The Great Grid Upgrade

Grimsby to Walpole

Preliminary Environmental Information Report

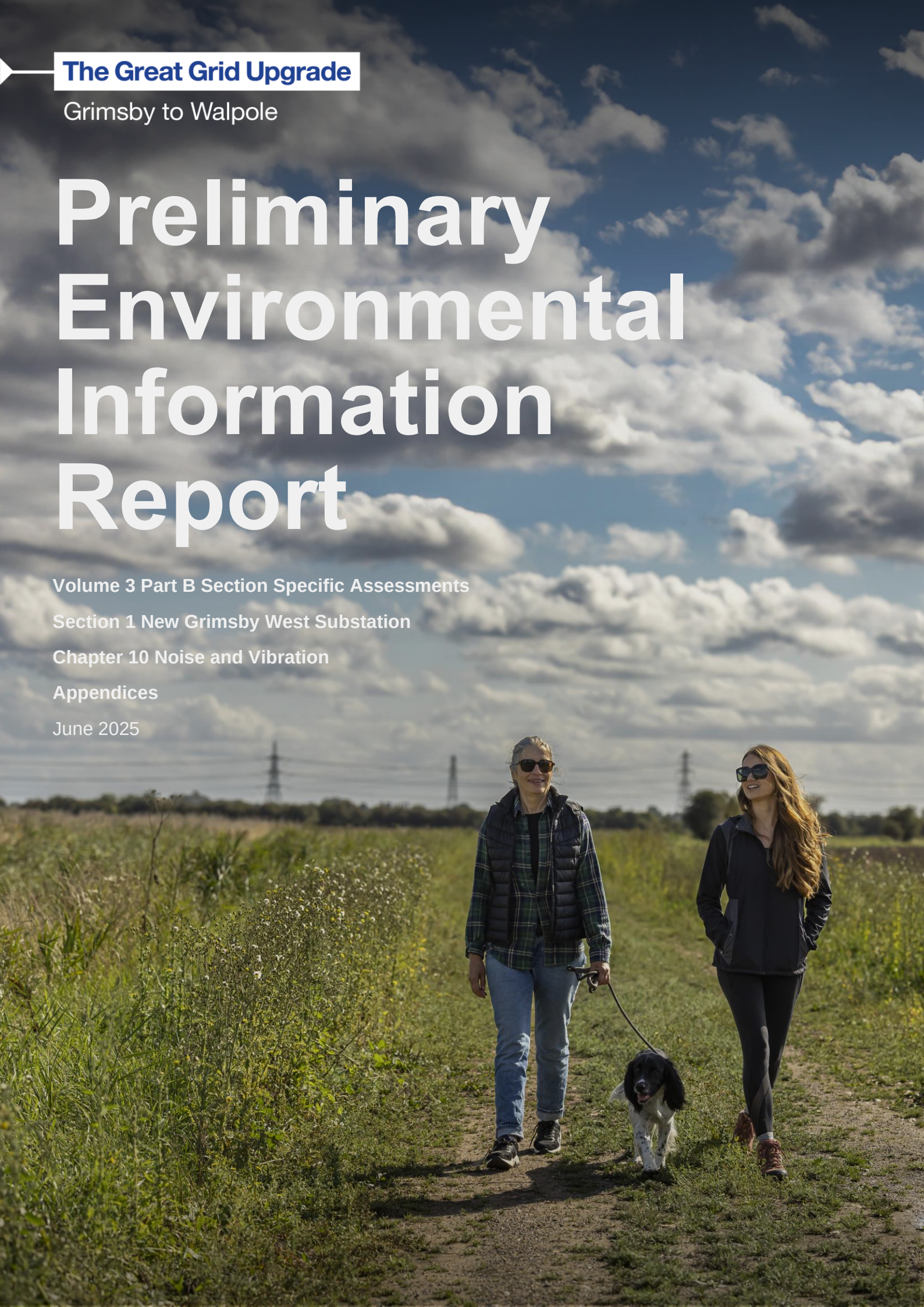
Volume 3 Part B Section Specific Assessments

Section 1 New Grimsby West Substation

Chapter 10 Noise and Vibration

Appendices

June 2025



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10A. Baseline Noise Survey Data

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10A1. Baseline Noise Survey Data

10A1.1 Introduction

10A1.1.1 This appendix presents results of the baseline noise survey conducted for the New Grimsby West Substation Section (Section 1) as part of the Grimsby to Walpole Project (the Project). Baseline noise surveys have been conducted at three locations representative of noise sensitive locations (NSR) within the operational noise Study Area for use within the operational noise assessment for the proposed substation.

10A1.2 Noise Survey Methodology

10A1.2.1 The noise monitoring was undertaken following the principles of British Standard (BS) 7445-1:2003 – Description and measurement of environmental noise – Part 1: Guide to quantities and procedures (BS 7445-1) (Ref 1) and BS 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound (BS 4142) (Ref 2).

Survey Procedure

10A1.2.2 Continuous noise monitoring was undertaken at each location over eight days, including weekday and weekend periods, between Thursday 27 June and Friday 6 July 2024.

10A1.2.3 The calibration of the sound levels meter was checked at the start and end of the measurement. No significant drift was noted during the survey. The sound level meter had been laboratory calibrated within 24 months and the acoustic calibrators had been laboratory calibrated with 12 months of the survey, in line with the requirements of BS 4142.

10A1.2.4 A full suite of acoustical parameters was measured during the monitoring, but the following parameters are of particular relevance for the assessment of operational noise and reported:

i. $L_{Aeq,15min}$ (the equivalent continuous A-weighted sound pressure level);

ii. $L_{AFmax,15min}$ (the maximum sound level during the measurement period); and

iii. $L_{A90,15min}$ (the sound level that was exceeded for 90 per cent of the measurement period; i.e. a typical lower value).

10A1.2.5 The measurements were set to continuously repeating 15-minute periods. One-second L_{eq} measurements and one-third octave band sound levels were also recorded.

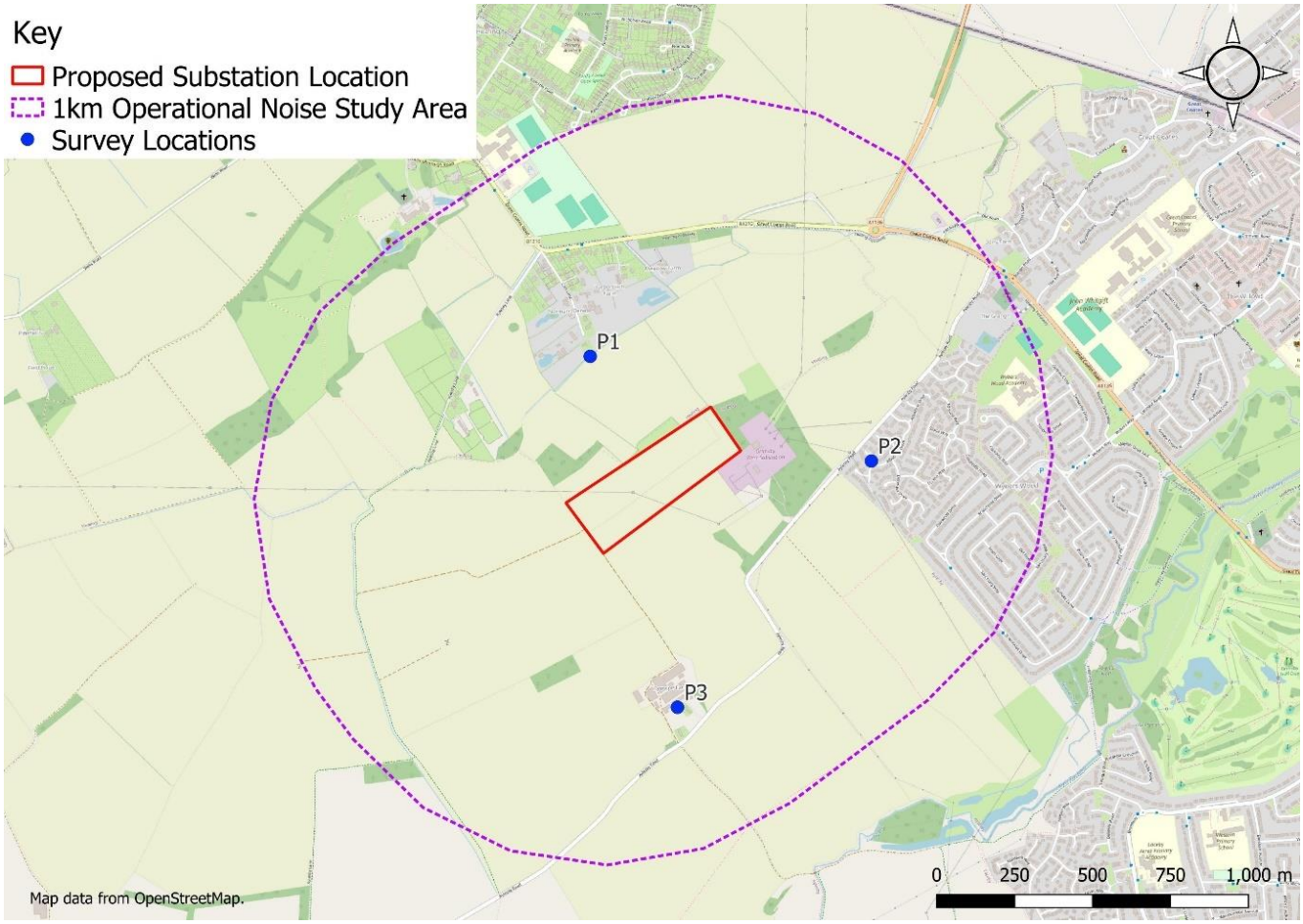
10A1.2.6 The sound level meter was housed within weatherproof peli-cases with the microphone mounted via a tripod or pole height at height of between 1.2 m and 1.5 m.

10A1.2.7 Weather conditions were monitored during the surveys and periods of rain and/or high wind (>5 m/s) were excluded from the assessment.

Survey Locations

10A1.2.8 The noise survey was conducted at three locations (marked as P1-3), representative of nearby receptors within the operational noise Study Area for the proposed New Grimsby West Substation. The survey locations are shown in **Image 10A-1**. The weather station was located at location P3.

Image 10A-1 Grimsby West noise survey locations



10A1.3 Noise Survey Results

Location P1

Location details

10A1.3.1 A photograph of survey location P1 is provided in **Image 10A-2**.

Image 10A-2 Survey location P1

10A1.3.2 The survey location is as follows:

i. Easting/Northing: 521989/409585;

ii. What3words: campus.whistle.soldiers; and

iii. measurement condition: Free-field.

Measurement equipment

i. Sound Level Meter: Rion NL-52 Serial number 00320635; and

ii. Acoustic Calibrator: Rion NC-74 Serial number 34235943.

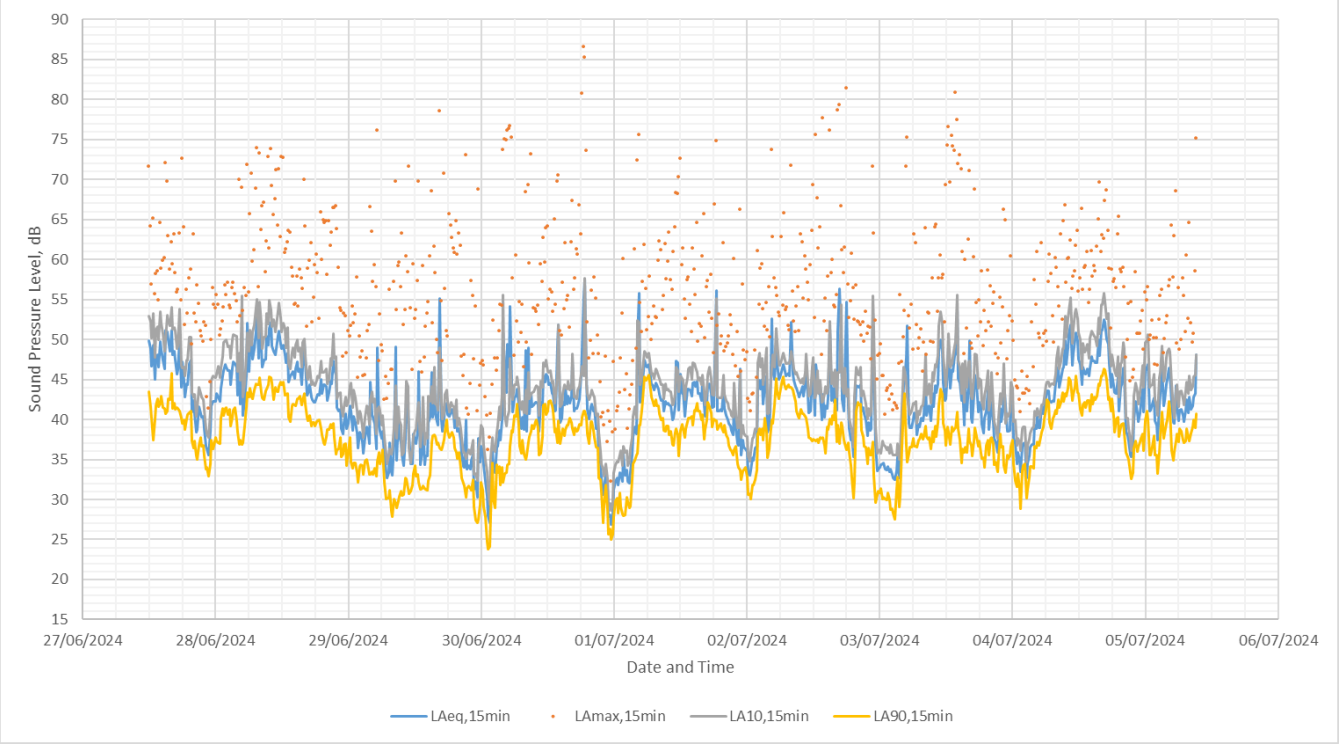
Details of the noise climate

10A1.3.3 The noise climate at monitoring location P1 is typical of a predominantly rural area. The main sources of ambient sound are distant road traffic sources, particularly the A180 to the north. There were also contributions from bird song and foliage.

Survey results

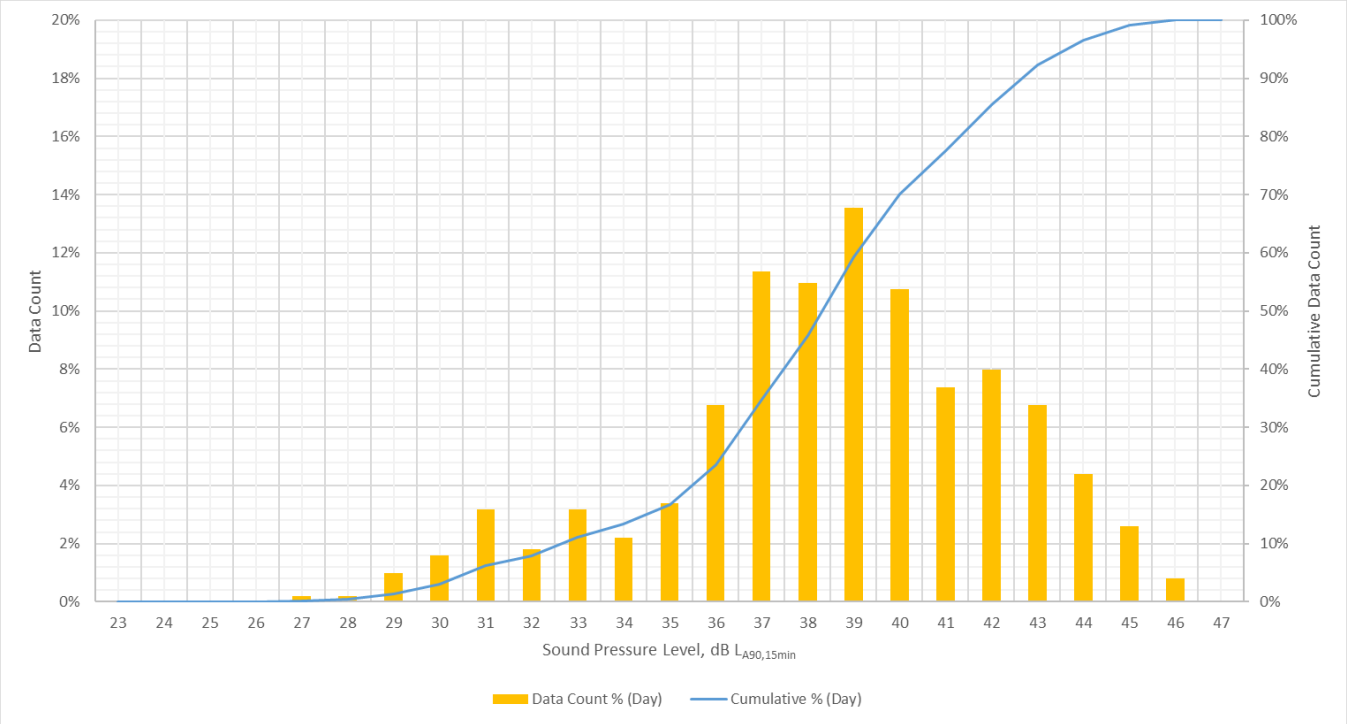
10A1.3.4 The temporal variation in sound level during the survey period is shown in **Image 10A-3.**

Image 10A-3 Survey variation in sound levels - Location P1



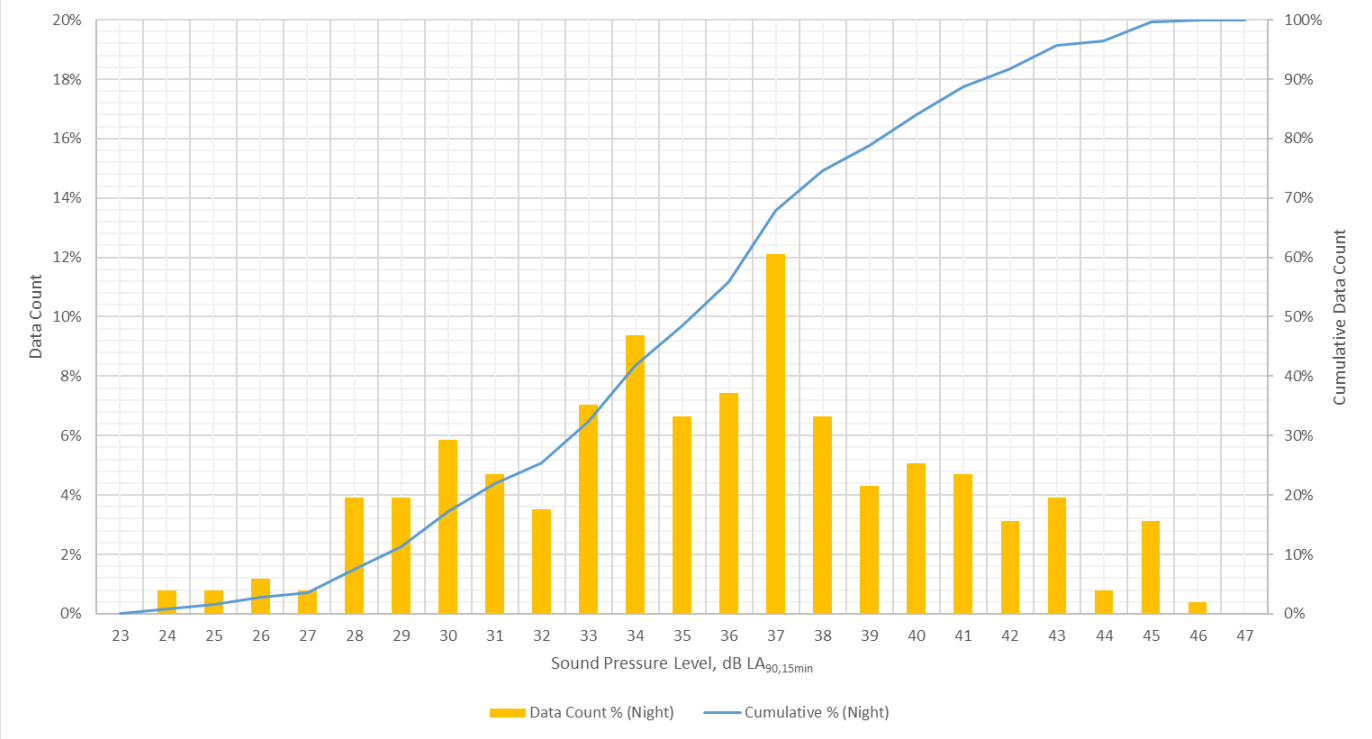
10A1.3.5 The distribution of background sound level levels during daytime periods is shown in **Image 10A-4**.

Image 10A-4 Distribution of background sound levels (Daytime) - Location P1



10A1.3.6 The distribution of background sound level levels during night-time periods is shown in **Image 10A-5**.

Image 10A-5 Distribution of background sound levels (Night-time) - Location P1



10A1.3.7 A summary of measured sound levels is provided in **Table 10A.1**.

Table 10A.1 Summary of measured sound levels – P1

Time Period	Average Sound Level, dB $L_{Aeq,15min}$	Maximum Sound Level, dB $L_{AFmax,15min}$	Background Sound Level, dB $L_{A90,15min}$
Day	Range: 31 - 57 Average: 46	Range: 33 - 58 Typical: 43	Range: 27 - 46 Average: 38 Mode: 39
Night	Range: 27 - 56 Average: 43	Range: 29 - 56 Typical: 44	Range: 24 - 46 Average: 35 Mode: 37

Representative background sound levels

10A1.3.8 Based on the results of the survey, considering the average, modal and temporal variation in background sound level, the following representative background sound levels are applied at locations represented by P1:

i. daytime: 36 dB L_{A90}; and

ii. night-time: 30 dB L_{A90}.

Location P2

Location details

10A1.3.9 The survey location P2 was in a private garden of a dwelling on Albertross Drive, Grimsby. For the purposes of privacy, a photograph is not provided.

10A1.3.10 The survey was located in the vicinty of:

i. Easting/Northing: 522892/409248;

ii. What3words: informer.table.expiring; and

iii. measurement condition: Façade (1 m from garden outbuilding).

Measurement equipment

i. Sound Level Meter: Rion NL-52 Serial number 00620280; and

ii. Acoustic Calibrator: Rion NC-74 Serial number 34235943.

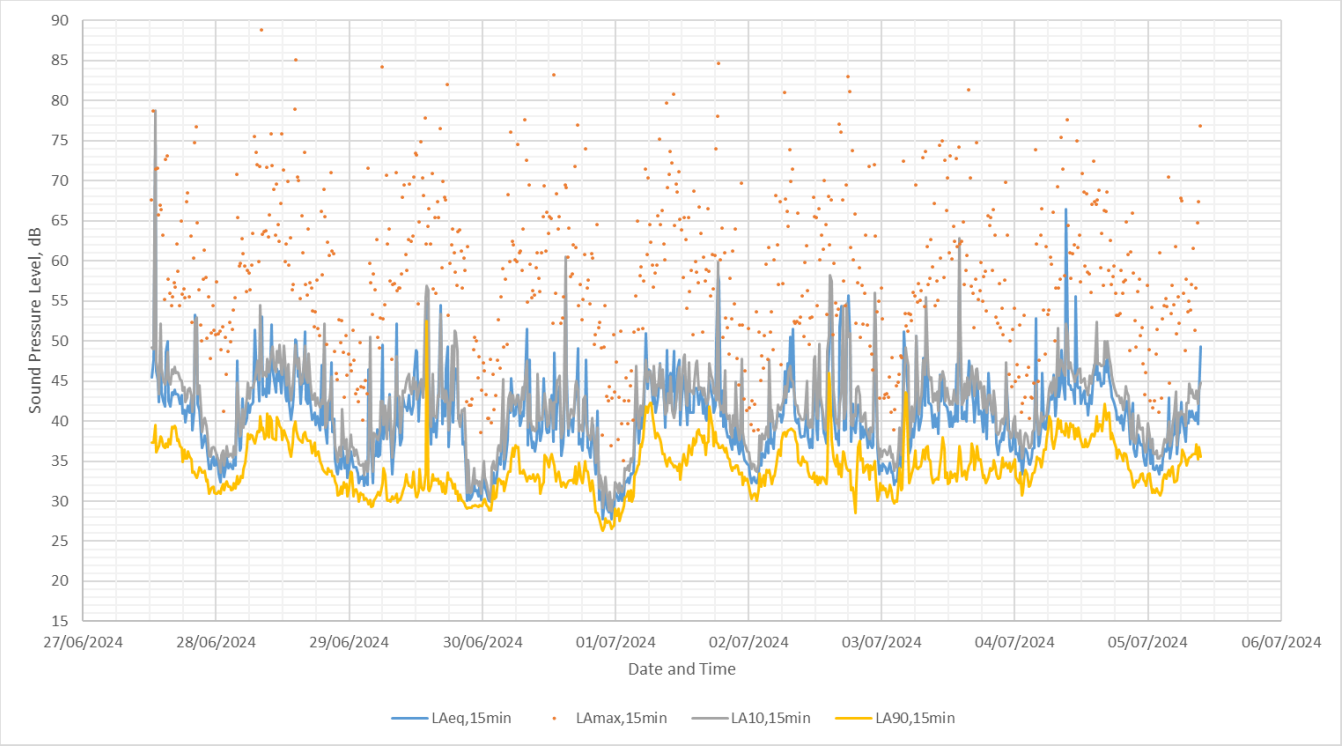
Details of the noise climate

10A1.3.11 The noise climate at monitoring location P2 is typical of a suburban area. The main sources of ambient sound are distant road traffic sources, particularly the A180 to the north, as well as a low to moderate level hum from the existing Grimsby West Substation to the northwest. There were also contributions from bird song and foliage.

Survey results

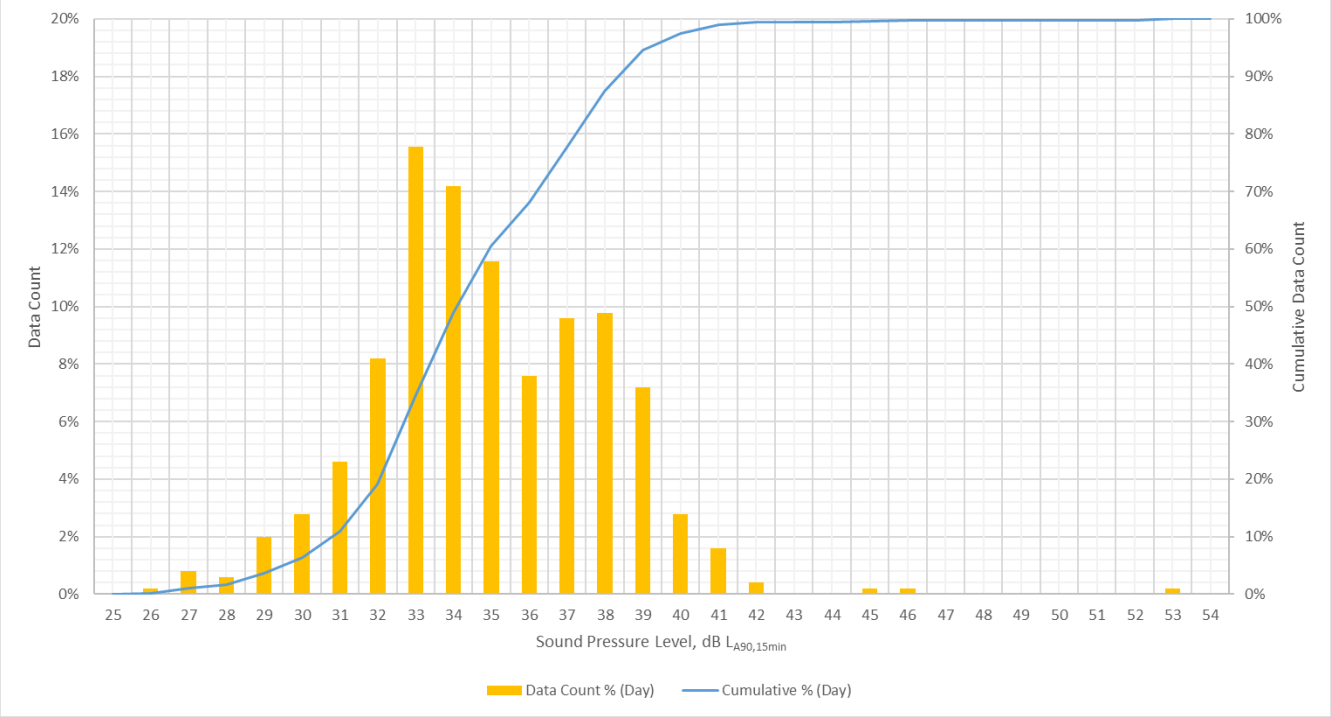
10A1.3.12 The temporal variation in sound level during the survey period is shown in **Image 10A-6.**

Image 10A-6 Survey variation in sound levels - Location P2



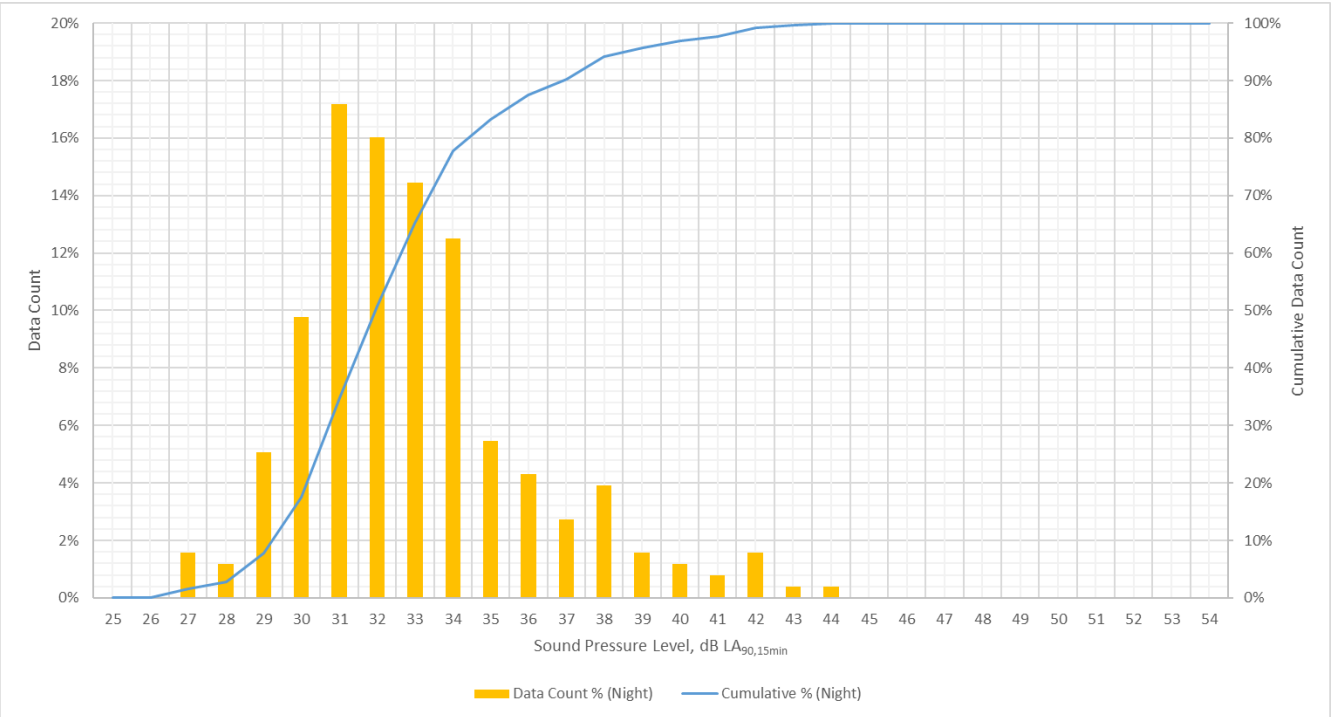
10A1.3.13 The distribution of background sound level levels during daytime periods is shown in **Image 10A-7**.

Image 10A-7 Distribution of background sound levels (Daytime) - Location P2



10A1.3.14 The distribution of background sound level levels during night-time periods is shown in **Image 10A-8**.

Image 10A-8 Distribution of background sound levels (Night-time) - Location P2



10A1.3.15 A summary of measured sound levels is provided in **Table 10A.2.**

Table 10A.2 Summary of measured sound levels – P2

Time Period	Average Sound Level, dB $L_{Aeq,15min}$	Maximum Sound Level, dB $L_{AFmax,15min}$	Background Sound Level, dB $L_{A90,15min}$
Day	Range: 28 - 75 Average: 50	Range: 38 -95 Typical: 57	Range: 26 - 53 Average: 34 Mode: 31
Night	Range: 28 - 53 Average: 40	Range: 35 - 84 Typical: 43	Range: 27 - 44 Average: 32 Mode: 31

Representative background sound levels

10A1.3.16 Based on the results of the survey, considering the average, modal and temporal variation in background sound level, the following representative background sound levels are applied at locations represented by P2:

i. daytime: 33 dB L_{A90}; and

ii. night-time: 31 dB L_{A90}.

Location P3

Location details

10A1.3.17 A photograph of the survey location P3 is provided in **Image 10A-9**. As well as noise monitoring, this location also included weather monitoring, as shown in **Image 10A-9**.

Image 10A-9 Survey location P3

10A1.3.18 The survey location is as follows:

i. Easting/Northing: 522269/408458;

ii. What3words: folks.inflict.tokens; and

iii. measurement condition: Free-field.

Measurement equipment

10A1.3.19 The measurement equipment used is as follows:

i. Sound Level Meter: 01dB Fusion Serial number 12077;

ii. Acoustic Calibrator: NC-74 Serial number 34235943; and

iii. Vaisala WXT536, logged via 01dB Fusion.

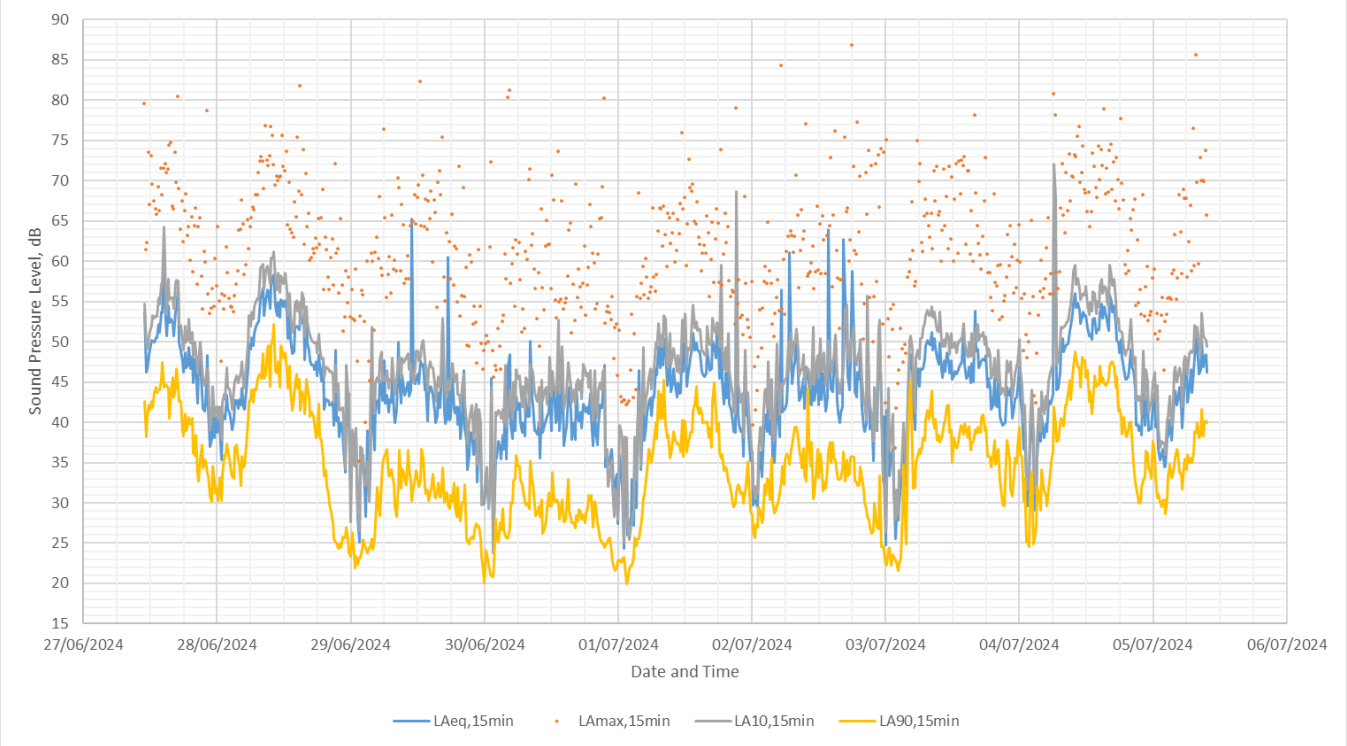
Details of the noise climate

10A1.3.20 The noise climate at monitoring location P3 is typical of predominantly rural area. The main sources of ambient sound are distance road traffic sources, particularly the A180 to the north. There were also contributions from bird song and foliage and farm activity.

Survey results

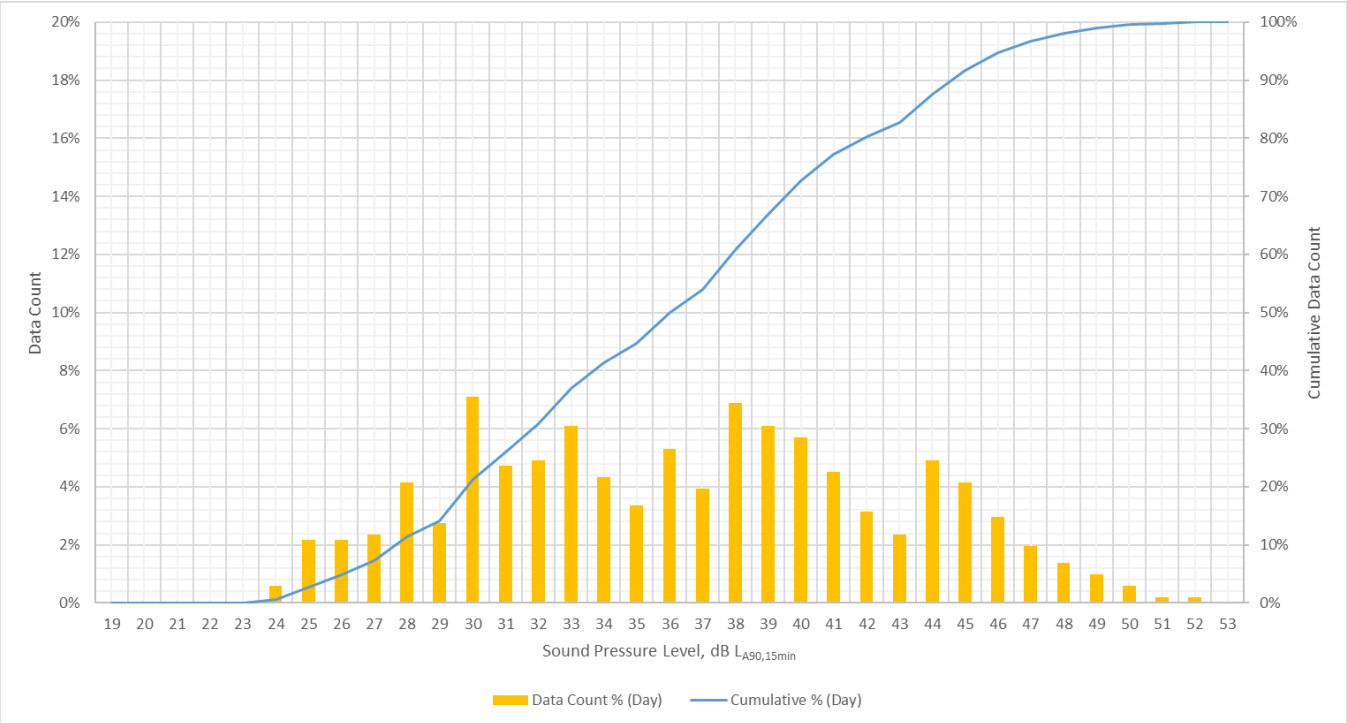
10A1.3.21 The temporal variation in sound level during the survey period is shown in **Image 10A-10.**

Image 10A-10 Survey variation in sound levels - Location P3



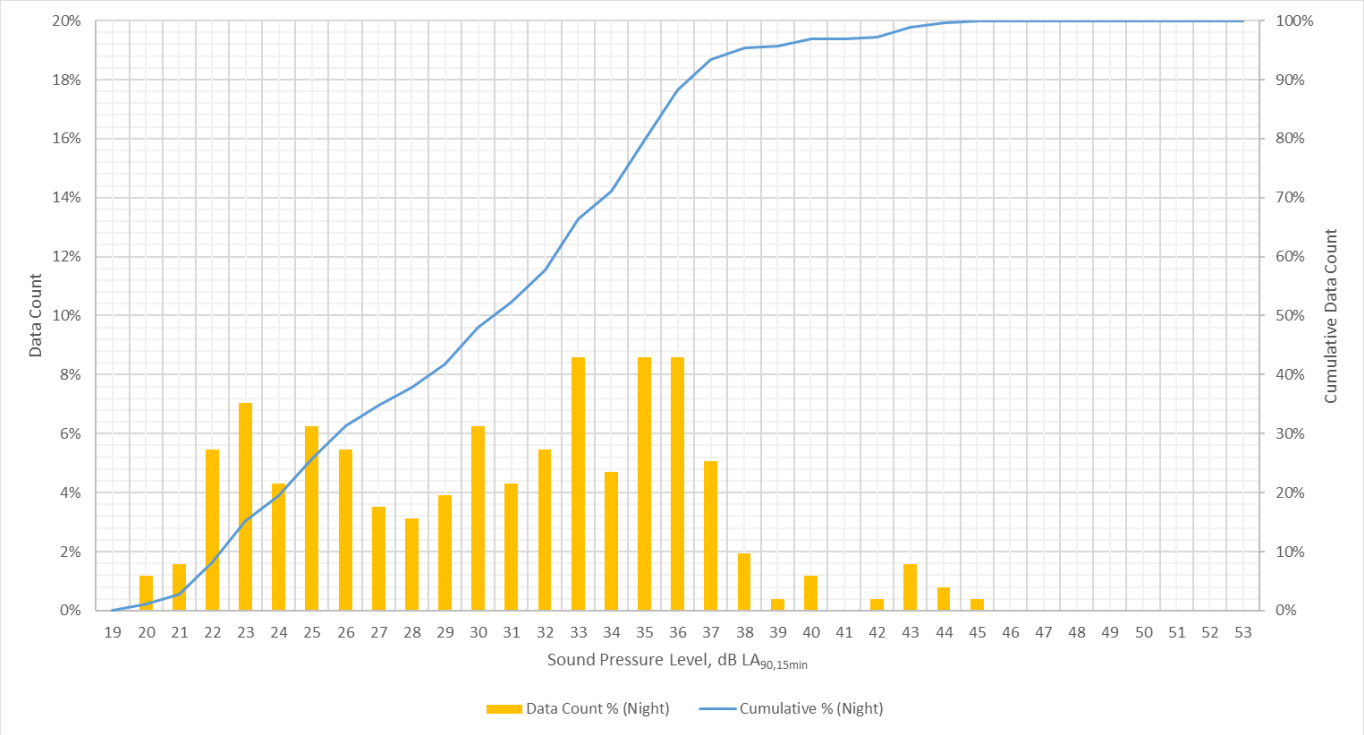
10A1.3.22 The distribution of background sound level levels during daytime periods is shown in **Image 10A-11**.

Image 10A-11 Distribution of background sound levels (Daytime) - Location P3



10A1.3.23 The distribution of background sound level levels during night-time periods is shown in **Image 10A-12**.

Image 10A-12 Distribution of background sound levels (Night-time) - Location P3



10A1.3.24 A summary of measured sound levels is provided in **Table 10A.3.**

Table 10A.3 Summary of measured sound levels – P3

Time Period	Average Sound Level, dB $L_{Aeq,15min}$	Maximum Sound Level, dB $L_{AFmax,15min}$	Background Sound Level, dB $L_{A90,15min}$
Day	Range: 33 - 65 Average: 50	Range: 47 -102 Typical: 66	Range: 24 - 52 Average: 36 Mode: 30
Night	Range: 24- 69 Average: 48	Range: 35 -99 Typical: 56	Range: 20 - 45 Average: 30 Modes: 23/33-36

Representative background sound levels

10A1.3.25 Based on the results of the survey, considering the average, modal and temporal variation in background sound level, the following representative background sound levels are applied at locations represented by P3:

i. daytime: 33 dB L_{A90}; and

ii. night-time: 23 dB L_{A90}.

10A1.4 Summary

10A1.4.1 This appendix presents results of the noise survey conducted as part of the Project. A noise survey has been conducted at three locations representative of NSR for use within the operational noise assessment for the proposed New Grimsby West Substation. The survey has been conducted in accordance with current guidance and good practice.

10A1.4.2 **Table 10A.4** presents a summary of representative background sound levels during daytime and night-time periods at the survey location for use in the operational noise assessment.

Table 10A.4 Summary of representative background sound levels

Monitoring Location	Representative Background Sound Level, dB $L_{A90,15min}$	
	Daytime	Night-time
P1	36	30
P2	33	31
P3	33	23

References

Ref 1 British Standard 7445-1:2003 – Description and measurement of environmental noise – Part 1: Guide to quantities and procedures, British Standard Institution, 2003.

Ref 2 BS 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound, British Standard Institution, 2019.

10B. Construction Noise and Vibration Data

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10B. Construction Noise and Vibration Data

10B.1 Introduction

10B.1.1 This appendix presents information and data used within the assessment of Noise and Vibration effects from construction activities at Noise and Vibration sensitive receptors (NSR) in the New Grimsby West Substation Section (Section 1) as part of the Grimsby to Walpole Project (the Project). This appendix includes:

i. construction noise data; and

ii. construction vibration data.

10B.2 Construction Noise

Construction Noise Introduction

10B.2.1 The construction noise assessment has been undertaken in accordance with the methods and empirical data outlined in British Standard (BS) 5228-1:2009+A1:2014 Code of practice for Noise and Vibration control on construction and open sites – Part 1: Noise (BS 5228-1) (Ref 1).

Construction plant data

10B.2.2 Indicative construction plant and data associated with each proposed construction activity is **Table 10B.1**. The table provides the average expected sound pressure level as A-weighted decibels (dBA) for each activity at a standard distance of 10 m. The construction noise assessment takes these values and corrects for the distance between the construction activity and each NSR within the Study Area in accordance with the methodology described in BS 5228-1. For the purposes of the assessment, attenuation from mitigation measures, such as screening, is not included. This is so that noise ‘hot spots’ can be identified, and specific mitigation measures can be identified where they are required to avoid significant adverse effects.

Table 10B.1 Construction activity plant and noise data

Activity	Plant Item	Number of Plant Items	BS 5228-1 Ref	Per cent on time	A-weighted Sound Pressure Level at 10 m, dBA	Average Activity Sound Pressure Level at 10 m, dBA
General Works						
Site preparation	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Top soil strip	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Temporary access route	Wheeled backhoe loader	1	C2.8	70	68	79
	Dumper	2	C4.4	70	76	
	Vibratory roller	1	C2.40	70	73	
Temporary Construction Compounds						
Site preparation	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Road construction	Dumper	3	C4.4	70	76	82
	Road Roller	1	C5.19	70	80	
Compound buildings	Telehandler	2	C4.55	50	70	70
	Generator	2	C3.33	100	57	

Activity	Plant Item	Number of Plant Items	BS 5228-1 Ref	Per cent on time	A-weighted Sound Pressure Level at 10 m, dBA	Average Activity Sound Pressure Level at 10 m, dBA
Compound operation	Lorry	1	C2.34	25	80	76
	Telehandler	2	C4.55	50	70	
	Generator	2	C3.33	100	57	
Overhead Line Construction						
Pylon construction	Tracked excavator	1	C2.7	70	70	83
	Steel tube piling rig	1	C3.8	25	88	
	Concrete pump	1	C3.26	50	75	
Pylon Assembly	Telehandler	1	C4.55	50	70	67
Pylon installation	Crane lifting pylon	1	C4.46	10	67	57
Cable tensioning	Winder	1	Suppliers' data	60	77	78
	Rear Winder	1	Suppliers' data	60	77	
Substation Construction						
Site preparation	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Substation assembly	Telehandler	2	C4.55	50	70	82
	Generator	2	C3.33	100	57	

Activity	Plant Item	Number of Plant Items	BS 5228-1 Ref	Per cent on time	A-weighted Sound Pressure Level at 10 m, dBA	Average Activity Sound Pressure Level at 10 m, dBA
	Vibratory piling rig	1	C3.8	25	88	

10B.3 Construction Vibration

Construction Vibration Introduction

10B.3.1 The construction vibration assessment has been undertaken with reference to the methods and empirical data outlined in BS 5228-2:2009+A1:2014 Code of practice for Noise and Vibration control on construction and open sites – Part 2: Vibration (BS 5228-2) (Ref 2).

10B.3.2 The main significant sources of vibration during construction activities are expected to be ground compaction, and percussive or vibratory piling. These processes may be required during the following activities:

i. Ground compaction with vibratory roller:
   - setup of site compounds;
   - site preparation;
   - temporary access route construction; and
   - cable laying.

ii. Piling:
   - pylon foundations; and
   - substation construction.

Prediction of Construction Vibration

10B.3.3 Peak particle velocity (PPV) vibration levels in millimetres per second (mm/s) generated by ground compaction and piling activities can be predicted using the guidance and empirical formulae in Table E1 of BS 5228-2. The formulae are shown below.

Vibratory roller calculation formula

$$v_{res} = k_s\sqrt{n_d}\left[\frac{A}{x+L_d}\right]^{1.5} \quad \text{(Equation 1)}$$

Where:

i. V_{res} = Resultant PPV, in millimetres per second (mm/s).

ii. k_s = Scaling factor (and probability of predicted value being exceeded).

iii. n_d = Number of vibrating drums.

iv. A = Maximum amplitude of drum vibration, in millimetres (mm).

v. x = Distance measured along the ground surface, in metres (m).

vi. L_d = vibrating roller drum width, in metres (m).

Percussive piling calculation formula

$$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}}\right] \quad \text{(Equation 2)}$$

Where:

i. V_{res} = Resultant PPV, in millimetres per second (mm/s).

ii. K_p = Scaling factor (depending on soil conditions).

iii. W = Nominal hammer energy, in joules (J).

iv. r = Slope distance from the pile toe, in metres (m).

Assumptions

10B.3.4 The following conservative assumptions have been made to predict vibration levels to assess a reasonable worst-case:

i. Vibratory Roller assumptions:

- scaling factor of 75, representative of average conditions; and
- vibratory roller data based on worst case Bomag BW 213, 1 drum of 2.13 m width and maximum amplitude of 1.1 mm.

ii. Percussive piling assumptions:

- typical value of nominal hammer energy of 25 kJ; and
- scaling factor of 1.5 representative of typical soil conditions.

Vibration prediction results

10B.3.5 Equations 1 and 2 have been used to predict the minimum distances within which the vibration threshold values human comfort impacts from vibration in terms of the significant observed adverse effect level (SOAEL) and potential cosmetic building damage threshold may be exceeded (1.0 mm/s, and 12.5mm/s PPV respectively). The calculated distances in **Table 10B.2** are used in the preliminary assessment to identify areas where NSR, and buildings and structures are potentially affected by construction vibration.

Table 10B.2 Indicative Construction Vibration Threshold Distances

Activity	Distance Within Which SOAEL May Be Exceeded (m)	Distance Within Which Cosmetic Building Damage May Occur (m)
Ground compaction	18	<2
Percussive piling	70	<10

References

Ref 1 BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, British Standard Institution, 2014.

Ref 2 BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration, British Standard Institution, 2014.

10C. Initial Construction Traffic Noise Assessment

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10C. Initial Construction Traffic Noise Assessment

10C.1 Introduction

10C.1.1 This appendix presents the initial assessment of construction traffic noise affecting Noise and Vibration sensitive receptors (NSR) in the New Grimsby West Substation Section (Section 1) as part of the Grimsby to Walpole Project (the Project).

10C.2 Assessment Methodology

10C.2.1 The assessment of construction traffic noise has been conducted following the guidance detailed in Design Manual for Roads and Bridges LA 111 (DMRB LA 111) (Ref 1). This provides guidance for the assessment and Noise and Vibration impacts from road projects; however, the guidance is widely used in the assessment of construction Noise and Vibration impacts from other types of project, particularly with regards to construction traffic noise in lieu of other guidance.

Data Sources

10C.2.2 The assessment is based on traffic data and assumptions that has been produced by National Grid Electricity Transmission plc (National Grid) to support the transport assessment, including the proposed numbers of heavy goods vehicles (HGV).

Study Area

10C.2.3 Noise from construction traffic on the existing local road network has been assessed based on the proposed construction traffic routes. The Study Area is defined following the guidance detailed in DMRB LA 111 which states that the construction traffic Study Areas shall be defined to include a 50 m width from the kerb line of public roads with the potential for an increase in basic noise level (BNL) of 1dB(A) or more because of the additional construction traffic to existing traffic levels.

Assessment Criteria

10C.2.4 Noise from construction traffic on the public highway has been calculated in accordance with the Calculation of Road Traffic Noise (CRTN) (Ref 2) and assessed against the criteria detailed in DMRB LA 111. The BNL from public roads used as construction traffic routes has been calculated in accordance with CRTN for the Do-minimum and Do-something scenarios in the construction period. The calculated BNL values were compared to determine the magnitude of the impact.

10C.2.5 The BNL is a standardised metric for determining the noise level from a road and is defined as the noise level exceeded for 10 per cent of the time at a reference of 10 m away from the nearside carriageway edge obtained from traffic flow, speed, and is calculated in line with the methodology described in CRTN.

10C.2.6 Calculations are based on the Annual Average Weekday Traffic over the 18-hour period between 06:00 and 00:00 (AAWT,18 h). The standard CRTN BNL calculation is applicable where the AAWT,18 h traffic flows are greater than 4000 vehicles per 18-hour day. Where flows are between 1000 and 4000 vehicles per day, a 'low flow' correction can be applied which is a function of the distance from the carriageway. For the purposes of the initial assessment, a typical worst-case distance of 10 m has been assumed (the correction reduces with increased distance, with no correction applied beyond 30 m).

10C.2.7 Where there are potential changes in the BNL on roads greater than or equal to 1dB(A) a subsequent assessment of the impacts has been conducted on NSR within 50 m of routes where there are potential significant effects. NSR include dwellings, healthcare facilities, education facilities or other buildings where noise can cause disturbance to people using the buildings.

10C.2.8 Construction traffic noise effects are significant where there are medium or large magnitude impacts for a duration of ten or more days in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months. A detailed program of works is not currently available. However, for the purpose of this initial assessment it is assumed that the above temporal thresholds may be exceeded, as a worst-case.

10C.2.9 There are also potential significant effects were there is a small magnitude impact at NSR located within Noise Important Areas (NIA), which are more sensitive to increases in noise. NIAs are determined via strategic noise maps and highlight the residential areas experiencing the highest 1 per cent of noise levels from road and rail sources in England.

10C.3 Assessment

10C.3.1 The results of the construction traffic noise assessment are provided in **Table 10C.1**. It is assumed that there is no change in average speed between the do-minimum and do something scenarios. The results are colour coded as follows:

i. Green – Negligible magnitude impact (neutral)

ii. Yellow – Small magnitude impact (no NIA) (negative)

iii. Orange – medium magnitude impact, or small magnitude with NIA (negative)

iv. Red – Large magnitude impact (negative)

10C.3.2 Construction traffic noise impacts have been assessed on 33 construction traffic road links in Section 1 where data is available. The assessment indicates that construction traffic would lead to the following impacts:

i. no change in noise level on 14 road links;

ii. a negligible increase in noise level on 15 road links; and

iii. a small increase in noise level on 4 road links, none of which include NIAs.

10C.3.3 No medium or large magnitude construction traffic noise impacts are expected in Section 1. Additionally, there are no small magnitude impacts in locations which include NIAs (where a small magnitude impact may be considered significant). Therefore, there are no likely significant effects from construction traffic noise in Section 1.

Table 10C.1 Construction traffic noise assessment

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
CR21-2	A1173	3579	10.5	4103	24.3	68	70.4	2.4	Small magnitude. Not significant.
LK3	Aylesby Rd - C149	2487	8.2	2952	15.0	65.7	67.7	2.0	Small magnitude. Not significant.
CR21-3	A1173	8778	4.9	9303	11.3	71	72.3	1.3	Small magnitude. Not significant.
LK1	A1136	9053	2.6	9386	5.1	68.9	69.6	0.7	Negligible magnitude. Not significant.
CR1	A180	27875	12.2	28728	14.8	77.9	78.4	0.5	Negligible magnitude. Not significant.
CR2	A180	37125	8.0	37453	8.6	78.5	78.7	0.2	Negligible magnitude. Not significant.
CR4-2	A16	15980	3.8	16043	3.8	69.7	69.8	0.1	Negligible magnitude. Not significant.

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
W4	Cambridge Road	9073	0.1	9115	0.1	65.9	66	0.1	Negligible magnitude. Not significant.
CR3-1	A180	34705	3.8	34746	3.8	76	76	0.0	No change. Not significant.
CR3-2	A180	31414	7.3	31452	7.2	77.7	77.7	0.0	No change. Not significant.
CR4-1	A16	16702	3.7	16765	3.7	69.9	69.9	0.0	No change. Not significant.
CR5-1	A16	17409	3.0	17481	3.0	71.8	71.8	0.0	No change. Not significant.
W2	A1136 Great Coates Rd	16778	1.0	16880	1.0	69	69	0.0	No change. Not significant.

References

Ref 1 Highways England et al. (2020). Design Manual for Roads and Bridges LA 111 Noise and vibration.

Ref 2 Department of Transport. (1988). Calculation of Road Traffic Noise.

10D. Initial Operational Substation Noise Assessment

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Contents

10D. Initial Operational Substation Noise Assessment

10D.1 Introduction

10D.1.1 This appendix presents the initial assessment of operational substation noise on noise sensitive receptors (NSR) in Section 1 New Grimsby West Substation (Section 1) of the Grimsby to Walpole Project (the Project).

10D.1.2 The assessment draws on noise survey data presented in **PEI Report Volume 3 Part B Section 1 Appendix 10A Baseline Noise Data**.

10D.2 Assessment Methodology

Assessment Methodology Introduction

10D.2.1 The assessment of operational noise has been conducted in accordance with British Standard (BS) 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound (BS 4142) (Ref 1).

BS 4142 Methodology

10D.2.2 BS 4142 is used to assess the potential significance of effects by comparing the 'rating sound level' of an industrial source against the representative ‘background sound level’ at the location of nearby NSR. Certain acoustic features can increase the potential for a sound to attract attention, and therefore increase its relative significance than that expected from a simple comparison between the specific sound level and the background sound level. BS 4142 identifies noise that contains audible tonality, impulsivity and/or intermittency and recommends that a correction be added to the specific sound level. The specific sound level along with any applicable correction is referred to as the 'rating level'. It should be noted that the penalties can be additive (i.e., if they have a combination of tonal, impulsive, and intermittent acoustic characters).

10D.2.3 Where tonality is audible at a receptor a penalty of between 0 and 6 dB may be applied. Subjectively, a 2 dB penalty may be applied where a tone is just perceptible, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

10D.2.4 The greater the difference between the rating level and the background sound level; the greater the likelihood of complaints. The assessment criteria given by BS 4142 are as follows:

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

ii. a difference of +5 dB could be an indication of an adverse impact, depending on the context.

10D.2.5 The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact (in BS 4142 terminology), depending on the context.

10D.2.6 The assessment should also consider the context of the sound. Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be considered, including:

i. The absolute level of the sound.

ii. The character and level of the residual sound compared to the character and level of the specific sound.

iii. The sensitivity of the receptor, including whether dwellings already incorporate design measures that secure good internal and/or outdoor conditions, such as: façade insulation treatment, ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation and acoustic screening.

10D.2.7 With regards to the absolute level of the sound, BS 4142 (Ref 1) states that 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, particularly at night. Guidance in this matter is provided by the Association of Noise Consultants (ANC) BS 4142:2014+A1:2019 Technical Note, 2020 (ANC BS 4142 guidance) (Ref 2) and BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS 8233) (Ref 3).

10D.2.8 The noise rating level will be compared to the representative background sound level to magnitude of impact. The magnitude of impact of operational noise is determined against the criteria detailed in **Table 10D.1**.

Table 10D.1 Magnitude of impact from operational substation noise

Magnitude	Comparison of sound rating level and representative background sound level
Large	Rating level > 10dB above the background sound level
Medium	Rating level between 5 and 9 dB above background sound level
Small	Rating level between 0 and 4 dB above background sound level
Negligible	Rating level below background sound level

10D.2.9 Although the above criteria will be used to assess the magnitude of impact, it is standard practice to aim for a sound rating level not to exceed the background sound level, such that the impact is ‘low’ (as defined in BS 4142), or negligible in terms of the impact magnitude definition defined in Table 10D.1.

10D.2.10 Consideration will also be taken of context, as defined in BS 4142, for the final determination of significance; in particular, absolute noise levels.

10D.2.11 When considering context, BS 4142 references BS 8233 (Ref 3) as providing context where background and rating noise levels are low. BS 8233 provides recommended noise levels for a variety of situations and locations, including in habitable spaces such as living rooms and bedrooms, and external amenity areas. Guidance has also been sought from the ANC BS 4142 guidance (Ref 2), as appropriate.

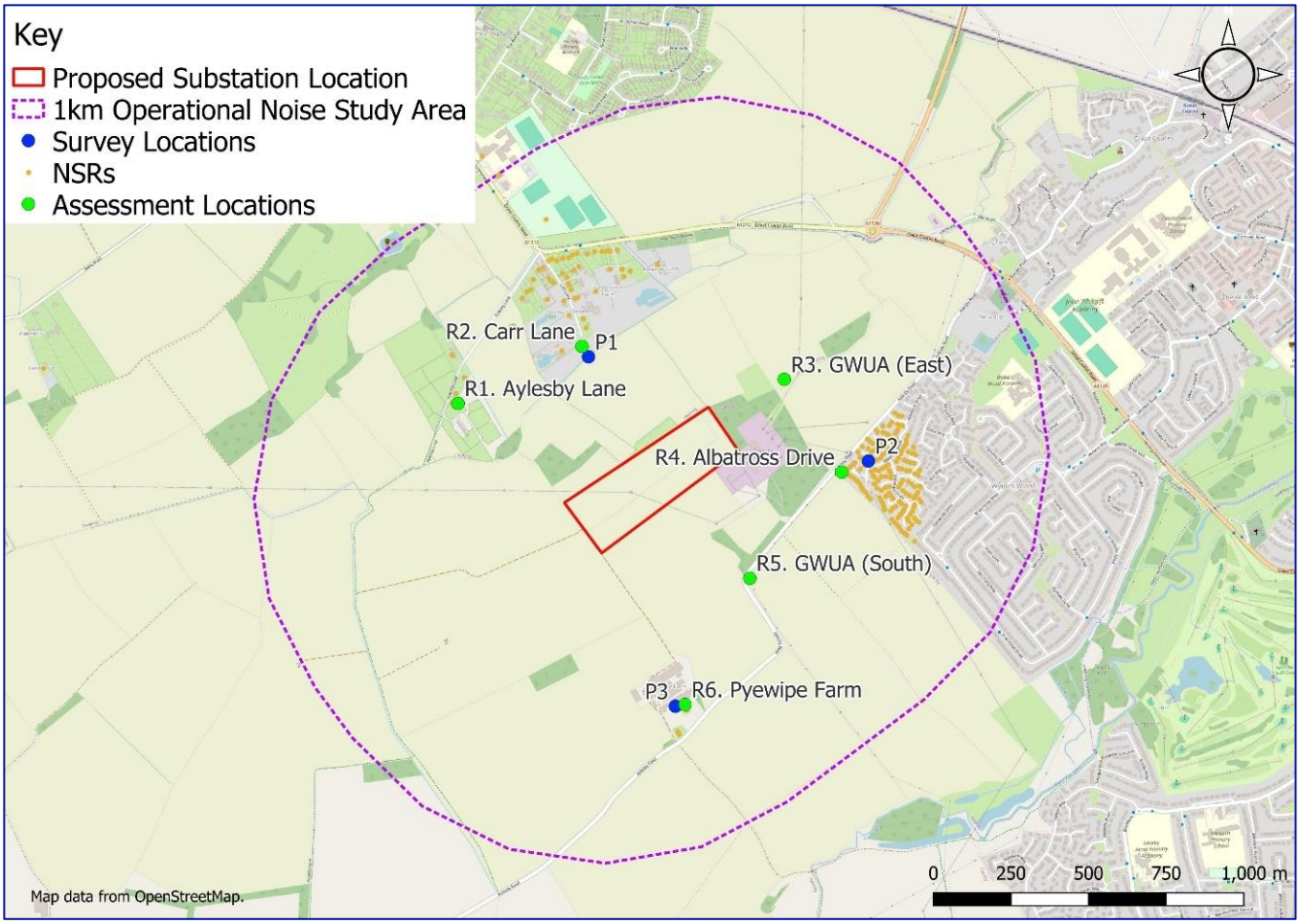
10D.3 Baseline Data

Baseline Data Introduction

10D.3.1 This section details the baseline information used within the preliminary operation noise assessment. This section provides a summary of the baseline data for use in the operational noise assessment. Further details can be found in **PEI Report Volume 3 Part B Section 1 Appendix 10A Baseline Noise Data**.

10D.3.2 The proposed New Grimsby West Substation location, Study Area, NSR locations, assessment locations, and noise survey locations, are shown in **Image 10D-1**.

Image 10D-1 Proposed New Grimsby West Substation noise survey and assessment locations



10D.3.3 Section 1 is located within a mixed rural and suburban environment to the west of Grimsby. The main sources of environmental noise include the A180 to the north, the A1136 to the east, and the Barton Line railway line to the north, as well as traffic on local roads. In terms of industrial sources, there is the existing Grimsby West Substation, two wind turbines located between approximately 1.0 and 1.5 kilometre (km) to the west of the existing Grimsby West Substation, as well as agricultural activity.

10D.3.4 With regards to NSRs in Section 1, there are built up residential areas of:

i. Great Coates to the west of Grimsby, approximately 100 m east of the main extent of the draft Order Limits (excluding access); and

ii. Healing, immediately to the north of the draft Order Limits.

10D.3.5 There are also isolated dwellings, farmhouses, and settlements.

10D.3.6 Section 1 includes part of the strategic allocation location of the proposed Grimsby West Urban Expansion (GWUA). The proposed urban expansion aims to deliver 3,500 new homes and associated facilities, as well as new transport links. There is limited information on the proposed layout or location of dwellings within the GWUA. However, the site allocation is understood to be located on land to the northeast of the existing Grimsby West Substation and draft Order Limits between Aylesby Road and Great Coates Road, and to the south of the existing Grimsby West Substation on land between Aylesby Road and the A46 Grimsby Road, As such, the assessment considers the likely location of new dwellings as part of the GWUA to the south and east of the Substation based on publicly available information for the development, as shown in in **Image 10D-1**.

10D.4 Study Area

10D.4.1 The proposed Study Area for operational noise effects from substations, based on guidance from International Organisation of Standardisation (ISO) 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors. Part 2: Engineering method for the prediction of sound pressure levels outdoors (ISO 9613-2) (Ref 4), would include NSR within 1 km of the Substation, with a particular focus on the nearest NSR.

10D.5 Measured Noise Levels

10D.5.1 To inform the assessment of operational noise from the proposed New Grimsby West Substation, existing baseline noise levels have been established by completing noise surveys at three locations representative of the identified NSR, as detailed in **Image 10D-1**.

10D.5.2 **Table 10D.2** presents a summary of measured sound levels during daytime and night-time periods at the survey locations for use in the operational noise assessment.

Table 10D.2 Summary of representative background sound levels

Monitoring Location	Description	Easting	Northing	Representative Average Noise Level, dB $L_{Aeq,T}$		Representative Background Noise Level, dB L_{A90}	
				Daytime	Night-time	Daytime	Night-time
P1	Red Carr Lane	521989	409585	46	43	36	30
P2	Albatross Drive	52282	409248	50	40	33	31
P3	Pyewipe Farm	522269	408458	50	48	33	23

10D.6 Operational Noise Assessment

Indicative Plant Data

10D.6.1 **Table 10D.3** presents indicative operational sound levels from proposed EACN substation plant.

Table 10D.3 Indicative substation plant sound data

Plant Item	Number of	Sound Power Level per Unit dBA	Assumed Mitigation	Resultant Sound Power Level per Unit dBA
Super Grid Transformer (SGT)	5	95	20 dB (Standard enclosure)	75

10D.6.2 The proposed SGTs will encompass a cooling system. Under normal operating conditions, the cooling systems of the SGTs will rarely operate. Cooling systems may operate during emergency conditions and during times of unusually high demand. Such conditions usually occur only during exceptional events (i.e. extreme weather combined with faults elsewhere on the system) requiring an SGT to carry a higher-than-normal load. These conditions would usually persist for a short duration and as such cooler operation can typically be regarded as an exceptional event. As such, noise from the cooling systems of the proposed transformers is not included in this assessment.

Operational Sound Propagation Modelling

10D.6.3 Specific sound levels due to the proposed New Grimsby West Substation plant have been predicted via computer noise modelling using SoundPlan software (version 9.0) at six locations representative of nearby NSR. The model calculates noise levels in accordance with the methodology described in ISO 9613-2 (Ref 4). The resultant predicted operational noise levels from the proposed New Grimsby West Substation at nearby NSR are presented in **Table 10D.4**. The specific sound levels are compared against the applicable representative background sound levels for that location to determine the worst-case affected NSR.

Table 10D.4 Resultant specific noise levels at NSR

NSR location	Corresponding Background Measurement Location and Level (Day/Night dB L_{A90})	Resultant specific sound level, dB L_{Aeq}	Excess over background, dB	
			Daytime	Night-time
R1 - Aylesby Lane	P1 (36/30)	18	-18	-12
R2 - Carr Lane	P1 (36/30)	20	-16	-10
R3 - GWUA (East)	P2 (33/31)	22	-11	-9
R4 - Albatross Drive	P2 (33/31)	20	-13	-11

NSR location	Corresponding Background Measurement Location and Level (Day/Night dB L_{A90})	Resultant specific sound level, dB L_{Aeq}	Excess over background, dB	
			Daytime	Night-time
R5 - GWUA (South)	P2 (33/31)	23	-10	-8
R6 - Pyewipe Farm	P3 (33/23)	15	-18	-8

10D.6.4 The results indicate that the worst-case affected NSRs R5 (GWUA (South)) and R6 (Pyewipe Farm), as the excess of the specific sound level over the background is greatest at these locations (albeit, below background at both locations). The specific noise level is predicted to be 8 dB below the background sound level at both of these locations during night-time periods. The excess below background during daytime periods at R5 (GWUA (South)) is less than at R6 (Pyewipe Farm) (-10 compared to -18) and R5 (GWUA (South)) is therefore used for further assessment as a worst-case.

BS 4142 Assessment

10D.6.5 The results of an initial BS 4142 assessment at the worst-case affected NSR R5 (GWUA (South)) are presented in **Table 10D.5**. Operational noise levels and impacts at all other receptors would be lower.

Table 10D.5 Indicative BS 4142 assessment - worst-case affected NSR P5 (GWUA (South))

Parameter	Value		BS 4142 Clause	Commentary
	Daytime	Night-time		
Background sound level, dB LA90	33	31	8.1	Representative background sound level at receptor based on measured noise data (Location P2).
Specific sound level, dB LAeq,T	23	23	7.3	Calculated via noise model based on indicative plant data.
Acoustic feature correction, dB	6	6	9.2	Assumed potential tonal audibility at receptor as worst-case. In practice likely to be less.
Sound rating level, dB LAr,T	29	29	9	Sum of specific sound level and acoustic corrections.
Difference in rating noise level relative to background sound level, dB	-4	-2	11	Noise rating below the background during both daytime and night-time periods.
Assessment Outcome	Negligible magnitude	Negligible magnitude	11	Context:

Parameter	Value		BS 4142 Clause	Commentary
	Daytime	Night-time		
	impact, depending on context.	impact, depending on context.		The context is a relatively low specific noise level in a rural area, below existing average levels of ambient noise during night-time periods (40 dB $L_{Aeq,8h}$). Additionally, the specific noise level is below the lowest observed adverse effect level (LOAEL) during daytime and night-time periods. Outcome – **Likely Not Significant**
Uncertainty			10	Uncertainty has been minimised using noise survey data over a suitable representative period. Main uncertainty from the use of indicative plant noise data, although this is based on specification data and as such should be worst-case. Likely worst-case acoustic character correction applied for tonality. In practice likely to be lower. Uncertainty unlikely to affect the outcome of the assessment. However, this assessment is indicative based on available plant noise data and further studies would be conducted as the design progresses.

Notes:

BS 4142 Clause refers to the corresponding clause in BS 4142 relating to that aspect of the assessment.

10D.7 Conclusions

10D.7.1 The assessment indicates that the noise rating from the proposed New Grimsby West Substation would be below the existing background sound level at all nearby NSR during both daytime and night-time periods.

10D.7.2 Operational noise from the proposed New Grimsby West Substation would therefore likely be not significant.

References

Ref 1 BS 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound, British Standard Institution, 2019.

Ref 2 BS 4142:2014+A1:2019 Technical Note Version 1.0. Association of Noise Consultants, 2020.

Ref 3 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings, British Standard Institution, 2014.

Ref 4 ISO 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors. Part 2: Engineering method for the prediction of sound pressure levels outdoors. International Organisation for Standardization. 2024.

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