



# Preliminary Environmental Information Report

## Appendix 13A: Noise and Vibration Assessment Data

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Future Energy Llanwern Limited

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# 13.A Noise and Vibration Assessment Data

## 13.1 Introduction

13.1.1 This Appendix sets out the input data and methodologies used to predict noise levels at the nearest Noise Sensitive Receptors (NSRs) during the construction phase and operational Phase of the Proposed Development. The nearest NSRs are identified in **Chapter 13: Noise and Vibration** and **Table 13-17**.

## 13.2 Construction Phase

13.2.1 This Section sets out the input data and prediction methodologies used to determine predicted noise levels at the nearest NSRs during the construction phase of the Proposed Development.

13.2.2 The input data is based on a review of the project information and experience of similar schemes. The worst-case plant assumptions for the primary construction activities are set out below in **Table 13A-1** to **Table 13A-6**. The plant data are primarily taken from BS 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (Ref 13-1). In each table, the number of plant items and the percentage on time during a typical working day are presented, with the final column presenting the predicted noise level at 10m from the activity.

13.2.3 The activities outlined in the plant item assumptions, below, correspond to key stages of the construction phase which are considered likely to result in the highest construction noise levels, therefore representing a worst-case assessment for the construction stage. The construction activities considered in the assessment are:

- Construction Compound Construction – Site Preparation;
- New Access Road Excavation and Grading;
- Open Cut Trenching - Fencing and Vegetation Removal;
- Trenchless Crossing Noise Levels – Horizontal Directional Drilling (HDD);
- Foundation Construction of Transformers, Coupler Station and Substation Plant; and
- Screw Piling to support Solar Panels and Inverters.

## Construction Plant Data

### Construction Compound Construction

13.2.4 The source noise levels for plant items considered in the assessment for the construction activities for the site preparation of the construction compounds are provided in **Table 13A-1**.

*Table 13A-1 Construction Compound Construction – Site Preparation*

Plant Item	BS 5228 Reference	dB LAeq,T at 10m dB from plant	No. of plant Items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>25t tracked excavator</b>	C.02 #19	77	1	80	76	82
<b>Chainsaw</b>	C.04 #72	79	1	50	76	
<b>Strimmer</b>	Library Data	80	1	50	77	
<b>Woodchipper</b>	C.04 #72	79	1	50	76	

### Access Tracks: Excavation and Grading

13.2.5 The source noise levels for plant items considered in the assessment for construction of the new access road are provided in **Table 13A-2**.

*Table 13A-2 New Access Road Excavation and Grading*

Plant Item	BS 5228 Reference	dB LAeq,T at 10m dB from plant	No. of plant Items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>Tracked excavator</b>	C.02 #02	77	1	80	76	85
<b>Dozer</b>	C.02 #01	75	1	80	74	
<b>Grader</b>	C.06 #31	87	1	50	84	
<b>Articulated dump truck</b>	C.02 #33	81	1	50	77	

### Cable installation: Open Cut Trenching

13.2.6 The source noise levels for plant items considered in the assessment for Open Cut Trenching activities are provided in **Table 13A-3**.

Table 13A-3: Open Cut Trenching - Fencing and Vegetation Removal

Plant Item	BS 5228 Reference	dB LAeq,T at 10m dB from plant	No. of plant Items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>Tractor</b>	C.04#75	79	2	80	81	85
<b>Post Rammer</b>	C.03#02	87	1	1	67	
<b>Nail Gun</b>	C.04#95	73	1	1	53	
<b>Tracked Excavator</b>	C.02#19	77	1	80	76	
<b>Woodchipper</b>	C.04 #72	79	1	80	78	
<b>Chainsaw</b>	C.04 #72	79	1	50	76	
<b>Strimmer</b>	-	80	1	50	77	

### Trenchless Crossings

13.2.7 Trenchless crossings will be constructed using Horizontal Directional Drilling (HDD). The source noise levels for plant items considered in the assessment for HDD activities are provided in **Table 13A-4**.

Table 13A-4 Trenchless Crossing Noise Levels - HDD

Plant Item	BS 5228 Reference/ Data Source	dB LAeq,T at 10m dB from plant	No. of plant Items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>HDD Drive Compound</b>						
Generator	C.04 #76	61	1	50	58	83
Slurry Separation Plant	C.04 #20	80	1	100	80	
Wheeled Excavator	C.04 #10	66	1	40	62	

35t Excavator	C.02 #19	77	1	40	73	
Dumper	C.04 #03	76	1	100	76	
HGV Deliveries	C.01 #11	80	1	20	73	
Vermeer D23x30 HDD	Manufacturer data	71	1	100	71	
Water Pumps	C.02 #45	65	1	100	65	
<b>HDD Exit Compound</b>						
Wheeled Excavator	C.04 #10	66	1	40	62	78
35t Excavator	C.02 #19	77	1	40	73	
Dumper	C.04 #03	76	1	100	76	

**Foundations for transformers, coupler station and substation plant**

13.2.8 Noise levels due to the construction of the foundations for the transformers, coupler stations and substation plant are provided in **Table 13A-5**.

*Table 13A-5 Foundation Construction of Transformers, Coupler Station and Substation Plant Noise Levels*

Plant Item	BS 5228 Reference	dB LAeq,T at 10m dB from plant	No. of plant Items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>Impact piling rig</b>	C.03 #1	89	1	25	83	85
<b>Tracked excavator</b>	C.02 #19	77	1	90	77	
<b>Concrete mixer truck</b>	C.04 #20	80	1	50	77	
<b>Tipper lorry</b>	C.08 #20	79	1	50	76	

## Solar Panels & inverters: Screw Piling

13.2.9 Noise levels due to piling activities for the Solar Panels and inverters are shown in **Table 13A-6**.

Table 13A-6 Screw Piling Noise Levels – Solar Panels and Inverters

Plant Item	BS 5228 Reference	dB LAeq,T at 10m from plant	No. of plant items	On-time %	dB LAeq,T at 10m from plant items	Resultant dB LAeq,T at 10m
<b>Mini piling rig</b>	C.03 #17	76	4	80	81	85
<b>Compressor for mini piling</b>	C.03 #19	75	4	90	80	
<b>Off-Road vehicle</b>	Library Data	66	2	50	66	
<b>Tipper lorry</b>	C.08 #20	79	1	50	76	

## Construction Stage Noise Level Prediction Methodology

13.2.10 Construction phase noise levels have been predicted in accordance with BS 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (Ref 13-1), assuming propagation over soft ground, and ignoring any influence of screening or reflections.

13.2.11 Predicted construction phase noise levels are representative of a reasonable worst-case maximum noise level when a given construction activity would be in closest proximity to the nearest receptors. As such, it is considered that the predicted construction phase noise levels (for most construction activities) are indicative of the noise level that receptors would be exposed to for a duration of around one to three days, and that in the longer term, e.g. weeks/ months, construction noise levels would tend to be significantly lower, in the order of 10 to 20dB lower, than the predicted levels.

13.2.12 Construction activities which may take place in a relatively limited area over a longer period are HDD, which is assumed to be in one location for around two weeks, and screw piling of supports for Solar Panels and inverters, which is assumed to be in one location for around a week.

13.2.13 Though there may be some variation in the activities required for construction and decommissioning, the predicted construction phase noise levels are considered representative of the noise levels that would be likely during the decommissioning phase.

### Predicted Construction Phase Noise Levels

13.2.14 Predicted construction phase noise levels at the nearest NSR to each construction activity are presented in **Table 13A-7**, below.

*Table 13A-7 Construction Noise Levels at Nearest NSRs*

Activity	Nearest NSR	Approx. distance to NSR, m	Predicted construction noise level, dB $L_{Aeq,T}$
<b>1. Compound Vegetation Removal</b>	NSR16	130	57
<b>2. Access Road Ground levelling</b>	NSR17	60	68
<b>3. Trenching</b>	NSR16	25	78
<b>4. HDD (drive and exit compound)</b>	NSR16	230	53
<b>5. Foundation Construction</b>	NSR8	150	58
<b>6. Screw Piling for Solar Panels &amp; Inverters</b>	NSR16	25	78

### Construction Vibration

13.2.15 Piling will be required for the Solar Panels, inverters and transformers. Screw piling will be used for the Solar Panels and inverters. Screw piling is not a significant source of vibration. Therefore, no prediction of vibration from screw piling is undertaken.

13.2.16 The foundations for the intermediate transformers and transformers required at the substations require piles and, at this stage, it is not possible to rule out percussive piling. A prediction of vibration levels at the nearest NSR due to typical percussive piling activities is provided in **Table 13A-8** below, based on impacts of 50 kW energy and stiff, cohesive soil. The nearest receptor to a proposed intermediate transformer or substation transformer is NSR R08 which is approximately 75m from a proposed intermediate transformer.

Table 13A-8 Construction Vibration Level at Nearest NSR due to Percussive Piling

Receptor	Distance, m	Maximum PPV, mm/s
R08	75	1.2

### 13.3 Operation Phase

13.3.1 This Section sets out the input data and prediction methodologies used to determine predicted noise levels at the nearest NSRs during the operation phase of the Proposed Development.

13.3.2 The input data has been determined based on data provided by the Applicant, manufacturer’s data and experience of similar developments.

13.3.3 The major noise emitting plant items considered in the assessment are:

- Inverters (SUN2000-330KTL-H1) ;
- Transformers (JUPITER-6000K-H1, 6000 KVA);
- Transformers (JUPITER-9000K-H1, 9000 KVA); and
- Substation Plant.

### Operational Plant Data

#### Inverters

13.3.4 Source sound power levels for the inverters were determined based on broadband sound level data provided by the manufacturer. The manufacturer data provides a maximum sound pressure level at 1 m form the equipment, which was converted to a point source sound power assuming free field propagation. A typical noise spectrum for similar equipment (Ref 13-2) was applied. The inverter sound power level is provided in **Table 13A-9**, below.

Table 13A-9 Inverter Sound Power Level: (SUN2000-330KTL-H1)

Sound power levels per octave band, dBZ L <sub>w</sub>								Overall sound power level, dBA L <sub>w</sub>
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
84.1	82.9	83.8	80.0	76.0	75.0	82.0	74.6	<b>86</b>

#### Transformers

13.3.5 Source sound power levels for the 6000 KVA and 9000 KVA transformers were determined based on broadband sound level data provided by the manufacturer. The manufacturer data indicates sound pressure levels at 1 m, which was converted to a point source sound power assuming free field propagation. A noise spectrum was applied based on data presented in a study of transformer noise (Ref 13-3). The transformer sound power levels are provided in **Table 13A-10** and **Table 13A-11**, below.

*Table 13A-10: Transformer Sound Power Level: (JUPITER-6000K-H1)*

Sound power levels per octave band, dBZ L <sub>w</sub>								Overall sound power level, dBA L <sub>w</sub>
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
78.7	95.0	92.8	90.5	77.4	69.0	62.2	62.0	<b>89</b>

*Table 13A-11 Transformer Sound Power Level: (JUPITER-9000K-H1)*

Sound power levels per octave band, dBZ L <sub>w</sub>								Overall sound power level, dBA L <sub>w</sub>
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
100.9	110.0	98.6	90.8	73.5	63.9	57.3	59.3	<b>94</b>

### Substation Plant

13.3.6 A number of grid connection options are being considered as part of the Proposed Development. Based on the information provided by the Applicant, the only significant noise sources proposed as part of the grid connection are the 132/33 kV transformers.

13.3.7 A review was undertaken to determine the worst-case option with regard to potential noise impacts at the nearest NSRs. The review indicated that Option 2 is the worst case with regard to potential noise emissions, as this option includes all 132/33 kV transformers proposed across all of the different grid connection options.

13.3.8 Based on information provided by the Applicant, it is assumed that noise levels from the 132/33 kV transformers are 85 dBA at 1m. This was converted to a point source sound power assuming 85 dBA at all points 1m from the transformer. On this basis, the calculations indicate a sound power level of a 132/33 kV transformer of 106 dBA L<sub>w</sub>. It is noted that this sound power is relatively high compared to similar transformers considered for similar developments. Therefore, the sound power of these transformers may be updated in the assessment presented in the ES if more detailed information is received. A spectrum for these transformers was applied

based on data presented in a study of transformer noise (Ref 13-3).

13.3.9 Based on the above, the sound power of the transformers used in the assessment is presented in **Table 13A-12**, below.

*Table 13A-12 132/33 kV Transformer Sound Power Level (Grid connection substation transformers)*

Sound power levels per octave band, dBZ L <sub>w</sub>								Overall sound power level, dBA L <sub>w</sub>
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
95.0	111.3	109.1	106.8	93.7	85.3	78.5	78.4	<b>106</b>

### Operation Phase Noise Level Prediction Methodology

13.3.10 Operation phase noise levels have been predicted using 3D noise modelling software CadnaA in accordance with ISO 9613-2:2024 *Acoustics - Attenuation of sound during propagation outdoors Part 2* (Ref 13-4). The model parameters were as follows:

- Predicted noise levels at dwellings are the highest from any façade at ground and first floor levels and are free-field, i.e. the reflection from the own façade is suppressed;
- Topography was modelled based on publicly available topography data;
- All ground assumed to be soft ground (G=1);
- All buildings assumed to be 8m height;
- Reflection order: 3; and
- Screening provided by the proposed Solar Panels is accounted for.

13.3.11 Operational phase noise emissions have been predicted assuming that all plant is operating at 100% capacity at all times. At this stage, the predicted noise levels are preliminary, and worst-case, as there is currently no information on the anticipated variation in operating duty of operational plant and limited data on how operational noise levels are expected to vary at different times of day.

13.3.12 In reality, it is expected that noise emissions from the inverters and intermediate transformers will be substantially reduced during hours of darkness. As such, evening and night-time operational noise levels, in particular, are likely to be lower than predicted.

### Predictions of Operational noise

13.3.13 As the predicted operational noise levels are preliminary, full results are not presented here, but will be presented in the ES. Based on the source data and prediction methodology set out above, the range of preliminary predicted operational noise levels is outlined below.

13.3.14 In general, the predicted specific sound levels are low in absolute terms. The preliminary results indicate that, at dwellings, predicted specific sound levels at ground floor level are between 28 to 41 dB  $L_{Aeq,T}$  and predicted specific sound levels at first floor level are between 31 to 43 dB  $L_{Aeq,T}$ .

13.3.15 The preliminary results indicate that, at the Wales Coast Path, predicted operational noise levels are between 41 to 42 dB  $L_{Aeq,T}$ .

## 13.4 References

- Ref 13A-1 British Standards Institution (BSI, 2014). British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. BSI; London.
- Ref 13A-2 RPS (2024). Botley West Solar Farm. Environmental Statement Volume 3 Appendix 13.3: Operational Phase Noise. PINS Ref: EN010147. Document Ref: EN010147/APP/6.5.
- Ref 13A-3 Gange, M. (2011). Low-frequency and Tonal Characteristics of Transformer Noise. Page 23, Proceedings of ACOUSTICS 2011. ACOUSTICS, Australia.
- Ref 13A-4 British Standards Institution. (2024). BS ISO 9613-2:2024. Acoustics - Attenuation of sound during propagation outdoors. Part 2: engineering method for the prediction of sound pressure levels outdoors. BSI; London.

# Annex A

# Noise Monitoring Form

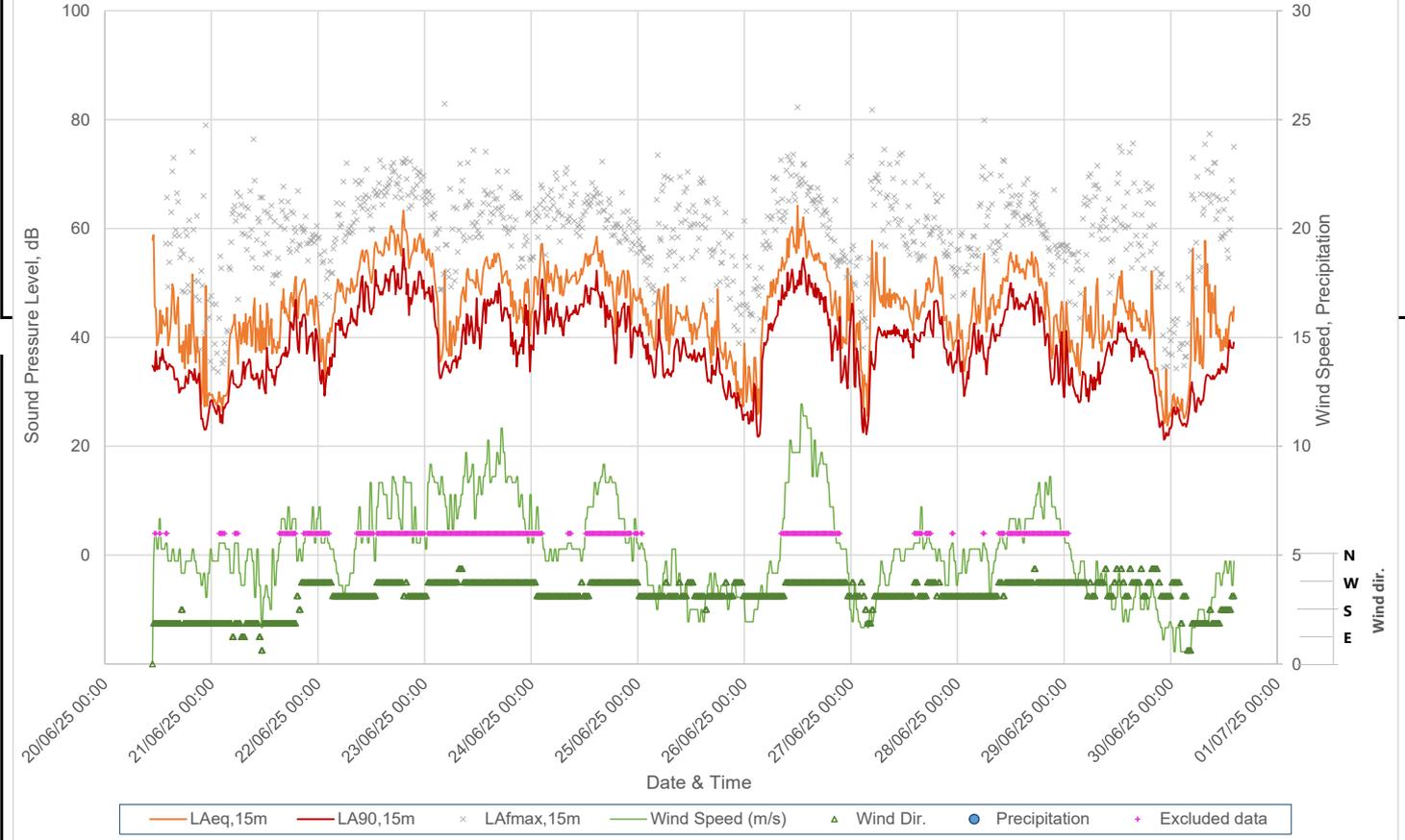
<b>Project Name:</b>	Future Energy Llanwern	<b>Project No:</b>	70109716
<b>Location:</b>	NML2: Porton Farm, Whitson, Newport W3W: ///atoms.workbench.cackling	<b>Engineer:</b>	JB
<b>Sound Level Meter:</b>	Rion NL-52. SN: 1021288	<b>Calibrator:</b>	Rion NC-74. SN: 35173440
<b>Pre-Calibration Level:</b>	94.0	<b>Weather:</b>	Dry and sunny throughout surveying period. Wind speeds generally low, with intermittent periods of high wind speeds.
<b>Post-Calibration Level:</b>	93.6 (0.4 dB correction)		

**Additional Comments:** Approx 930 m east of Whitson Common Road, and approx 650 m north of the Bristol Channel.

Measurement Period			Description of Audible Noise
Start/ Stop Date	Start/ Stop Time	Sample Interval	
20/06/2025	10:45:00	15 minute	Intermittent sheep calls heard in neighbouring fields. Background noise consisted primarily of cricket sounds, while wind rustling leaves of nearby trees could be heard faintly.
30/06/2025	14:15:00		



Baseline Monitoring Results: NML2 - Time History



# Noise Monitoring Form

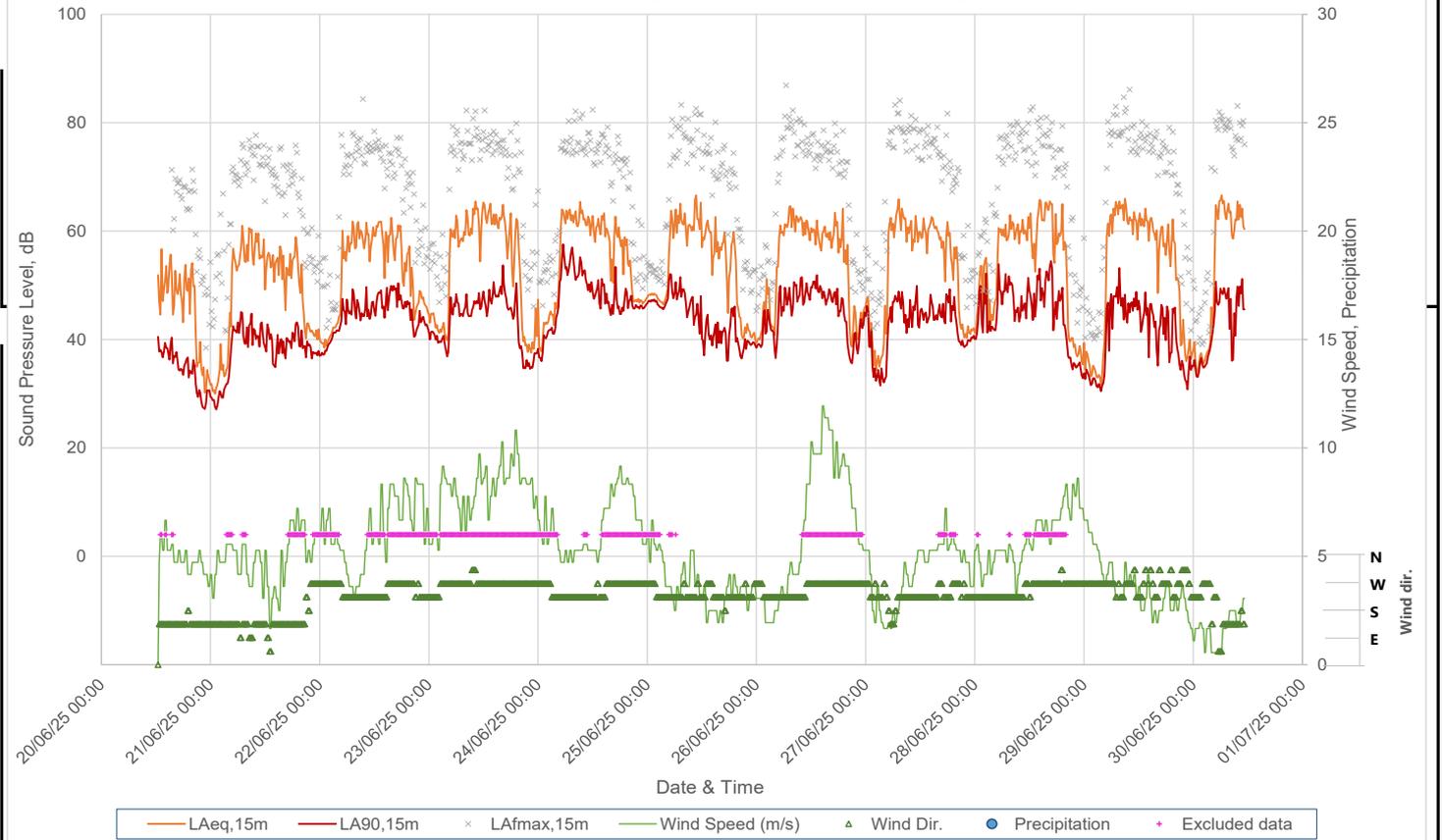
<b>Project Name:</b>	Future Energy Llanwern	<b>Project No:</b>	70109716
<b>Location:</b>	NML3: North Court Farm, Redwick, Newport W3W: ///pasting.sized.moved	<b>Engineer:</b>	JB
<b>Sound Level Meter:</b>	Rion NL-52. SN: 00632043	<b>Calibrator:</b>	Rion NC-74. SN: 1020510
<b>Pre-Calibration Level:</b>	94.0	<b>Weather:</b>	Dry and sunny throughout surveying period. Wind speeds generally low, with elevated wind speeds in intermittent periods.
<b>Post-Calibration Level:</b>	94.0		

**Additional Comments:** Meter positioned approx 50 m from farmsheds located west and south of the measurement location, and approx 160m west of North Row. Meter positioned 2m north of fenced off storage space.

Measurement Period			Description of Audible Noise
Start/ Stop Date		Sample Interval	
20/06/2025	12:30:00	15 minute	The dominant noise source was intermittent engine noise from farm vehicles. The background noise consisted of wind rustling in tall grass, birdsong and cattle in nearby farmsheds.
30/06/2025	11:15:00		



Baseline Monitoring Results: NML3 - Time History



# Noise Monitoring Form



<b>Project Name:</b>	Future Energy Llanwern	<b>Project No:</b>	70109716
<b>Location:</b>	NML4: Redwick Coastal Path W3W: ///permanent.vivid.dilute	<b>Engineer:</b>	JB
<b>Equipment:</b>	Rion NL-52. SN: 00764965	<b>General Weather Description:</b>	
<b>Pre-Calibration Level:</b>	94.0	Dry and sunny, with low wind speeds.	
<b>Post-Calibration Level:</b>	93.9		

**Additional Comments:**

Measurement Period		Weather	Statistical Noise Levels / dB				Description of Audible Noise
Date/Time	Elapsed Minutes	Wind Speed (m/s)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A90</sub>	
20/06/2025 15:45	60	4.0	41	70	45	29	Crickets, birdsong and occasional airplane flyover were clearly audible. Wind in flora and waves crashing against the sea wall could be heard faintly. The sound of distant farm vehicles could be heard very faintly.
30/06/2025 10:00	60	3.0	36	58	39	28	



# Noise Monitoring Form

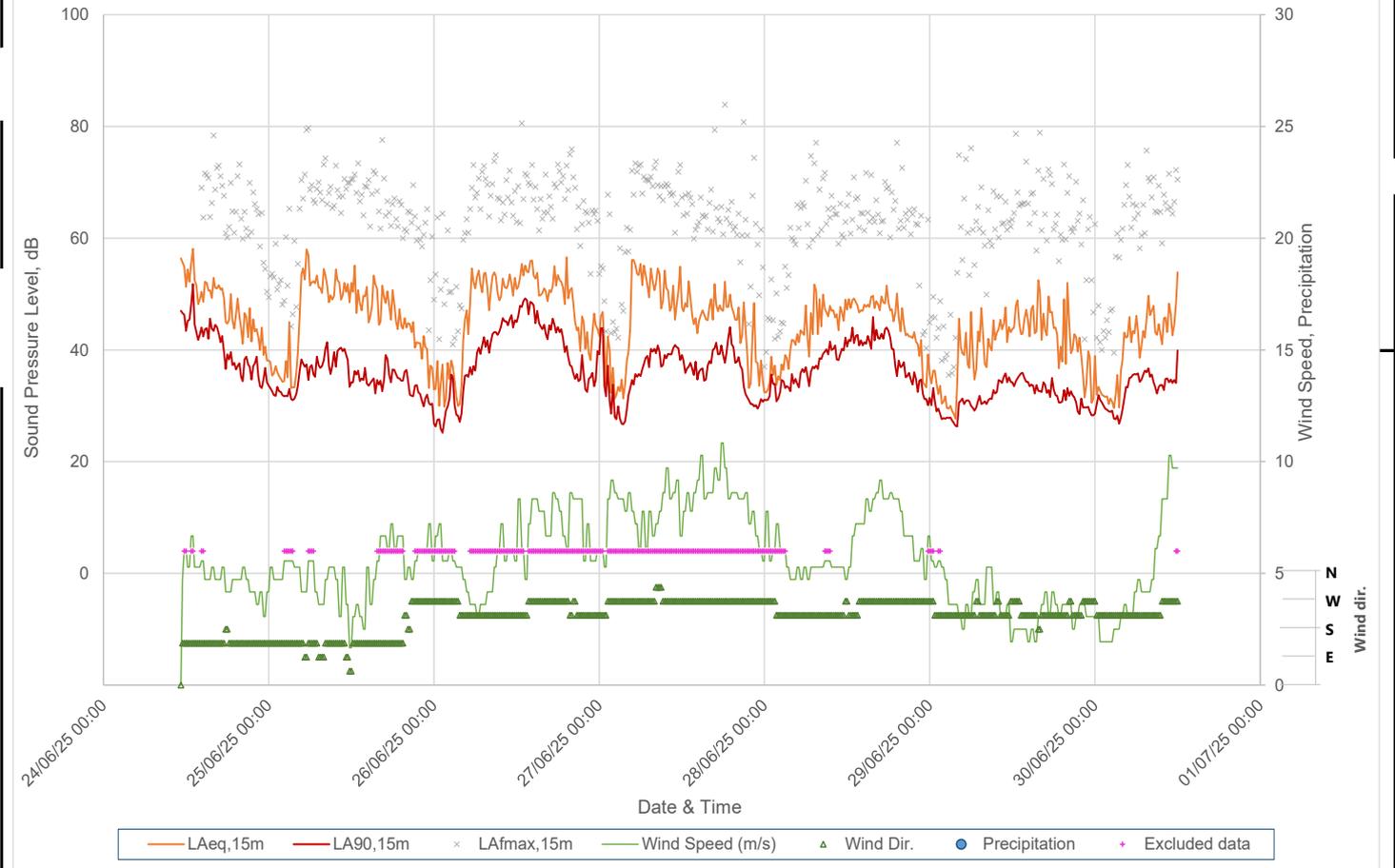
<b>Project Name:</b>	Future Energy Llanwern	<b>Project No:</b>	70109716
<b>Location:</b>	NML5: Magorpill Farm, Caldicot W3W: ///examiner.installs.certified	<b>Engineer:</b>	JB
<b>Sound Level Meter:</b>	Rion NL-52. SN: 00320638	<b>Calibrator:</b>	Rion NC-74. SN: 34657202
<b>Pre-Calibration Level:</b>	94.0	<b>Weather:</b>	Dry and sunny throughout surveying period. Wind speeds generally low, with elevated wind speeds in intermittent periods.
<b>Post-Calibration Level:</b>	94.0		

**Additional Comments:** Located approx 13 m south of The Causeway and approx 80m east of Whitewall.

Measurement Period			Description of Audible Noise
Start/ Stop Date		Sample Interval	
24/06/2025	11:15:00	15 minute	The dominant noise source was intermittent road traffic on The Causeway and Whitewall. The background noise consisted of distant engines of farm vehicles, wind rustling leaves in trees and birdsong.
30/06/2025	12:00:00		



Baseline Monitoring Results: NML5 - Time History



# Noise Monitoring Form

<b>Project Name:</b>	Future Energy Llanwern	<b>Project No:</b>	70109716
<b>Location:</b>	NML6: Magorpill Farm, Newport W3W: ///offstage.shippers.carefully	<b>Engineer:</b>	JB
<b>Sound Level Meter:</b>	Rion NL-52. SN: 00821130	<b>Calibrator:</b>	Cirrus CR:515. SN: 67437
<b>Pre-Calibration Level:</b>	94.0	<b>Weather:</b>	Dry and sunny throughout surveying period. Wind speeds generally low, with elevated wind speeds in intermittent periods.
<b>Post-Calibration Level:</b>	94.0		

**Additional Comments:** Located approx 18 m north of the Wales Coast Path.

Measurement Period			Description of Audible Noise
Start/ Stop Date		Sample Interval	
24/06/2025	11:45:00	15 minute	The primary noise source was wind rustling leaves in trees. The background noise consisted of cricket noises and birdsong.
30/06/2025	12:30:00		



Baseline Monitoring Results: NML6 - Time History

