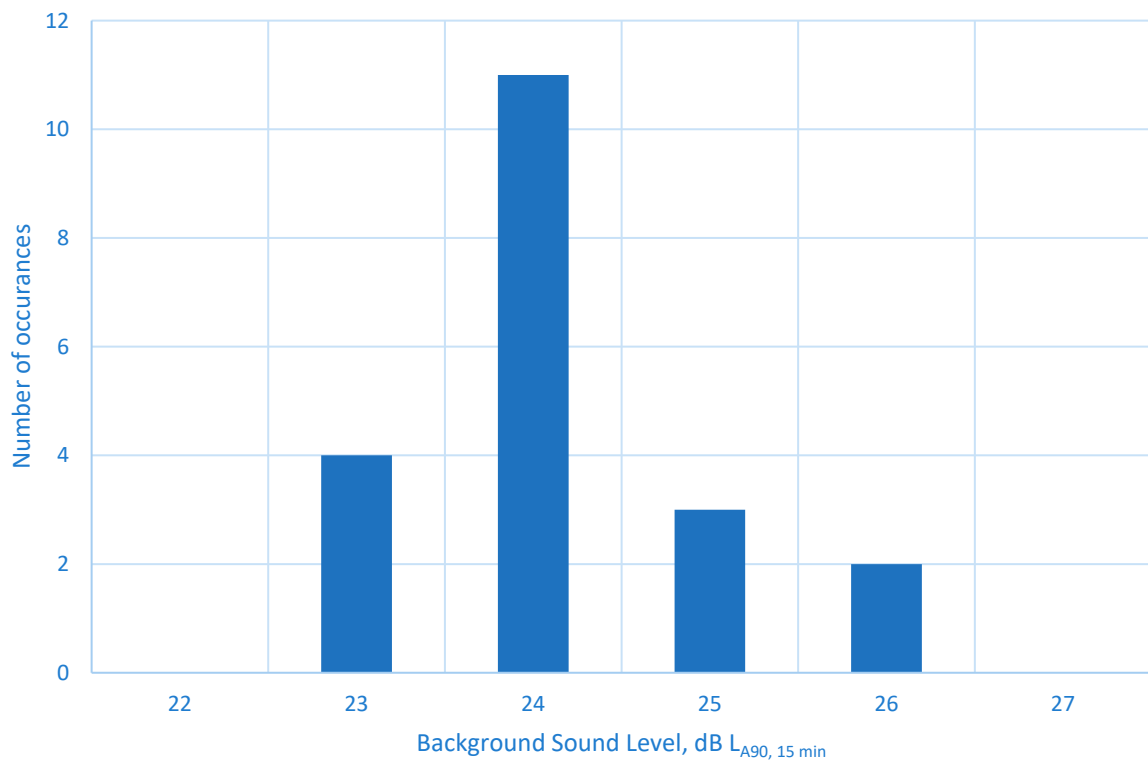
Noise Level, dB L _{Aeq}						
Date	S2-2	S2-3	S3-1	S3-2	S3-3	S3-4
Mon 26/09/2022	38	39	44	39	47	35
Tue 27/09/2022	38	37	44	38	46	34
Wed 28/09/2022	37	36	42	38	44	35
Thu 29/09/2022	39	35	44	42	44	37
Fri 30/09/2022	37	38	44	38	46	34
Sat 01/10/2022	37	38	43	37	44	34
Sun 02/10/2022	36	34	44	43	46	38

C.1.6 Set out below are histogram charts of the background sound levels for the daytime (0700 to 2300 hours) and night-time. Note the night-time does not include the dawn chorus (from 0400 hours) for data measured in July (LF1 to LF3, S1-1 to S1-4 and S2-1). Time history data follows this and weather data is at the end.

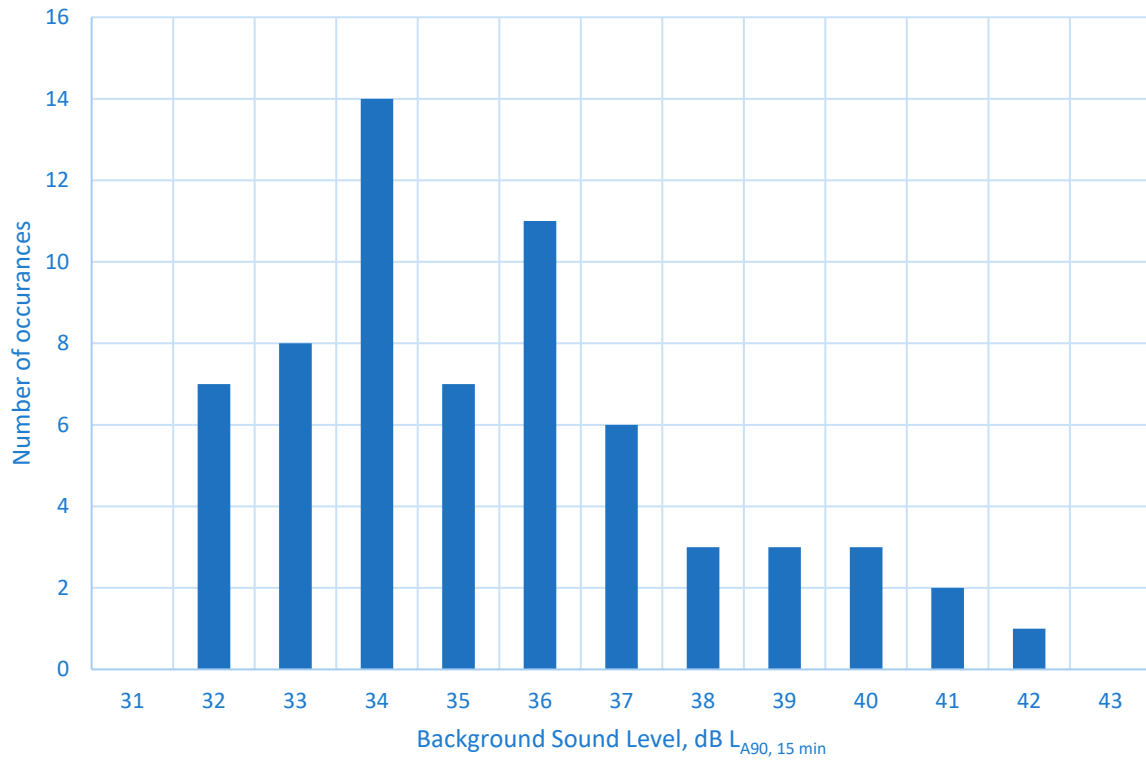
LF1 Daytime Background Sound Levels



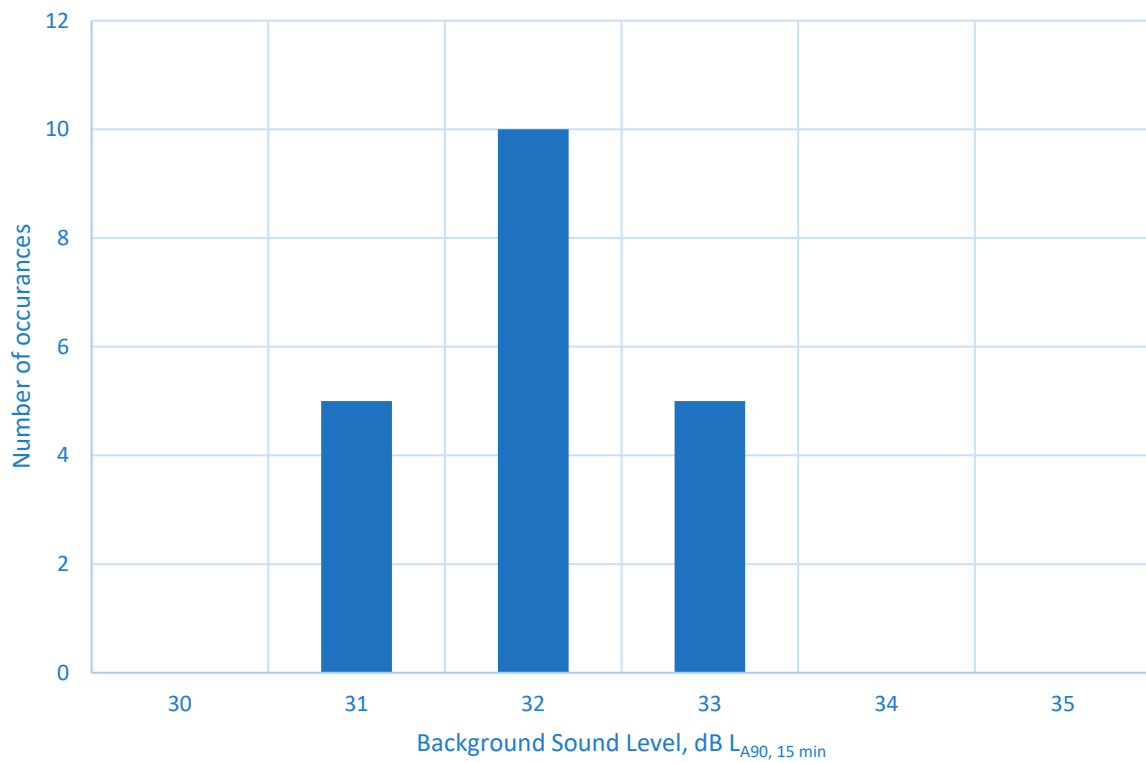
LF1 Night-time Background Sound Levels



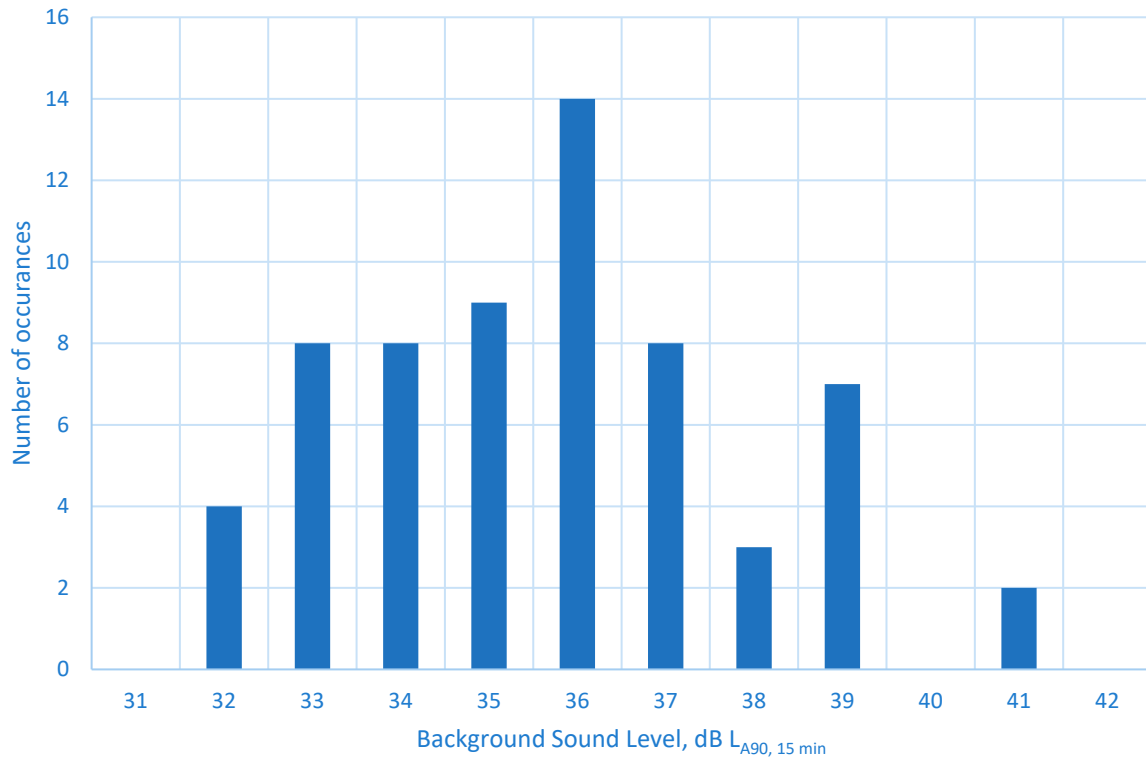
LF2 Daytime Background Sound Levels



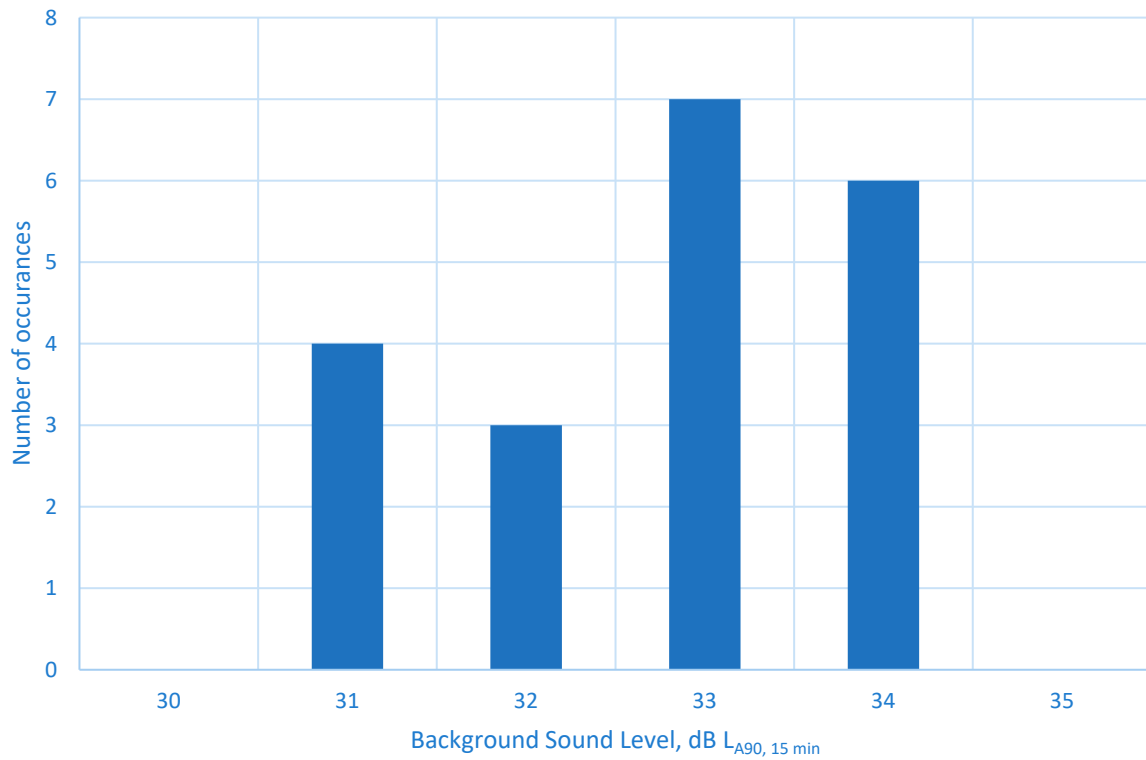
LF2 Night-time Background Sound Levels

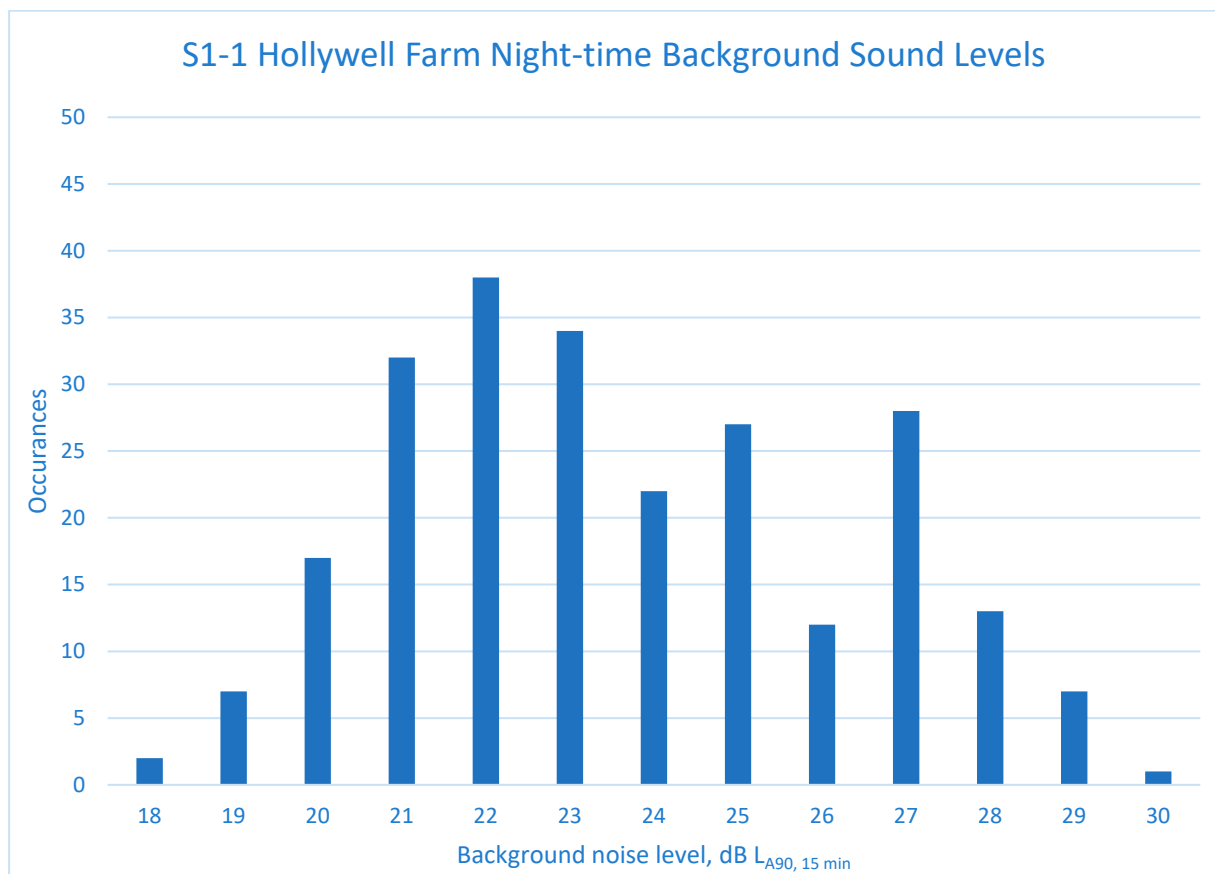
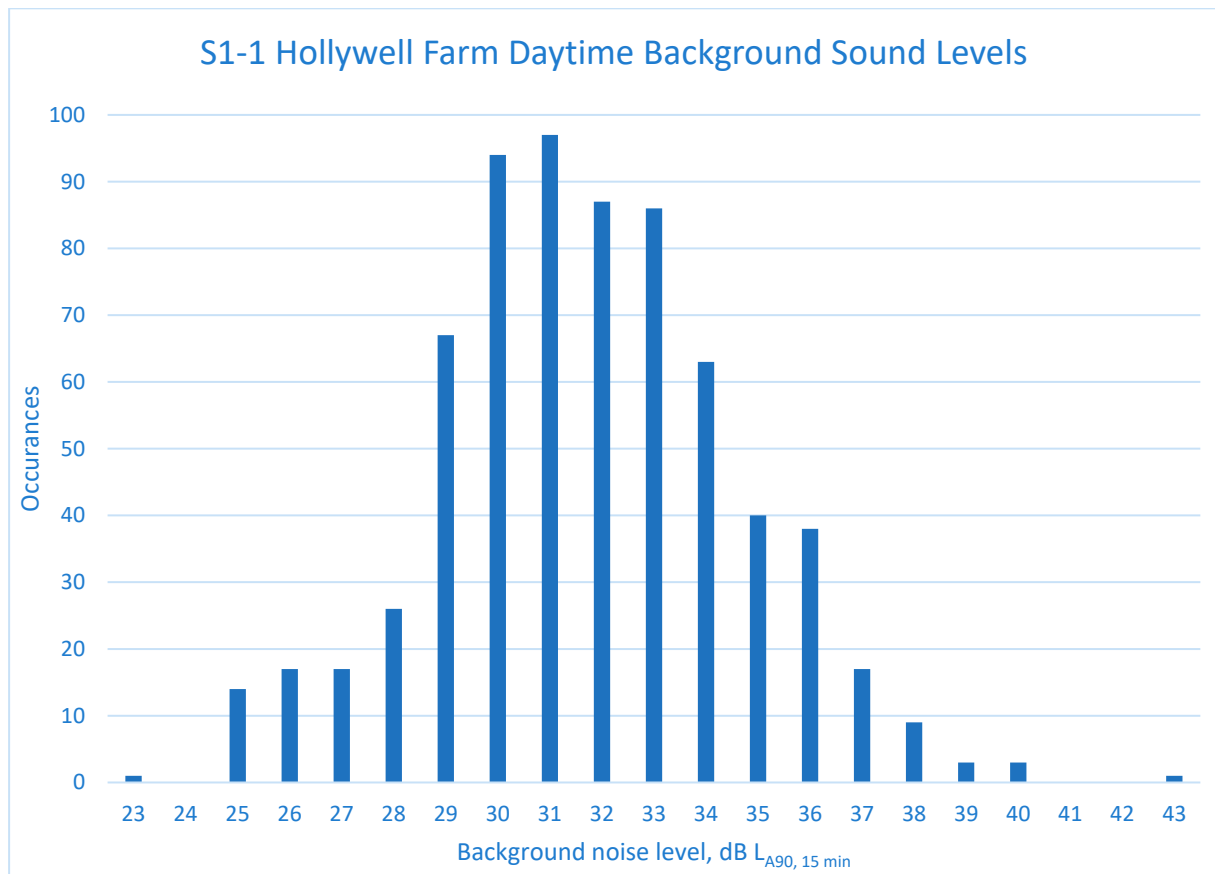


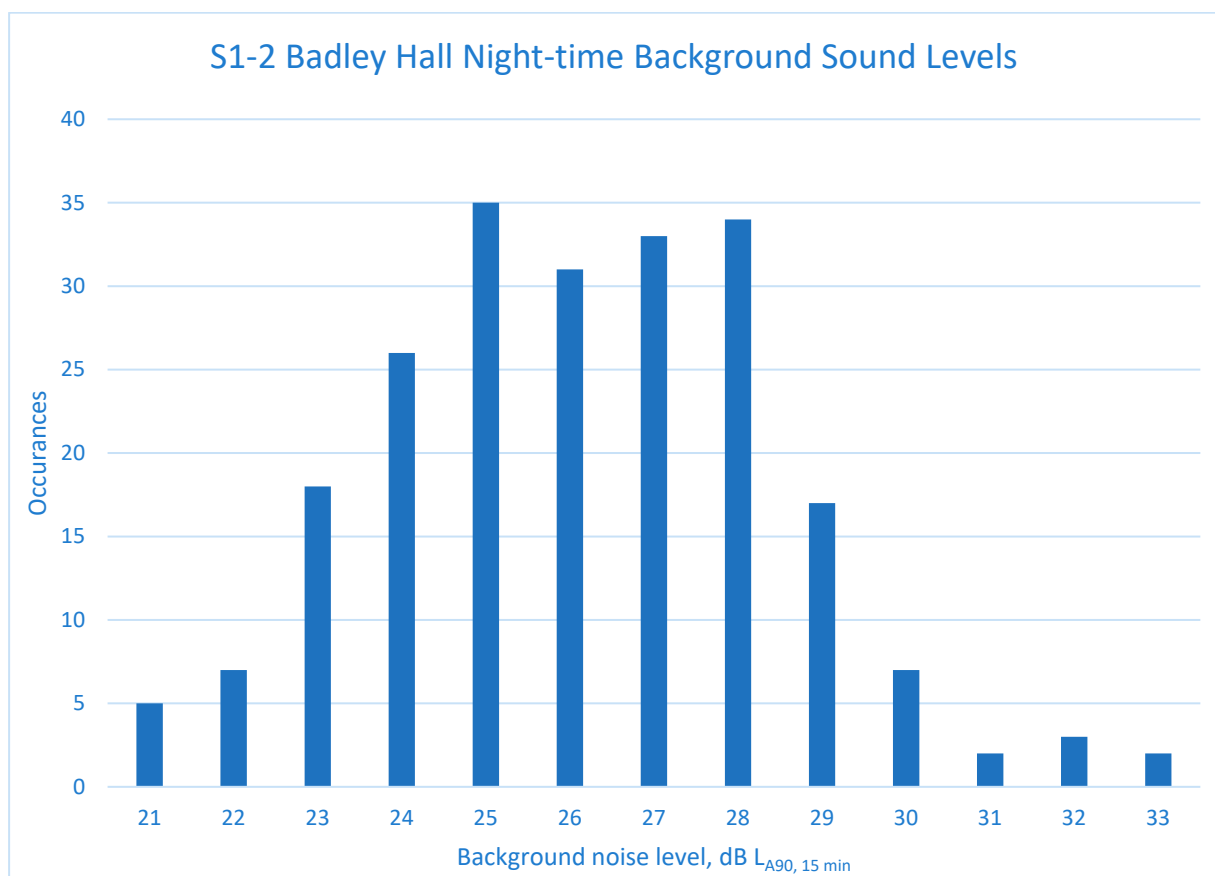
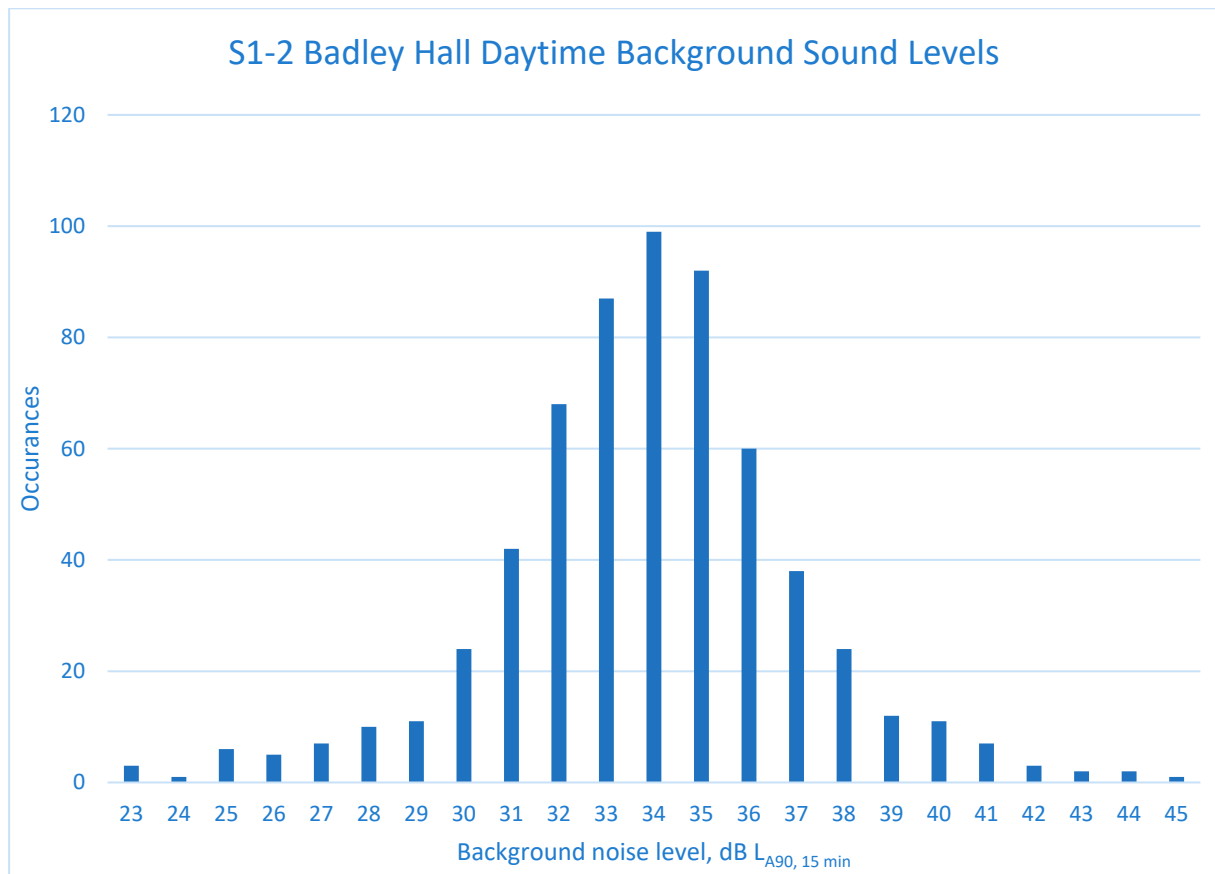
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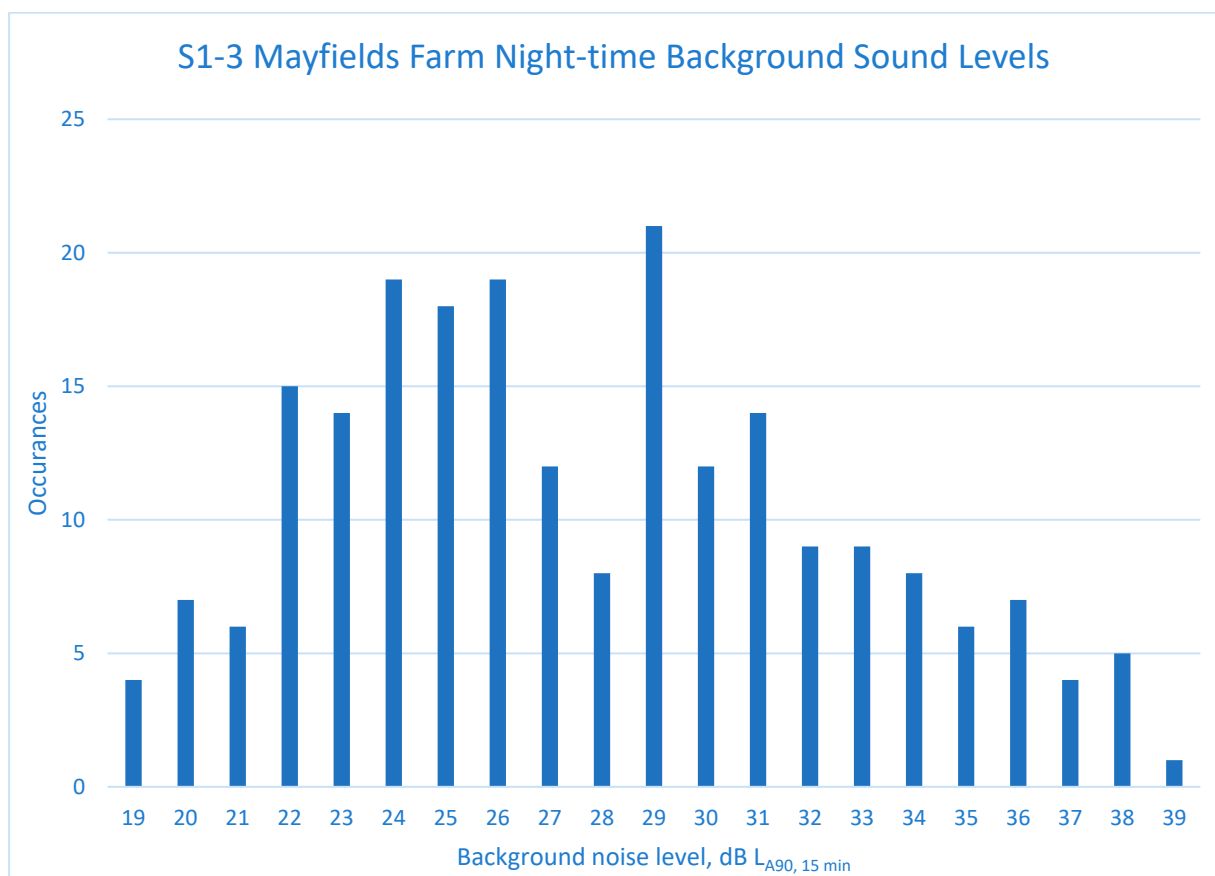
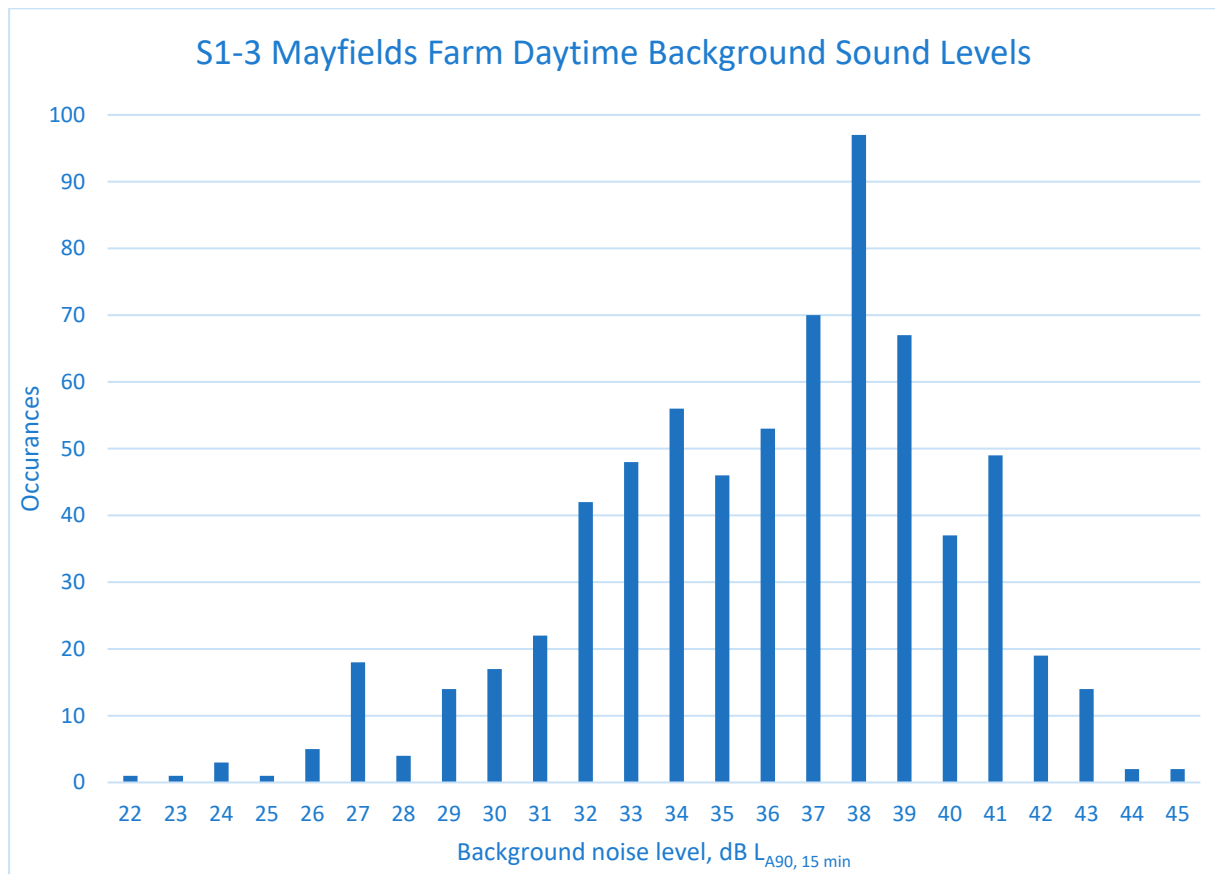


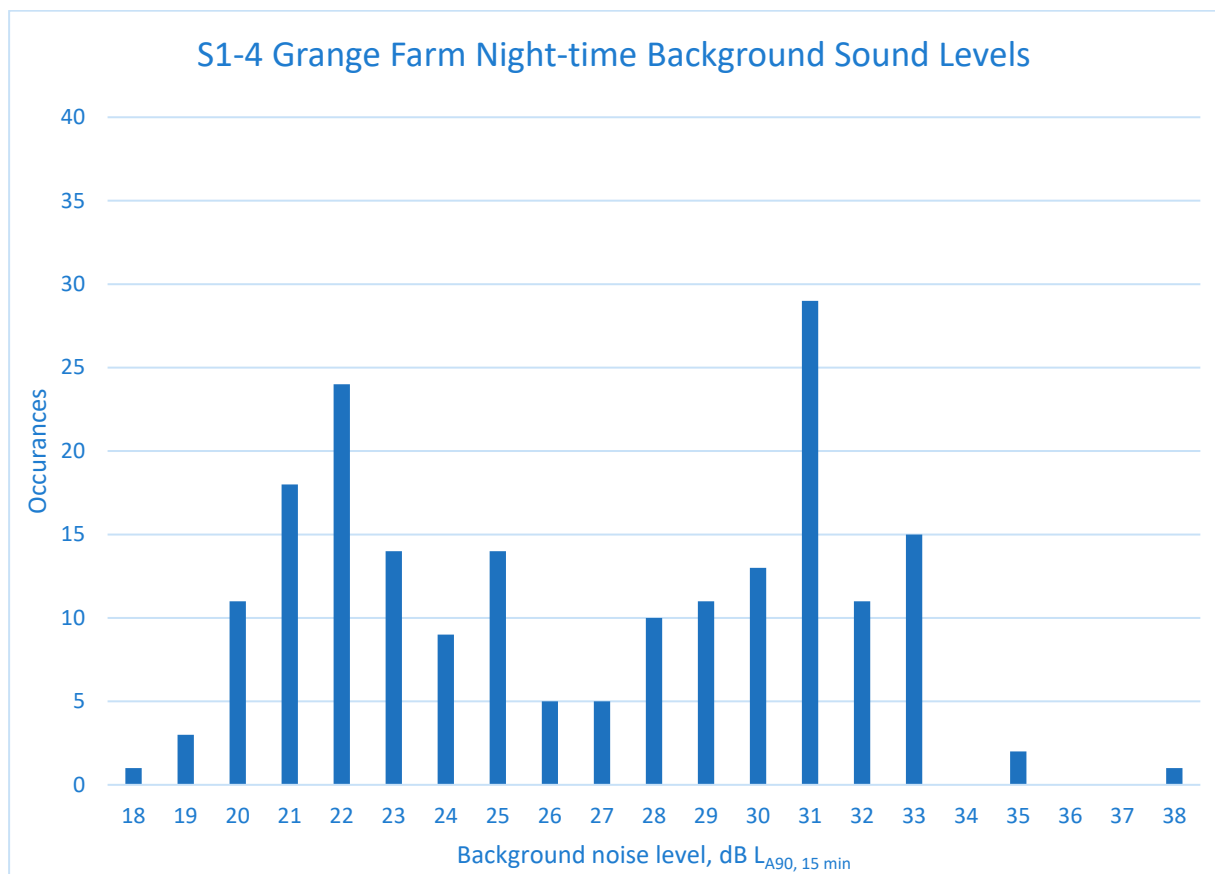
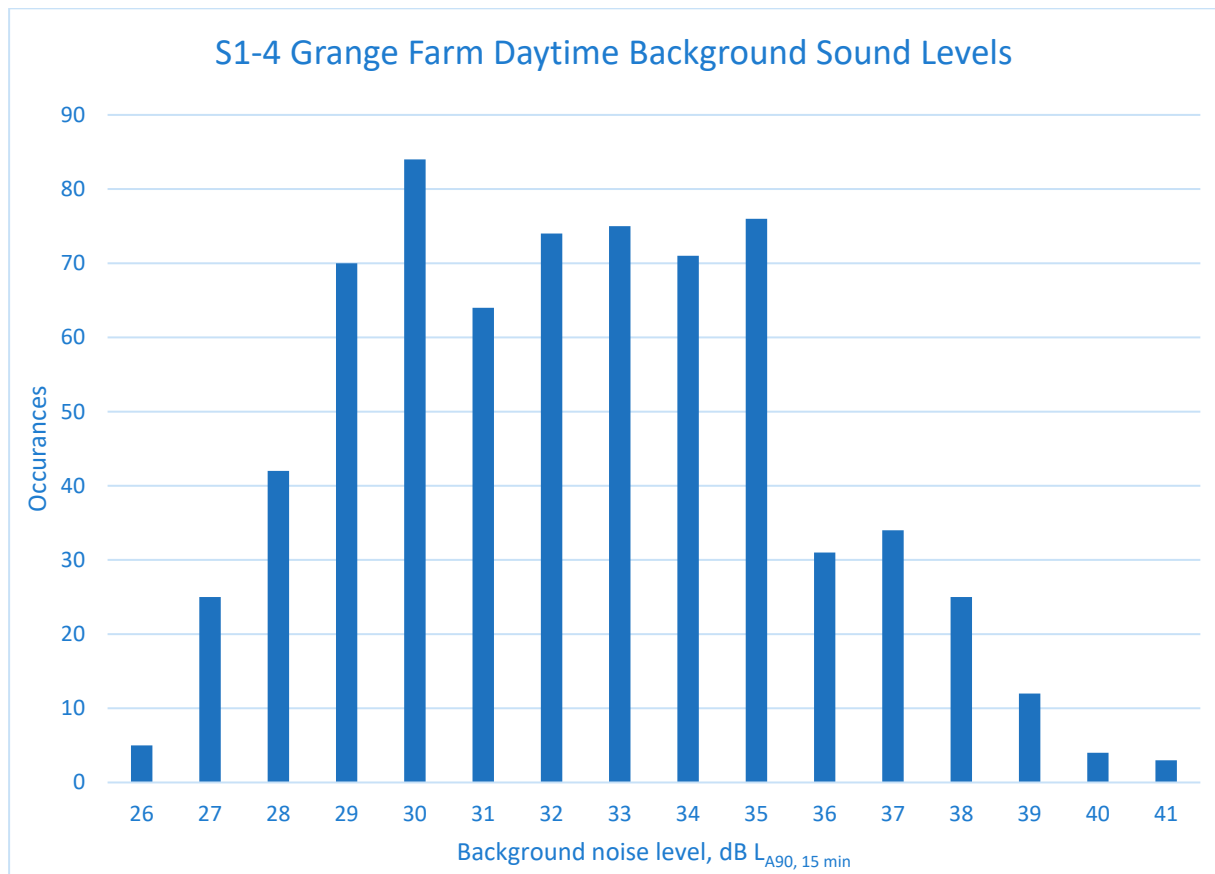
LF3 Night-time Background Sound Levels

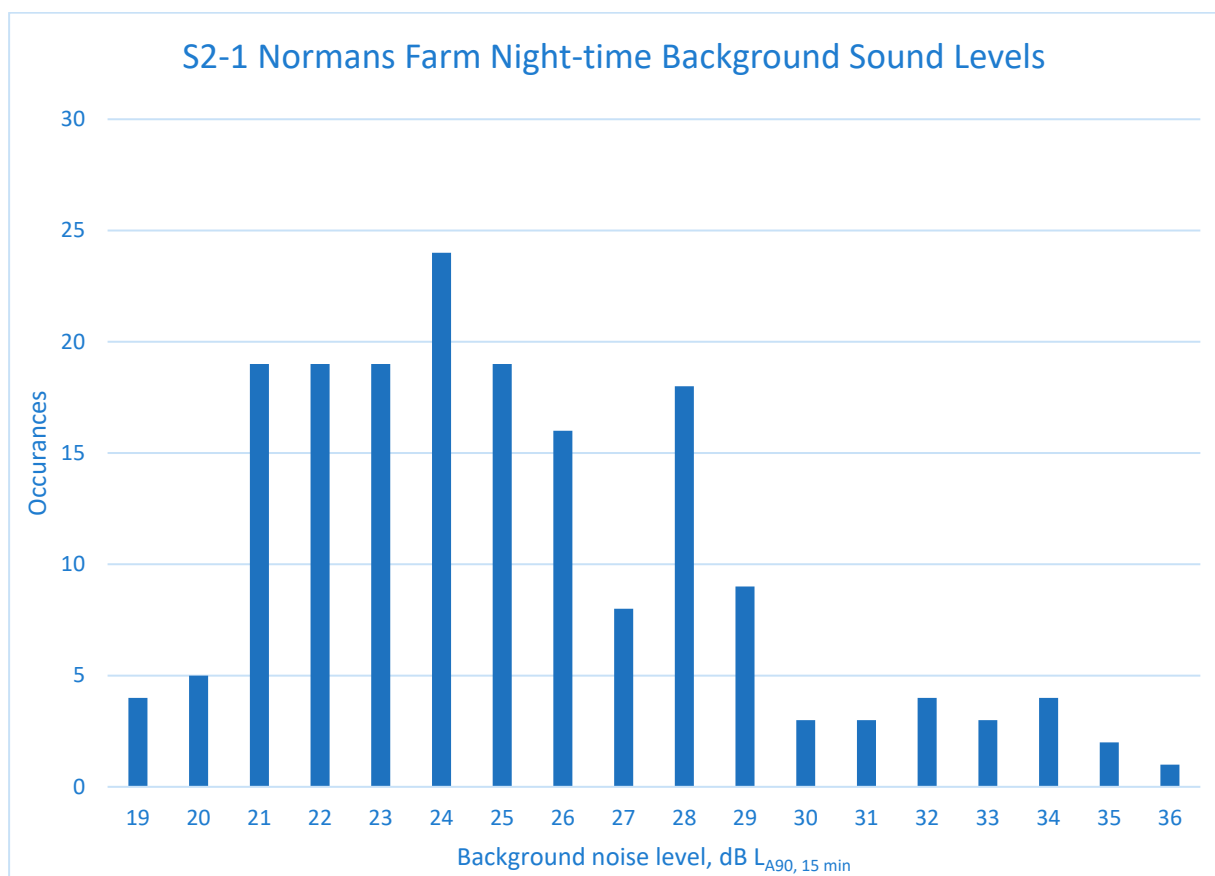
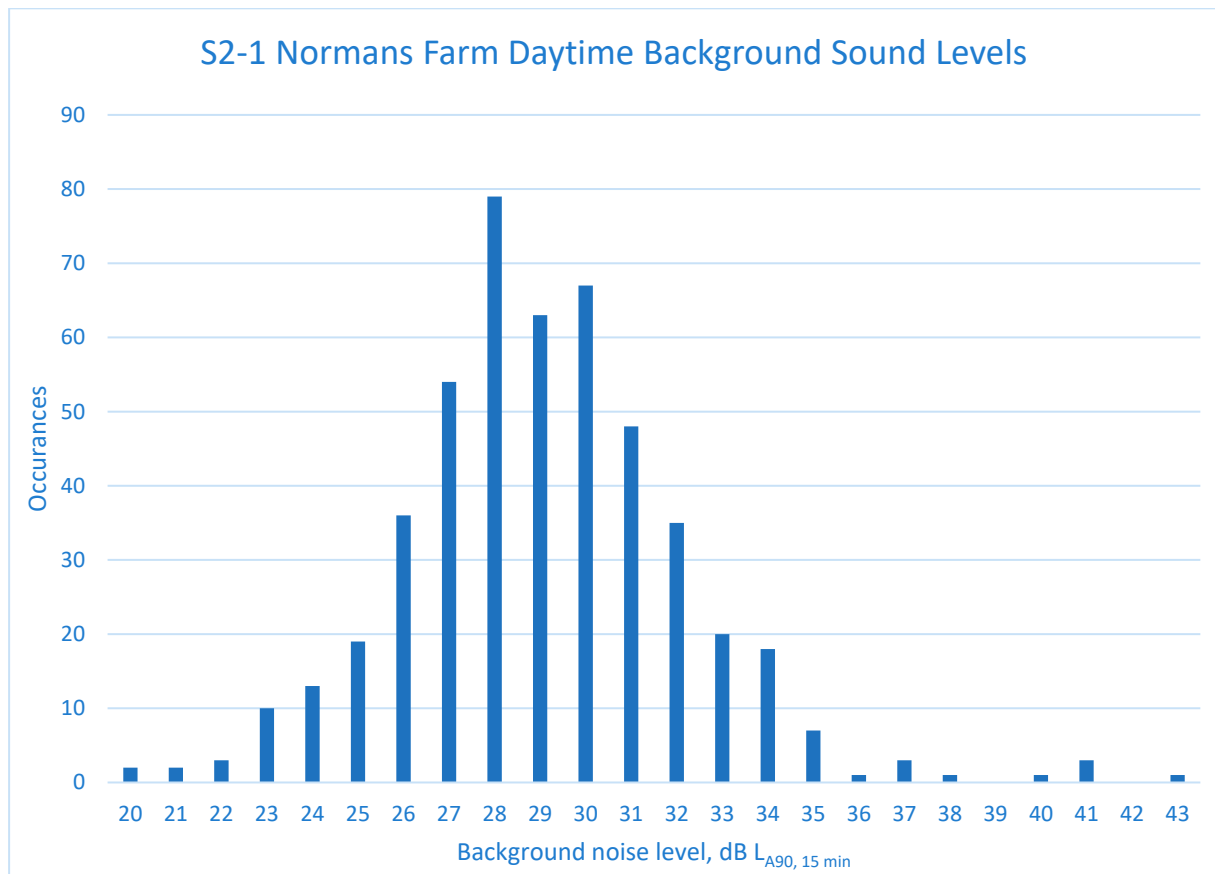


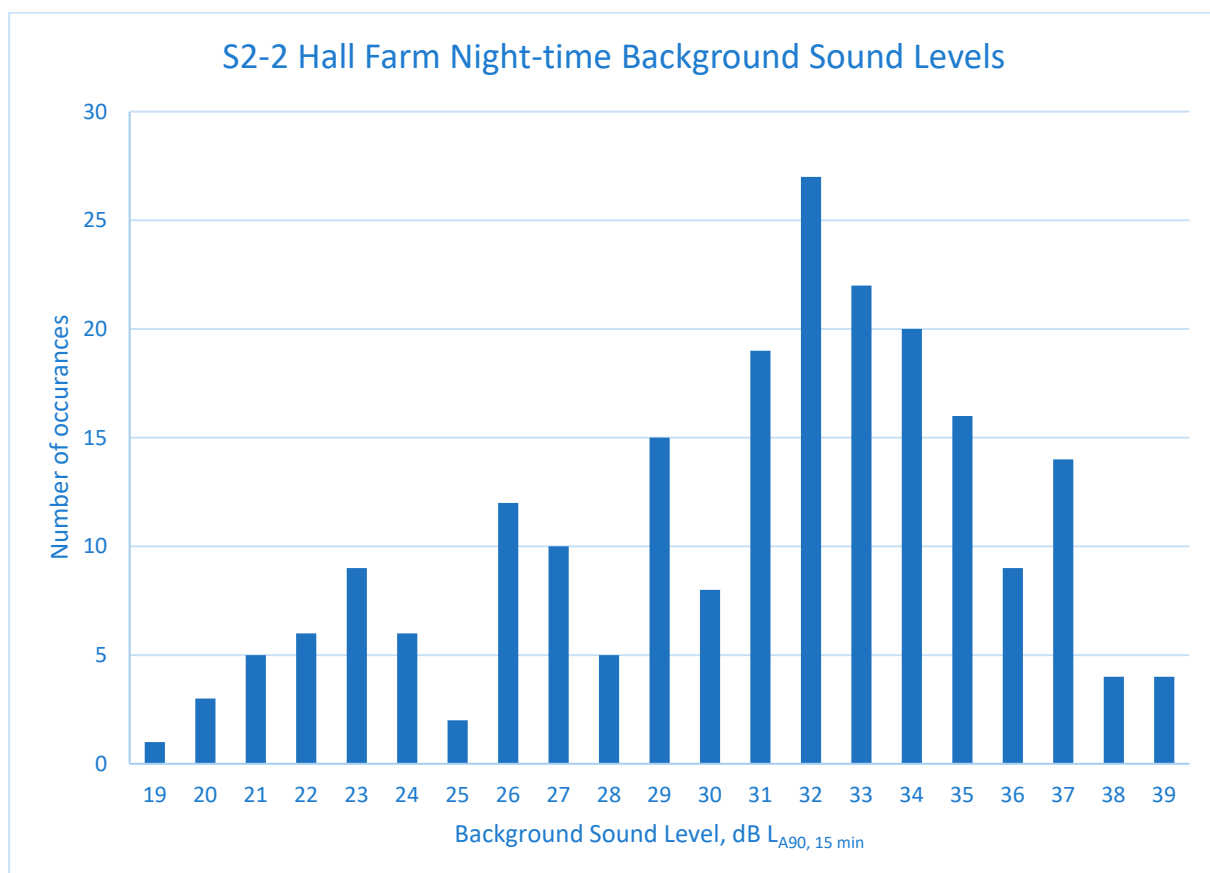
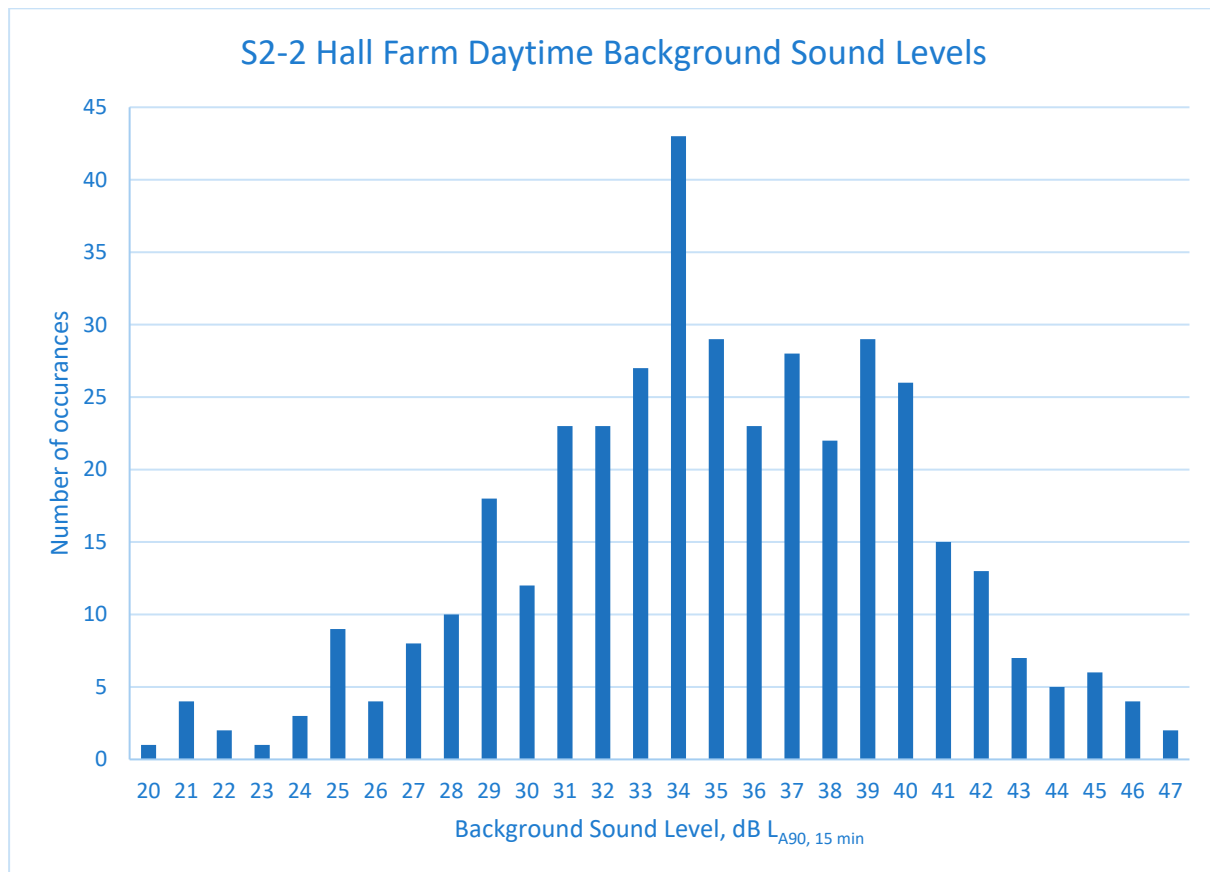


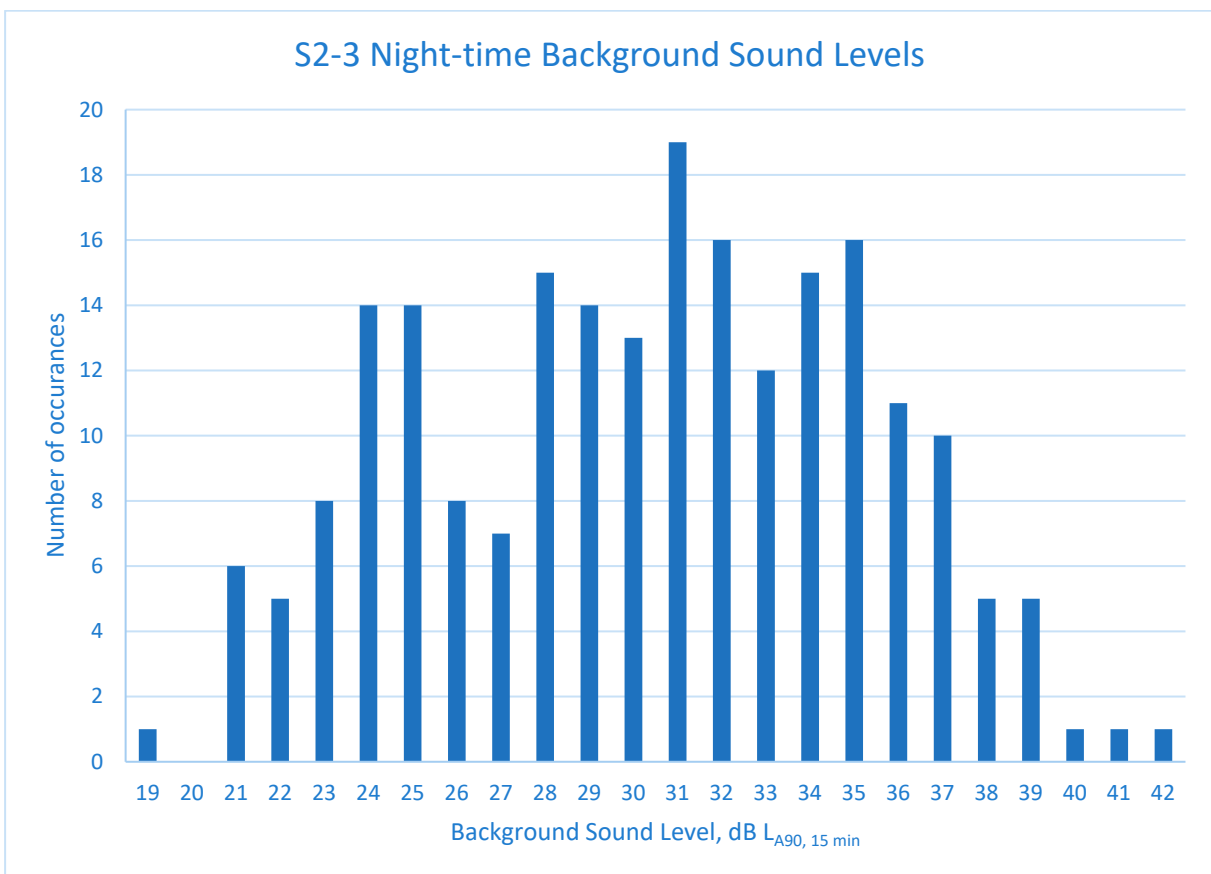
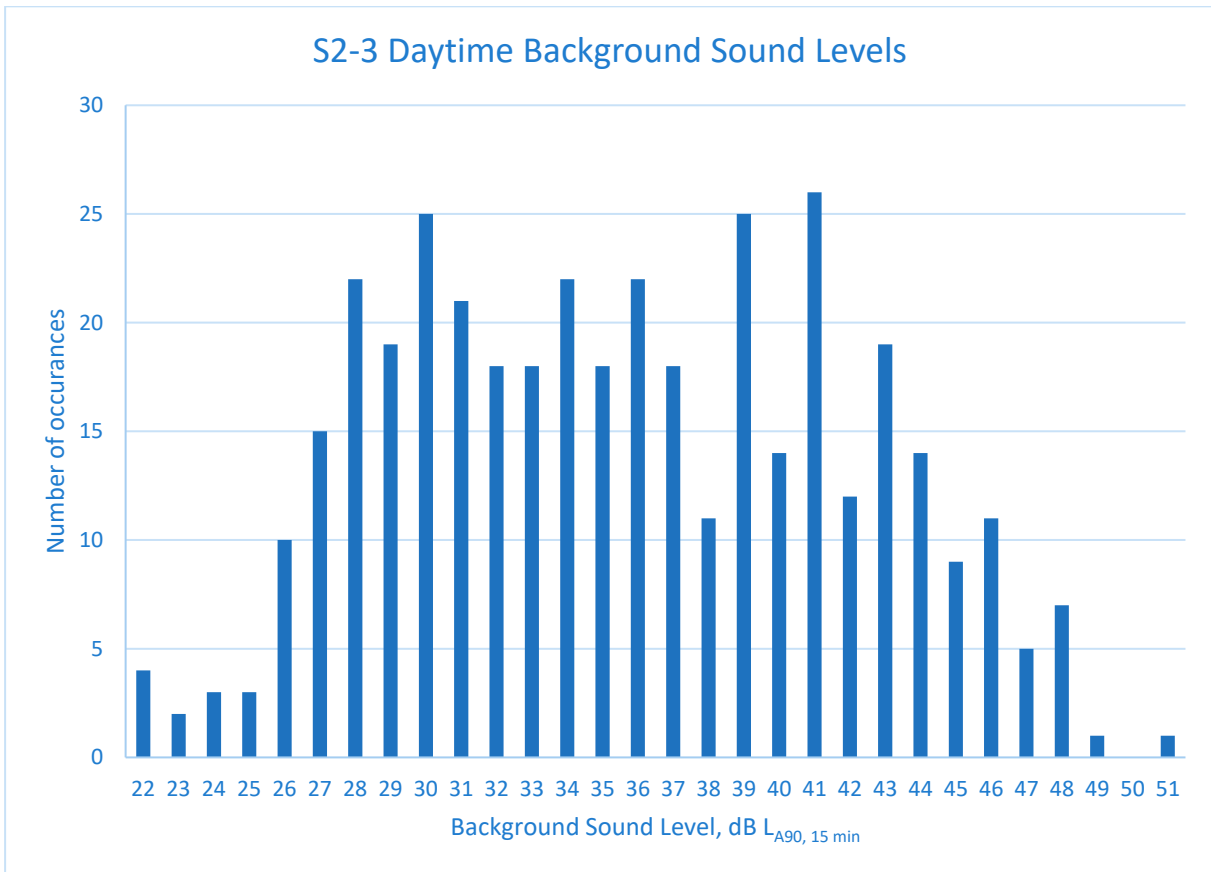


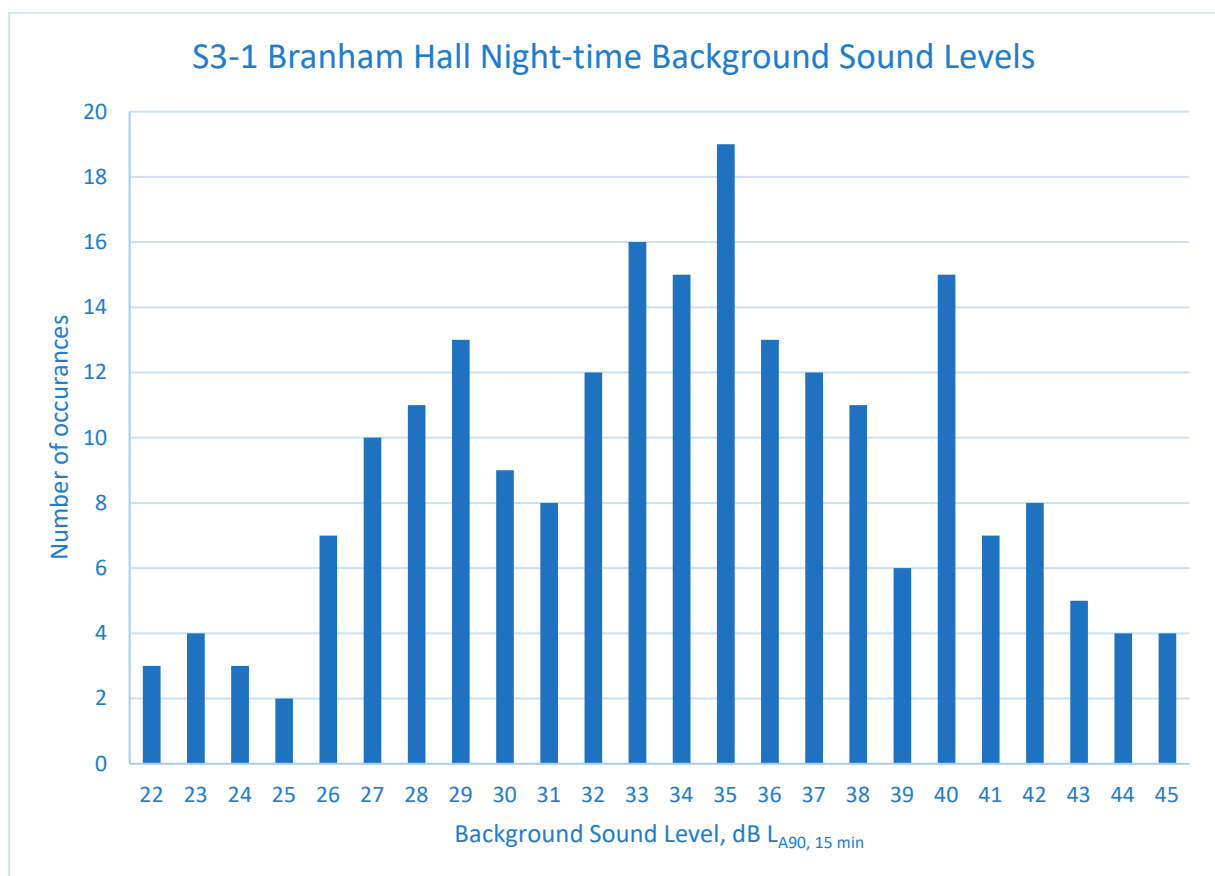
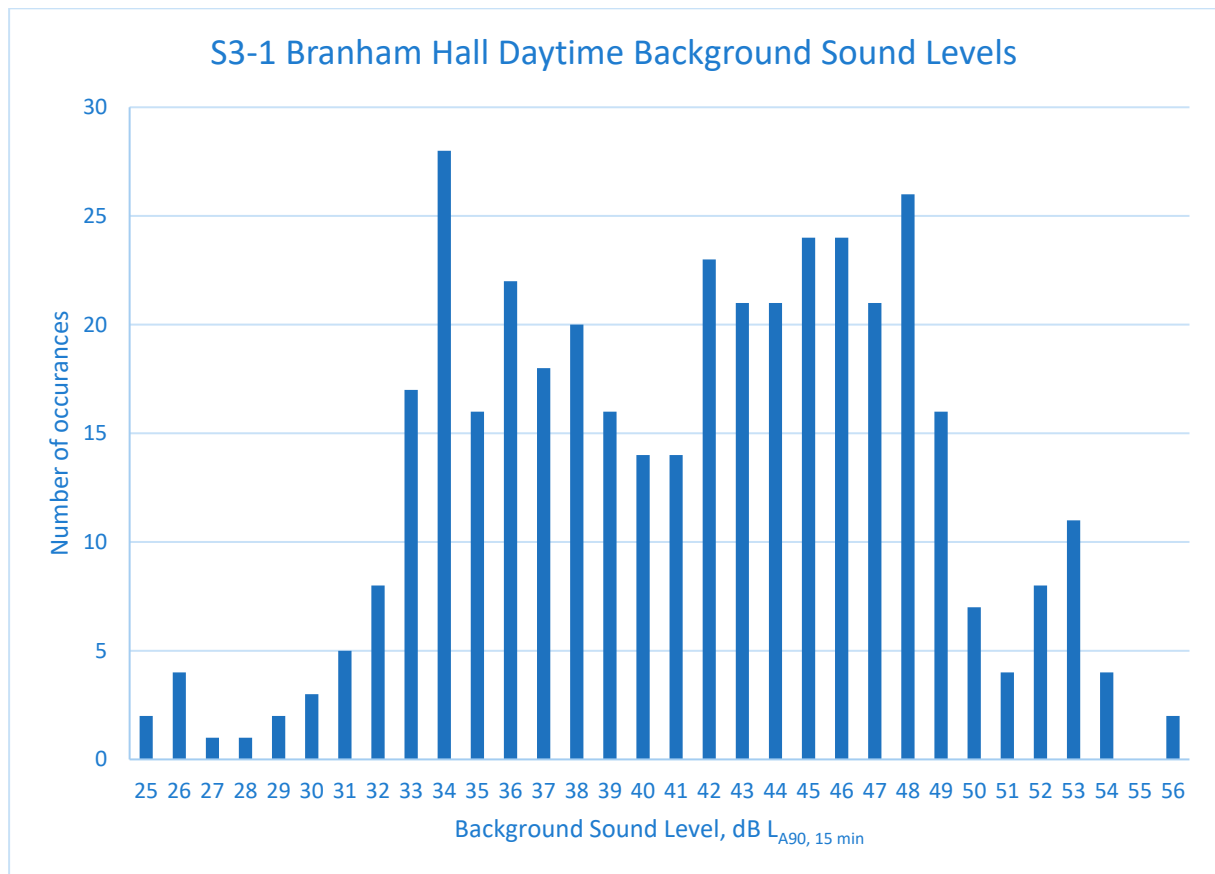


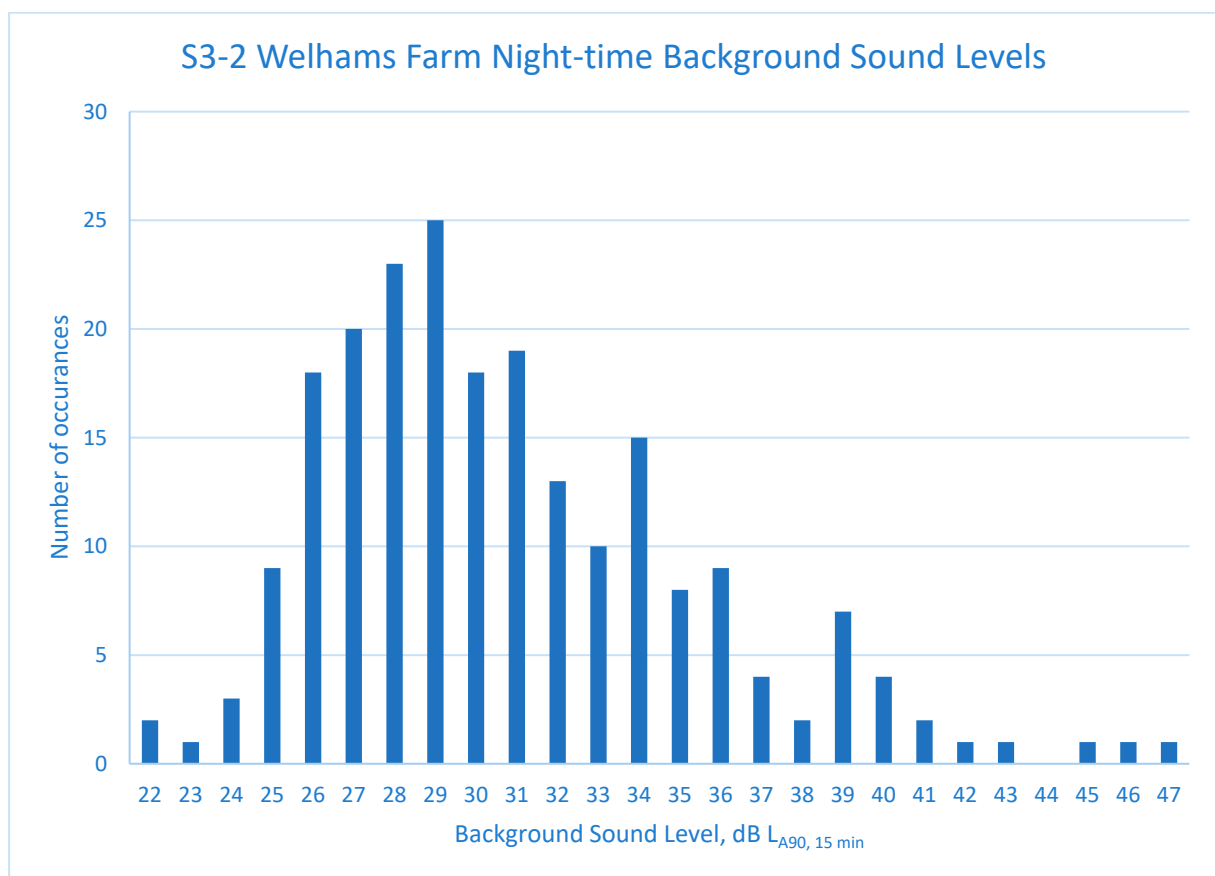
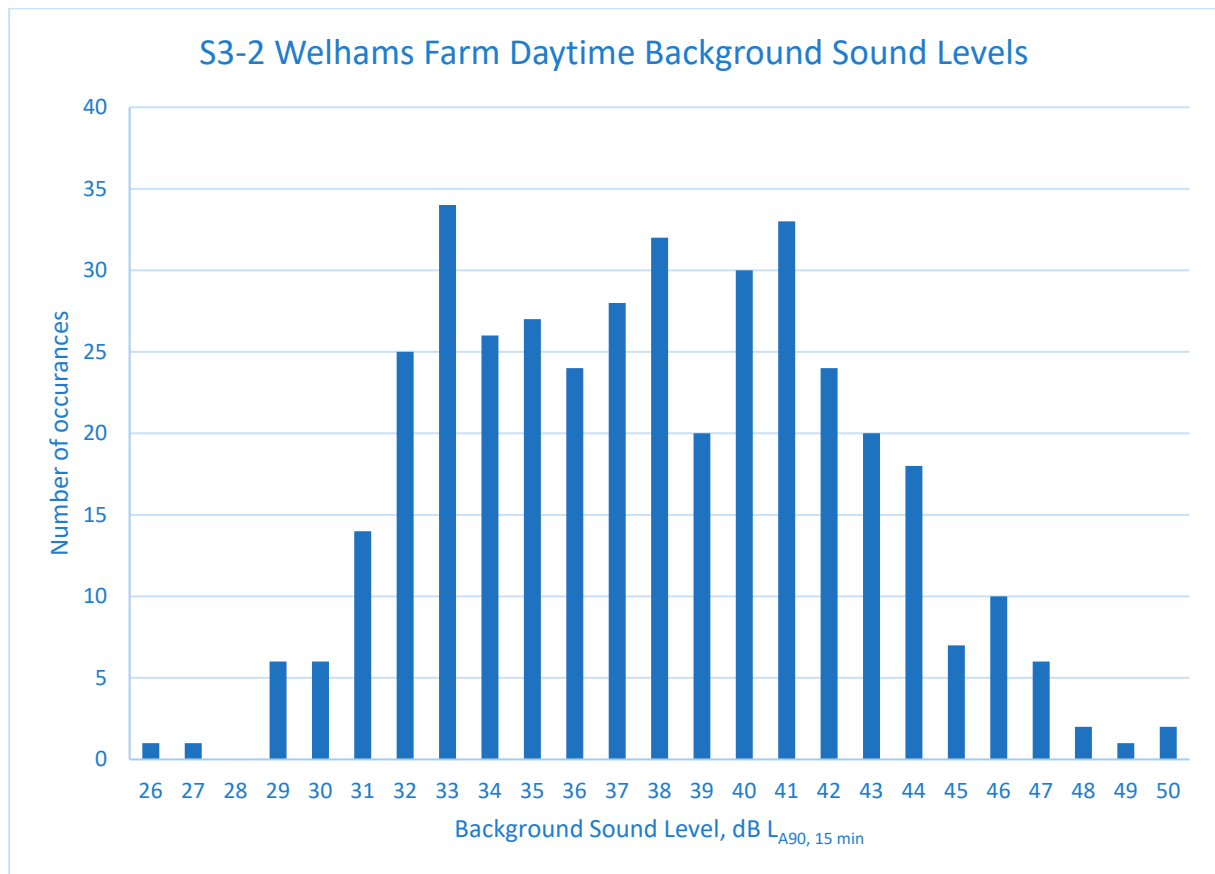


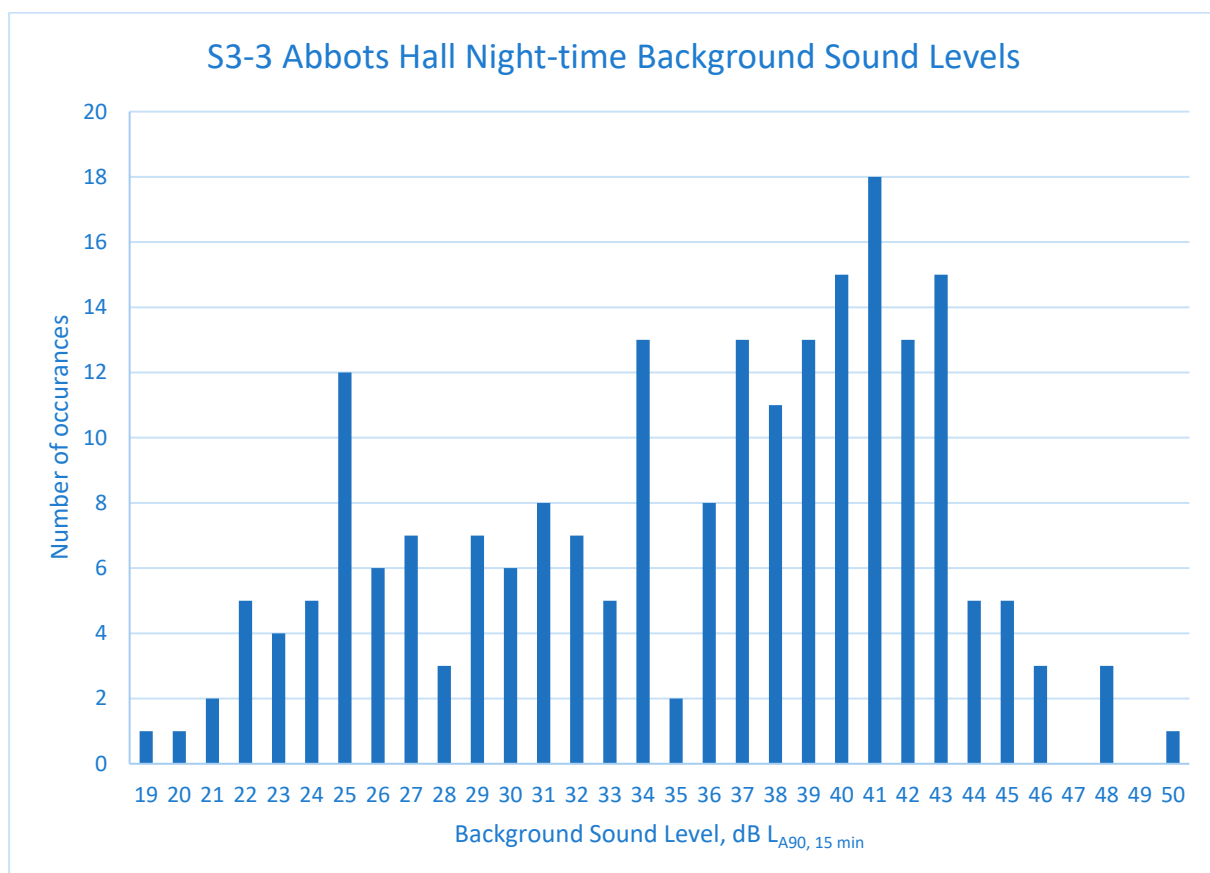
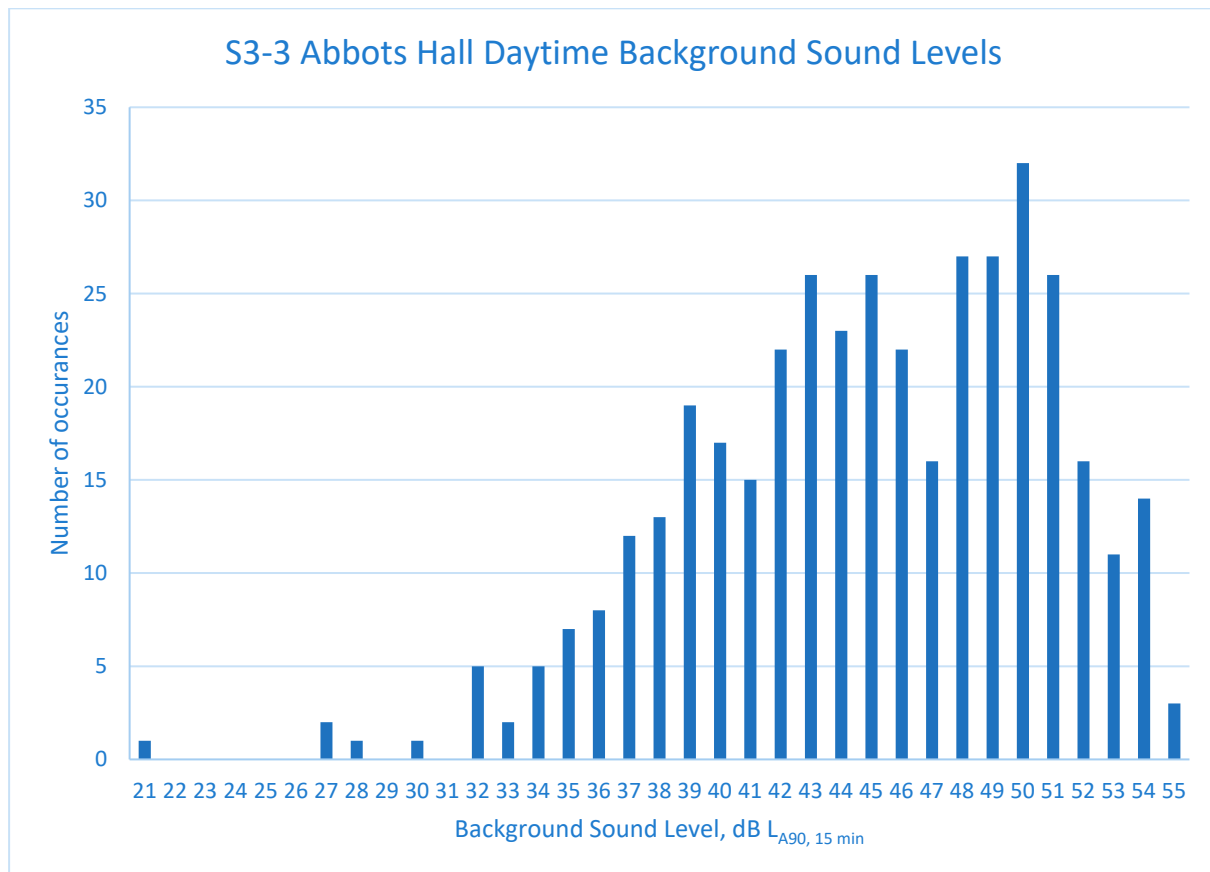


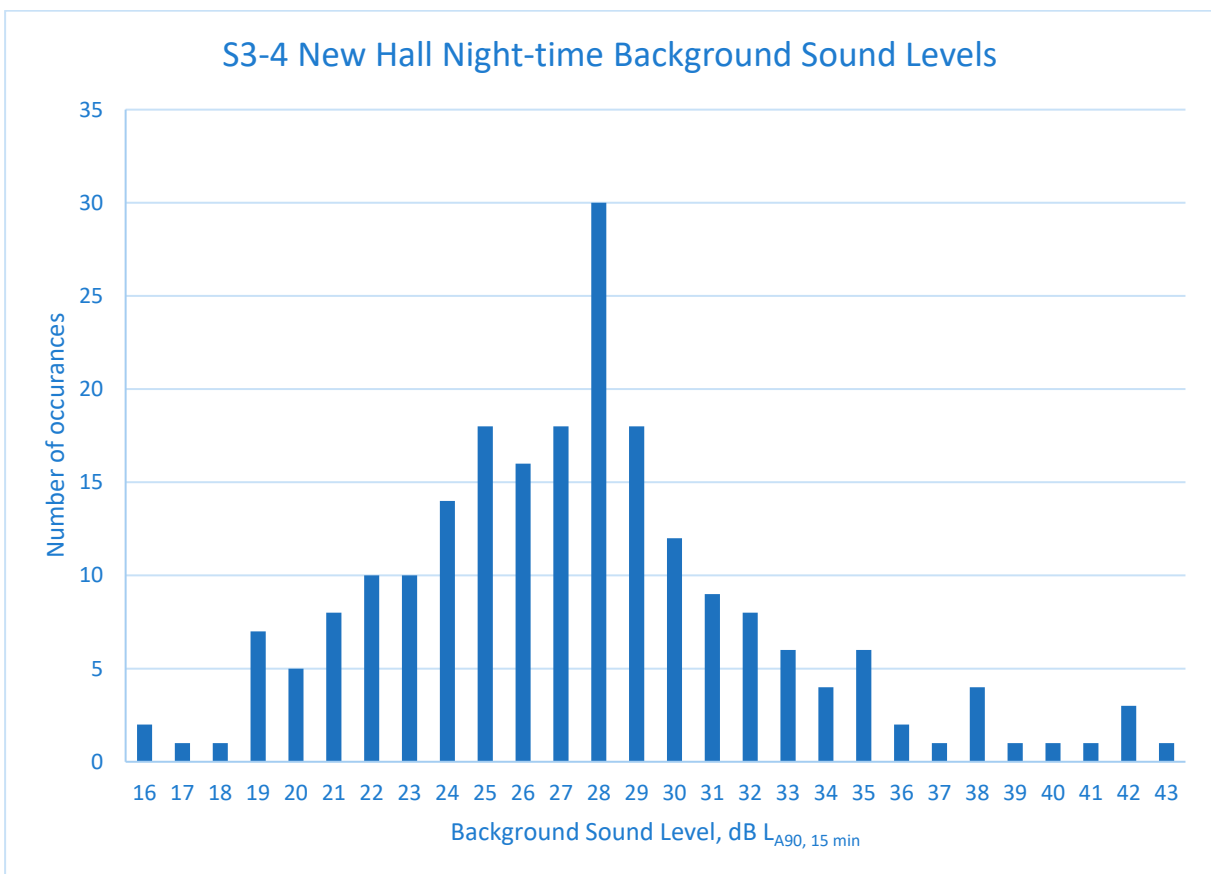
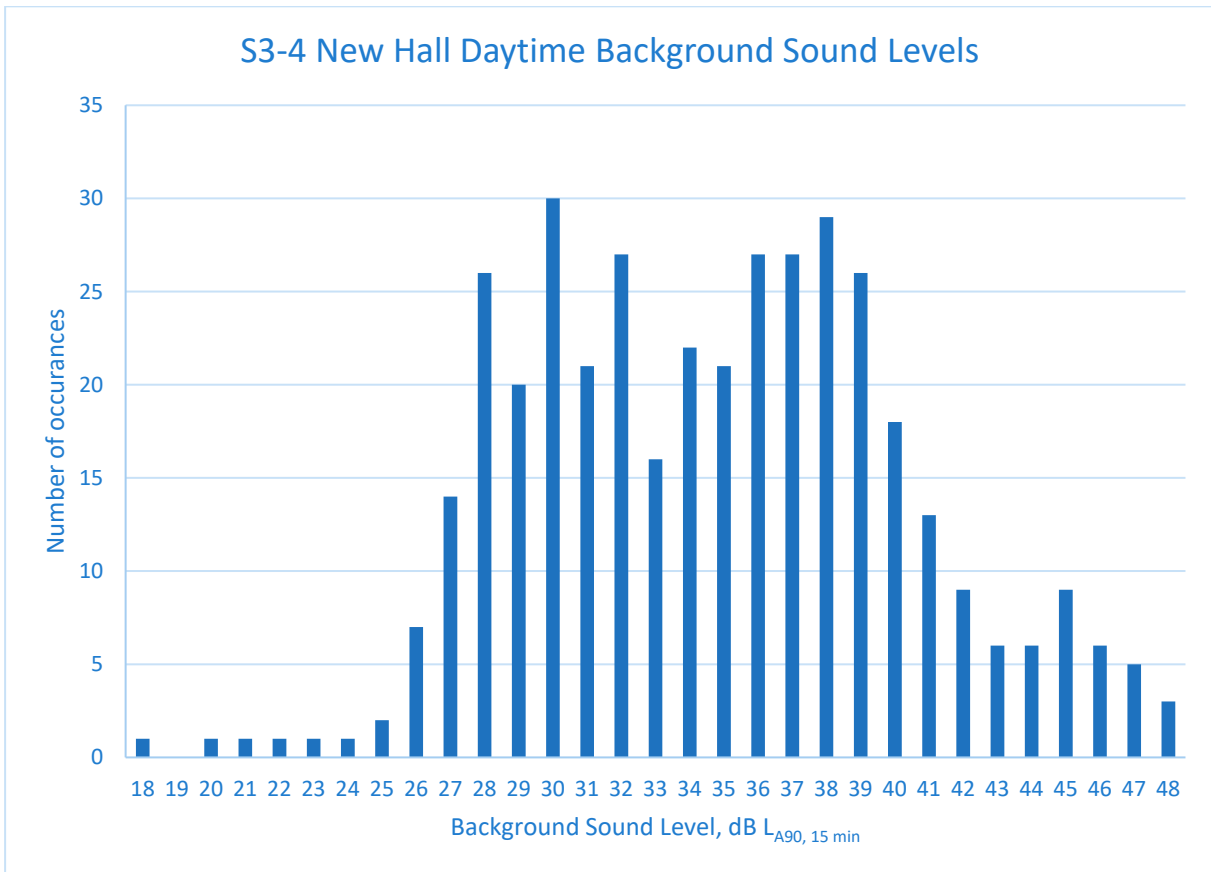


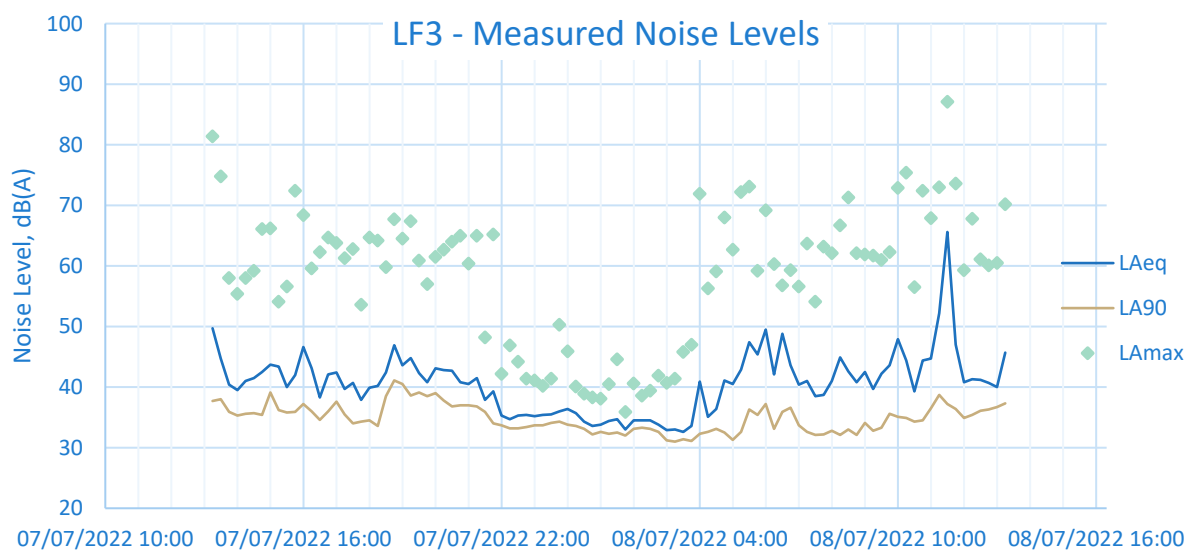
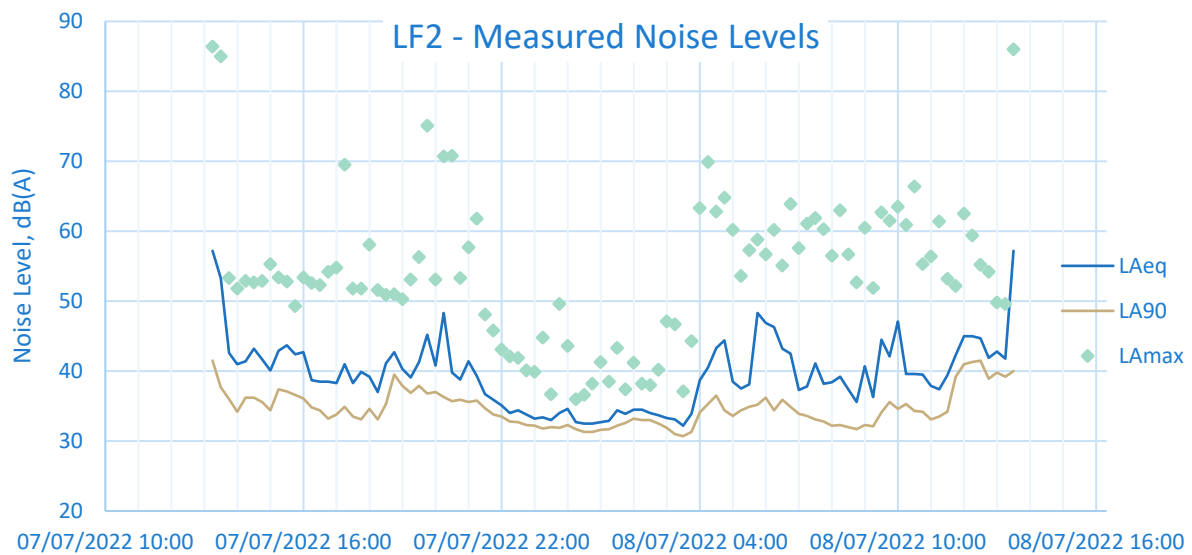
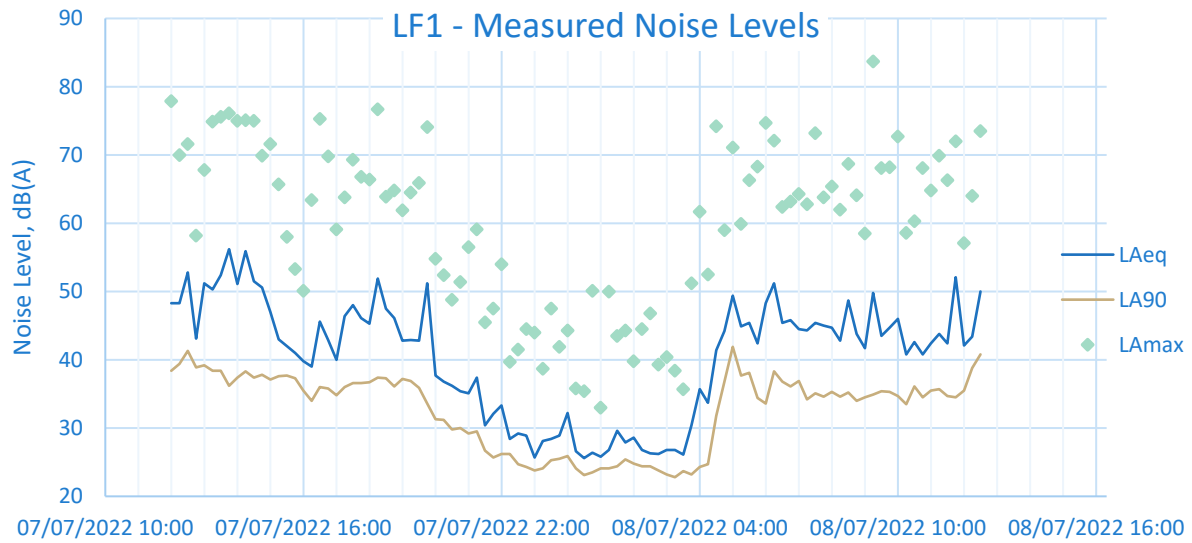


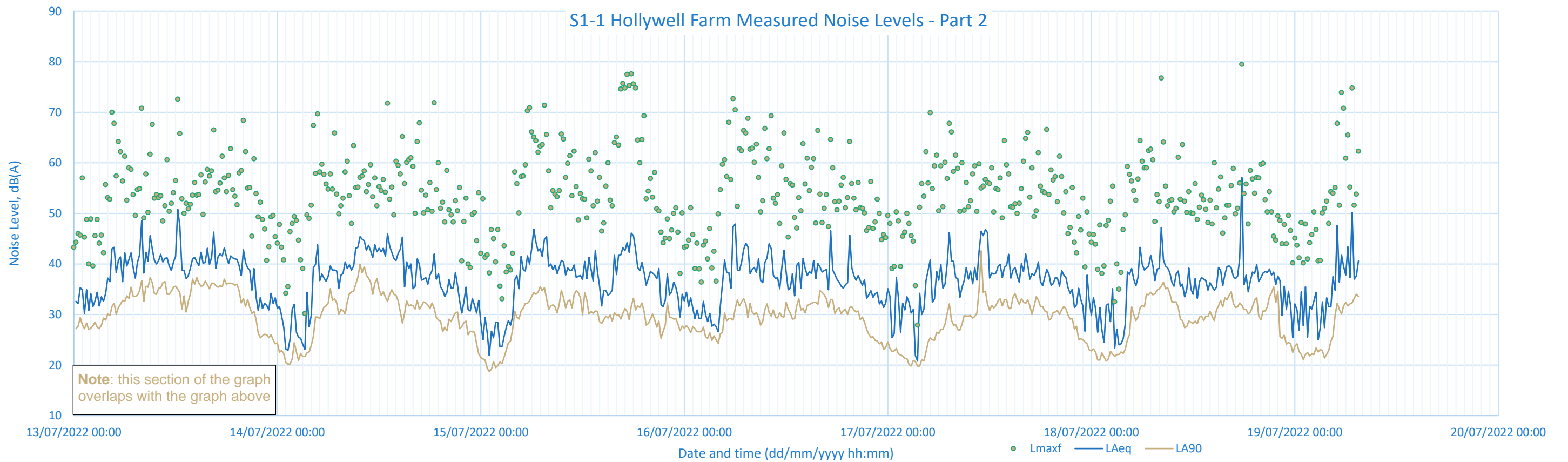
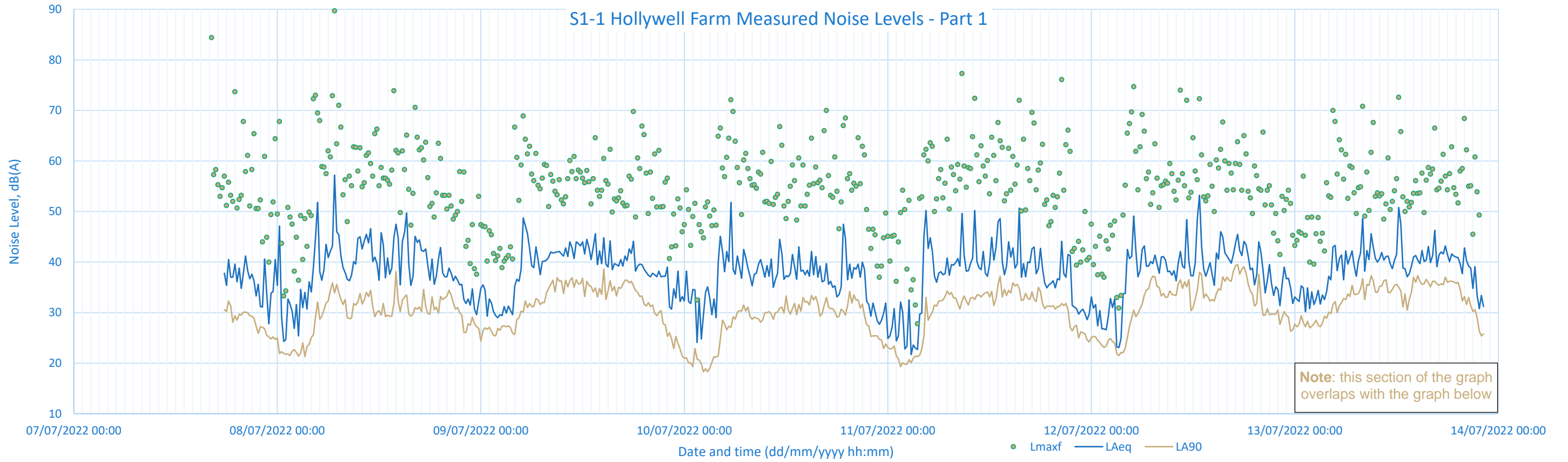


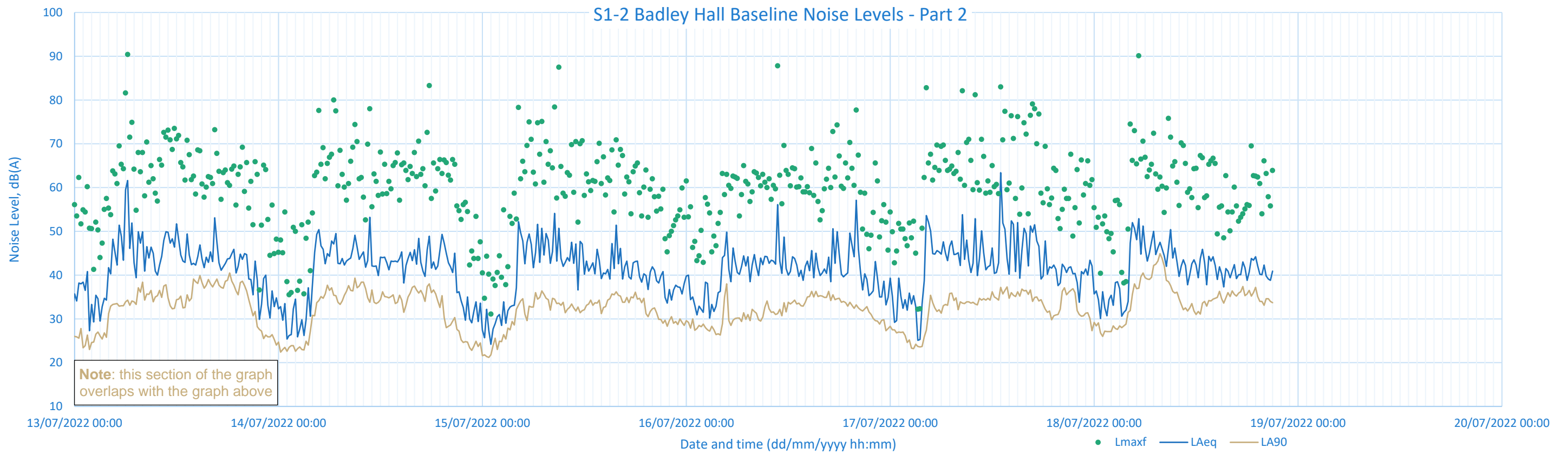
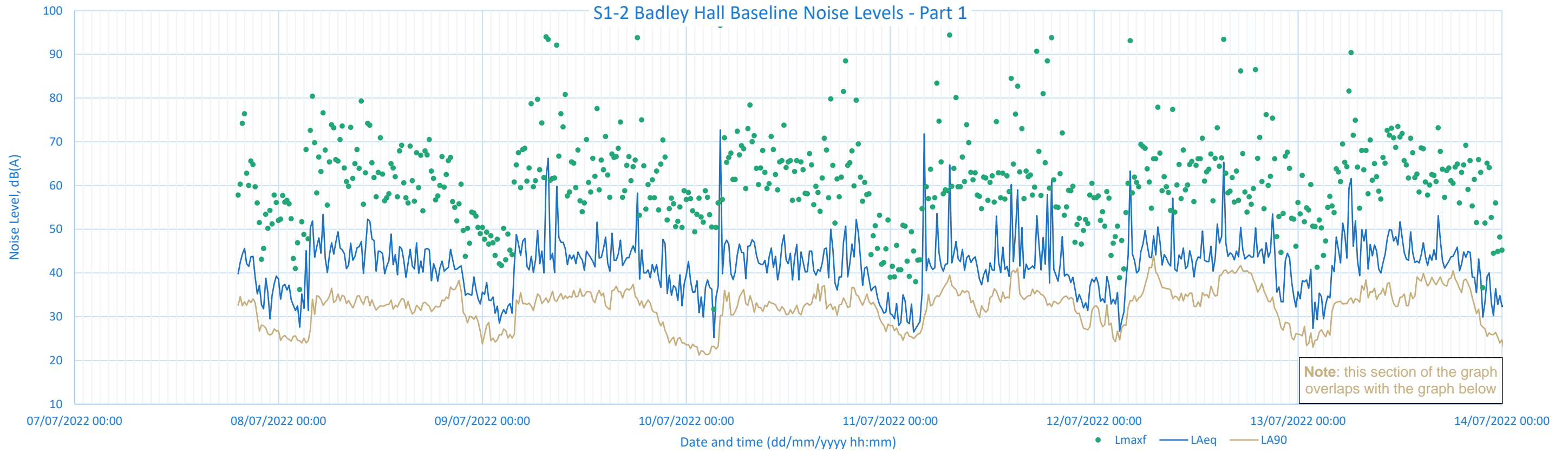


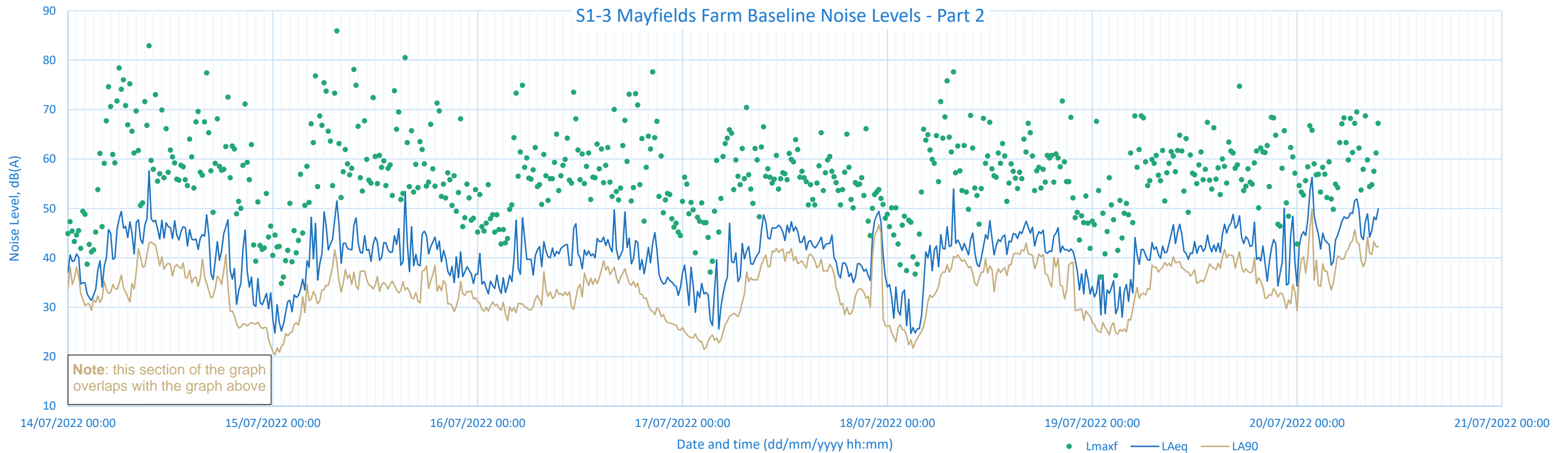
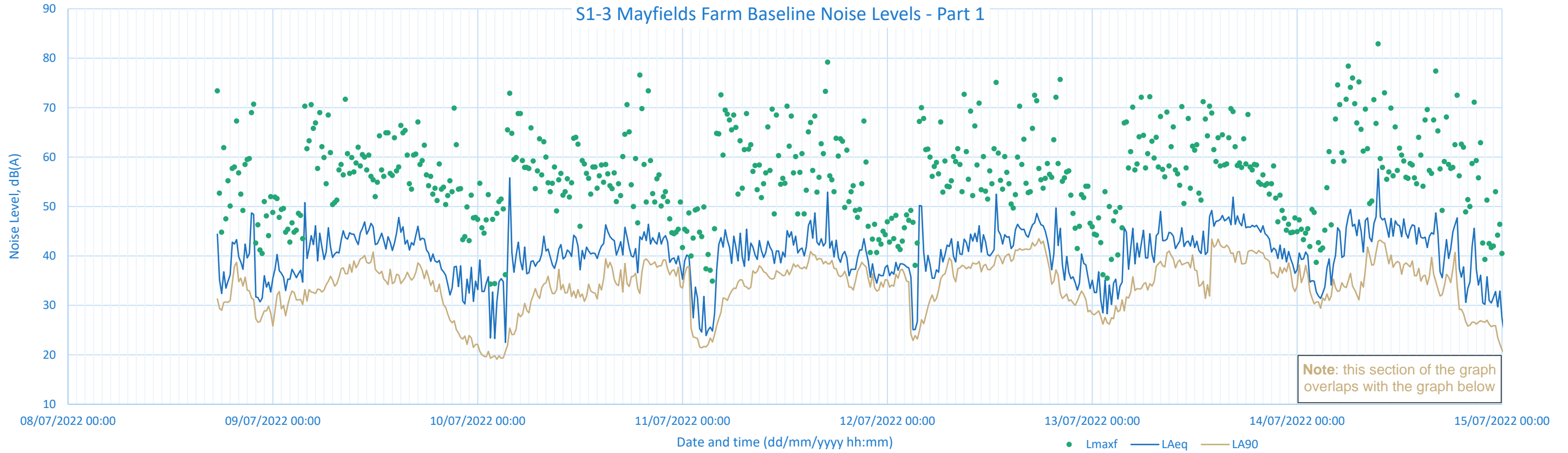


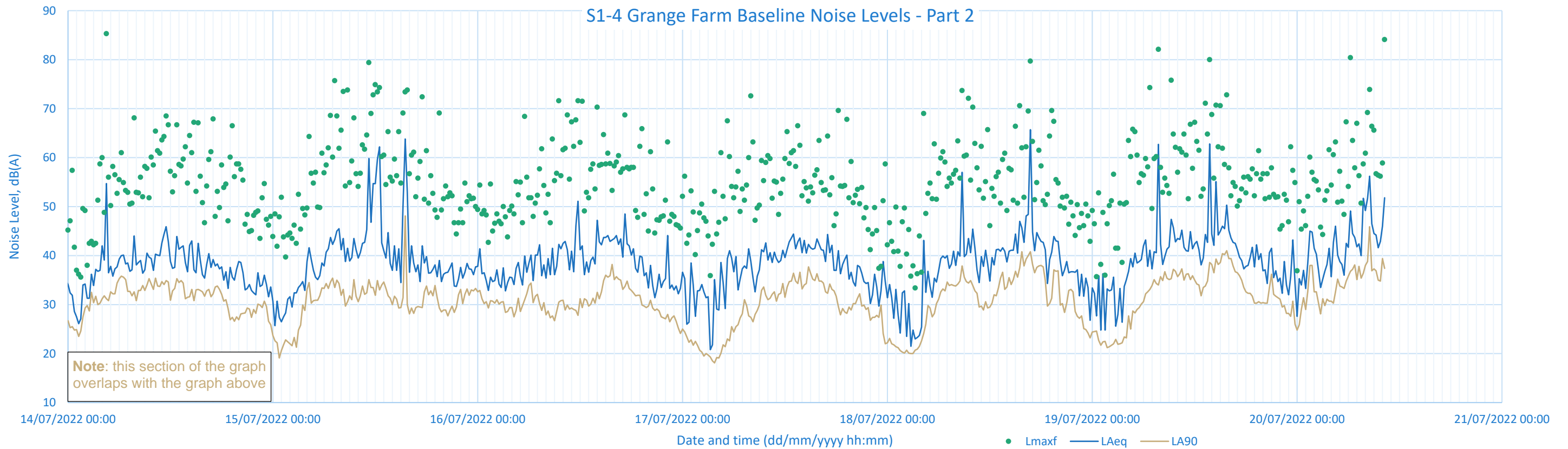
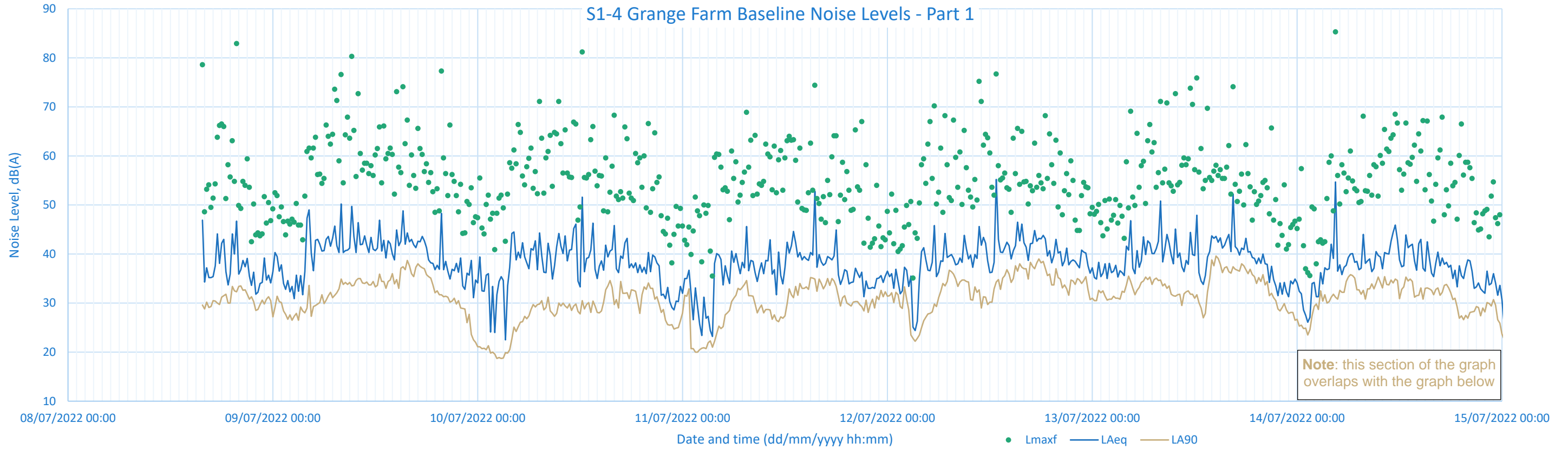


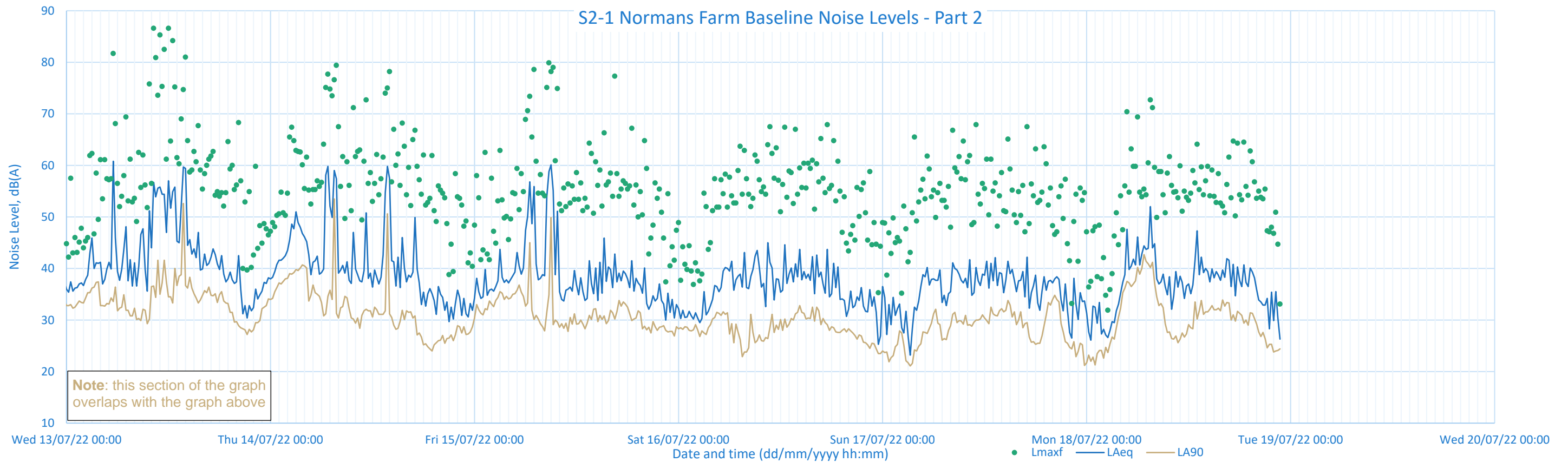
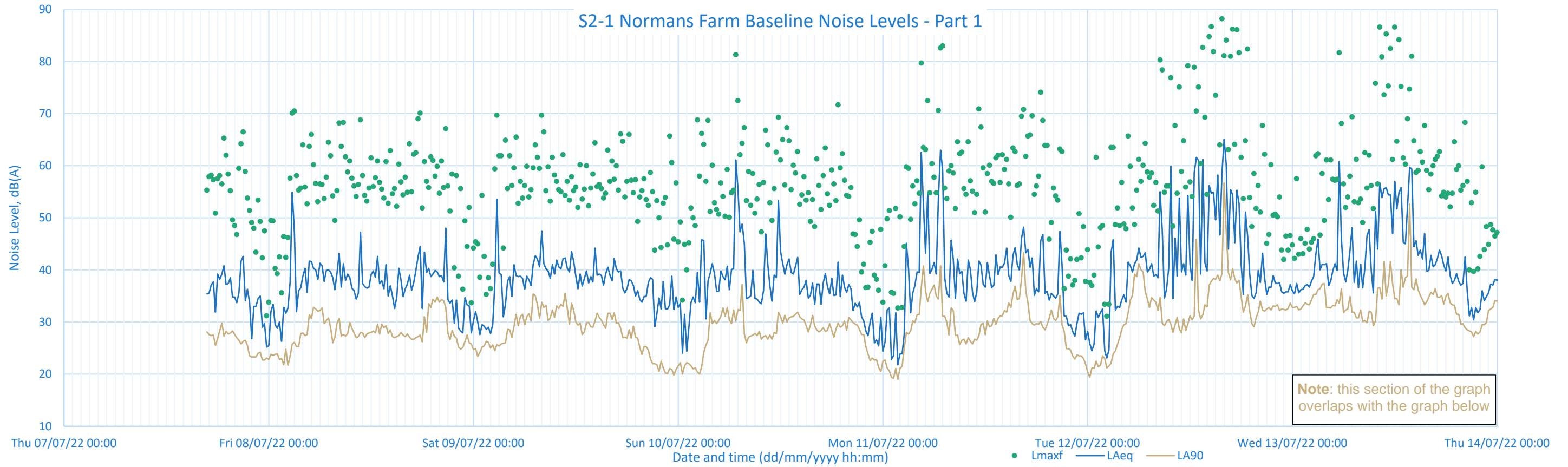


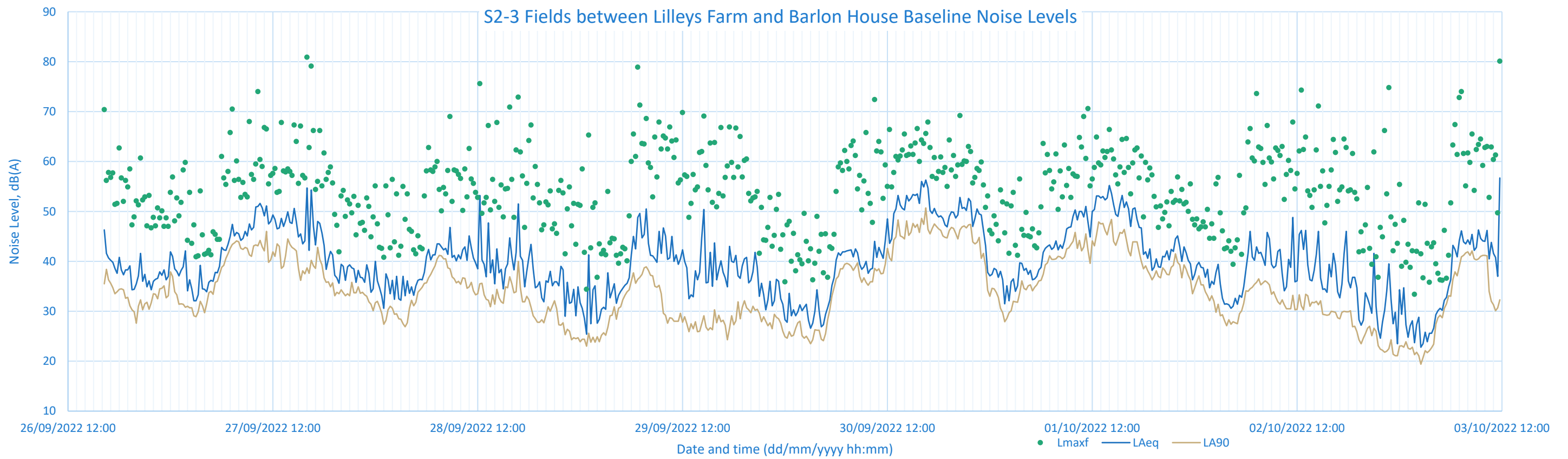
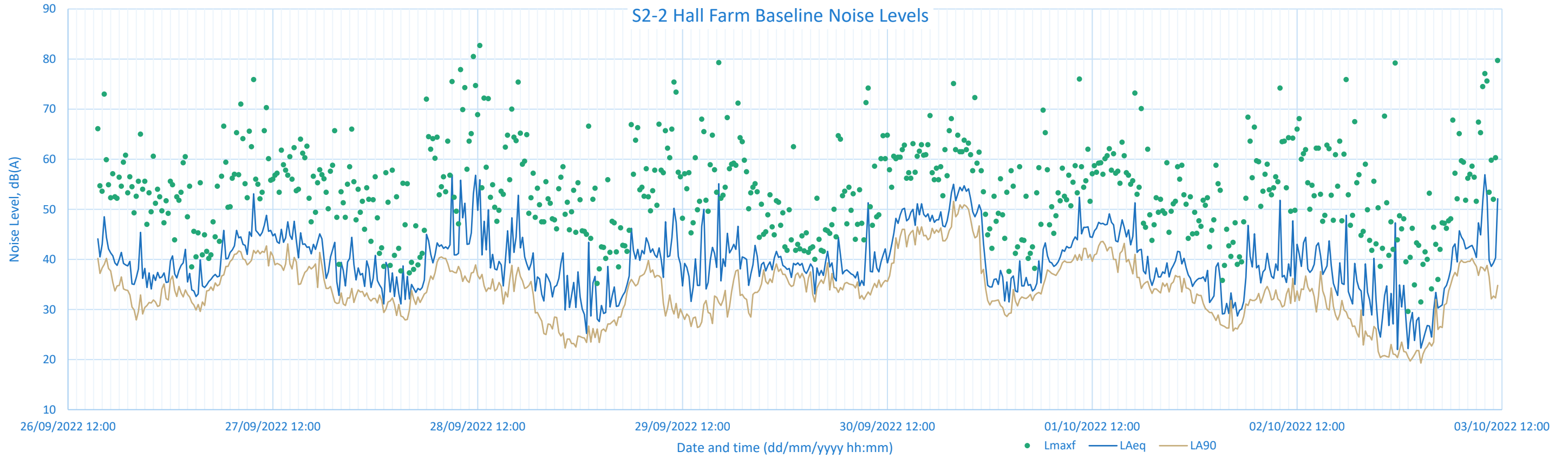


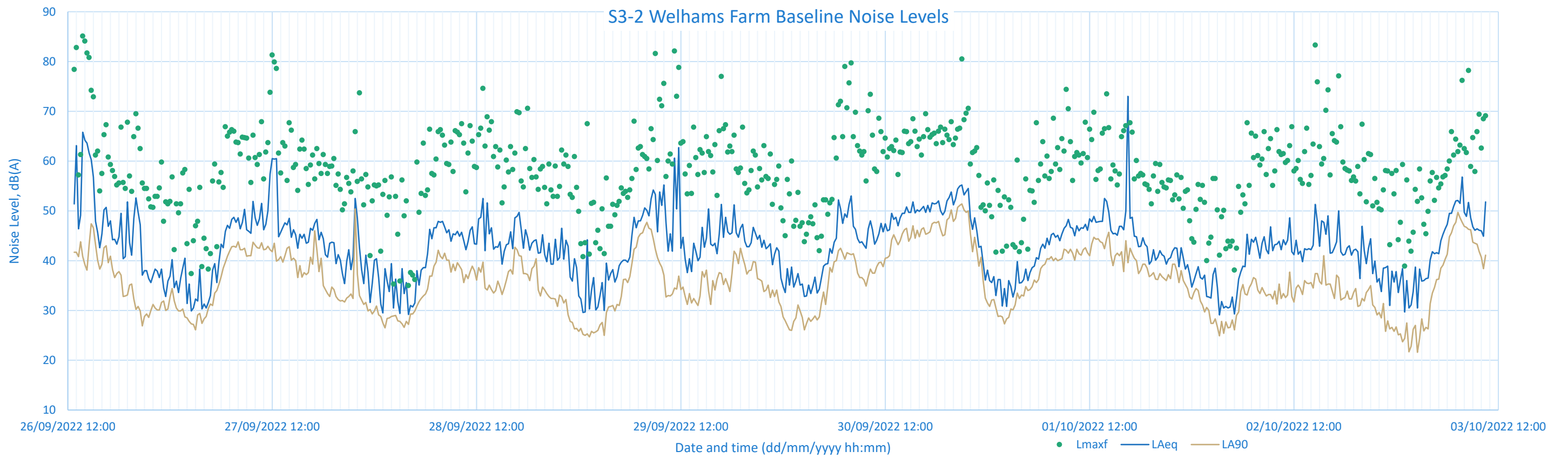
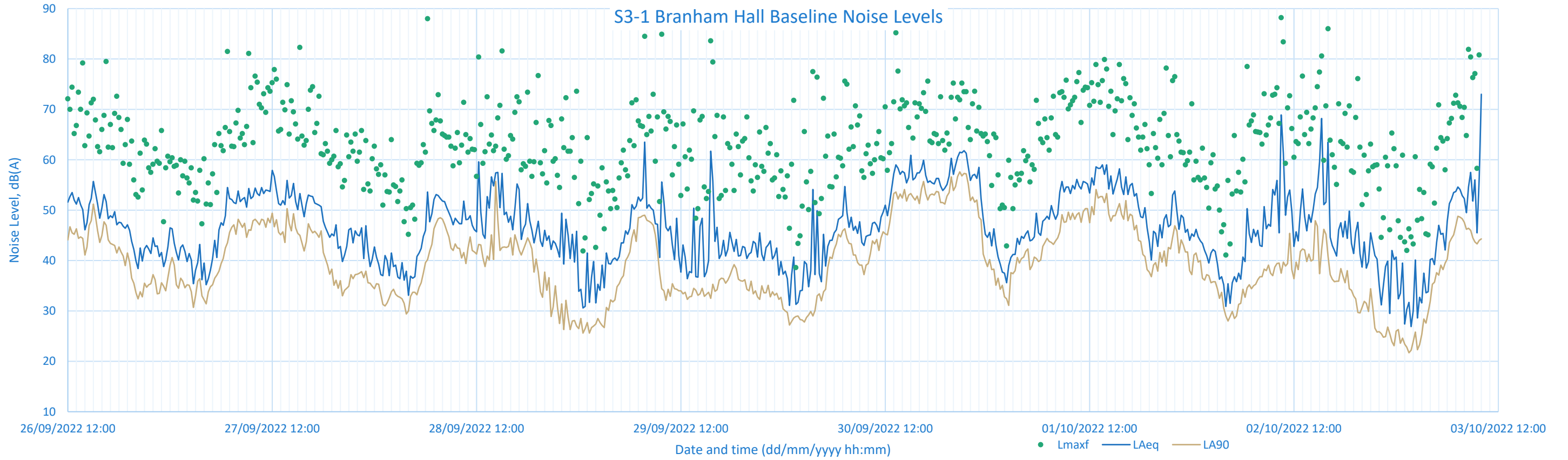


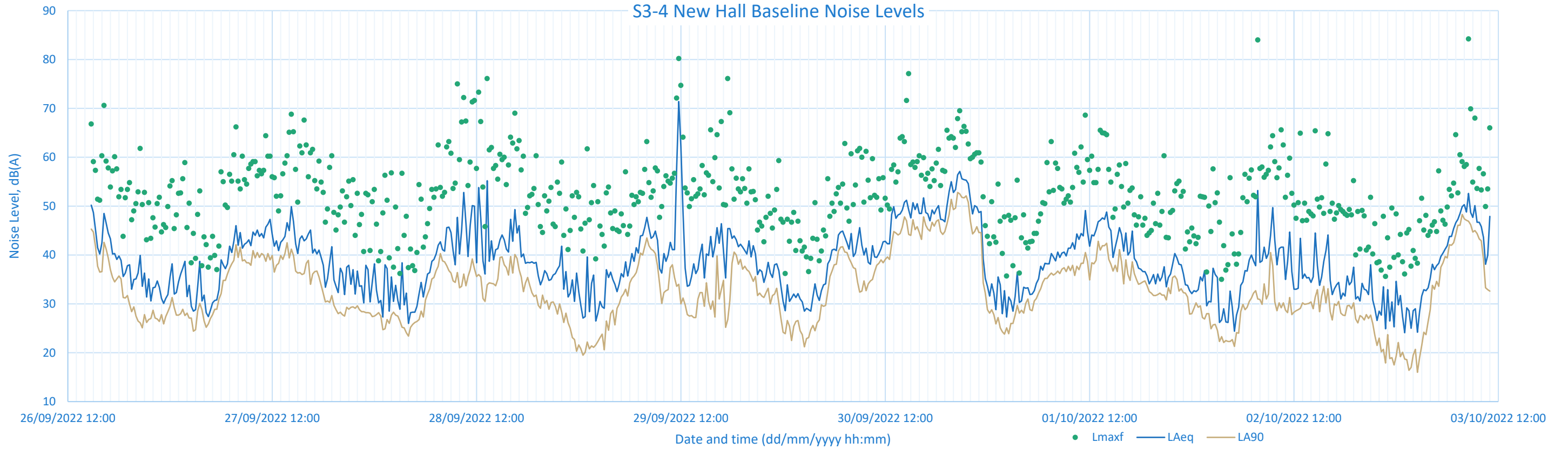
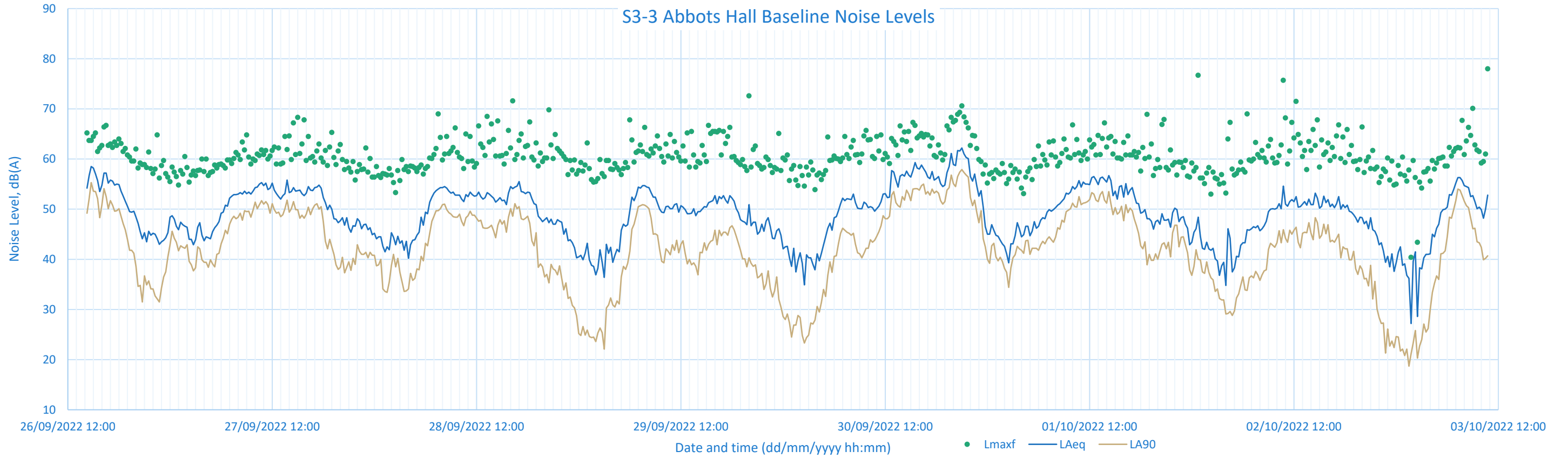


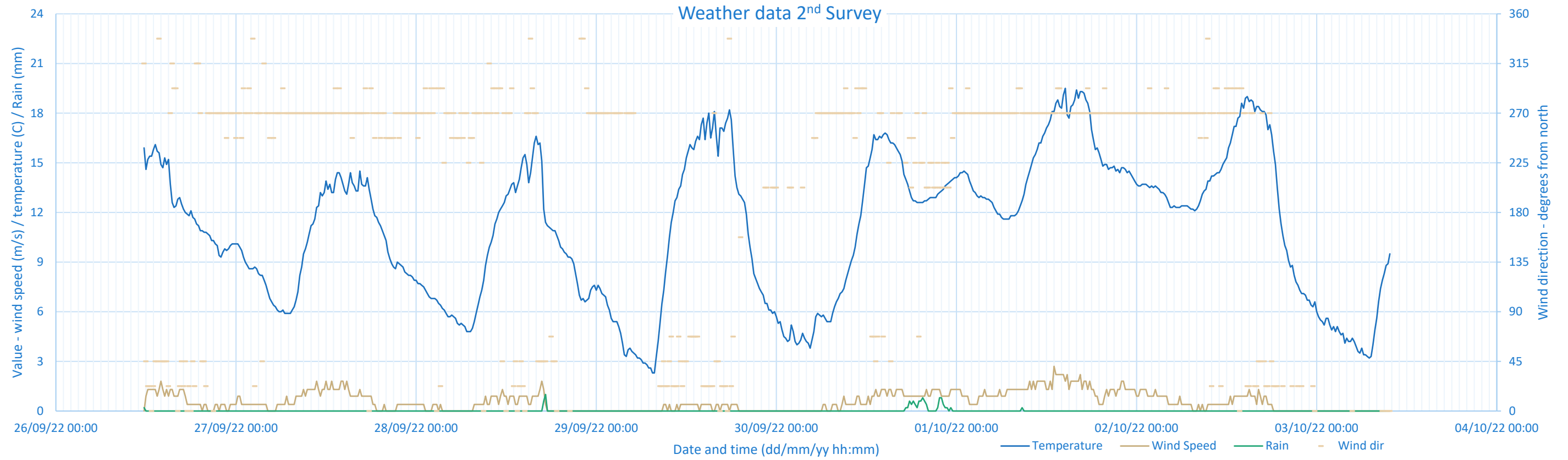
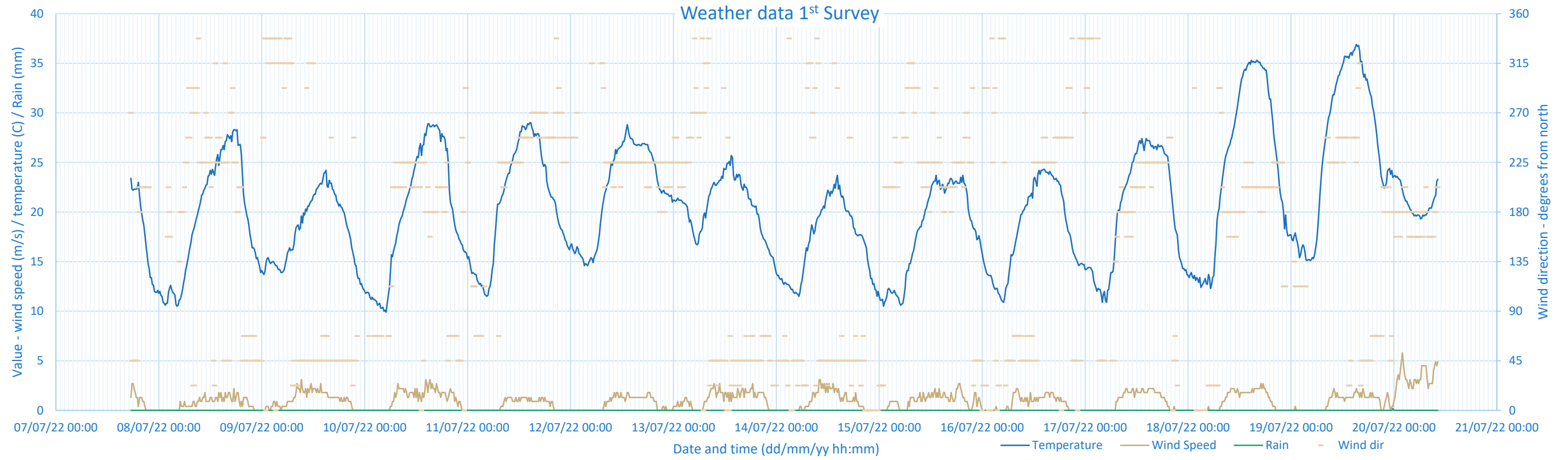














F I V E
ESTUARIES
OFFSHORE WIND FARM



PHONE
EMAIL
WEBSITE
ADDRESS

COMPANY NO

0333 880 5306

fiveestuaries@rwe.com

www.fiveestuaries.co.uk

Five Estuaries Offshore Wind Farm Ltd
Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
Registered in England and Wales
company number 12292474

