The Great Grid Upgrade

Grimsby to Walpole

Preliminary Environmental Information Report

Volume 3 Part B Section Specific Assessments

Section 5 Refined Weston Marsh Substation Siting Zone

Chapter 10 Noise and Vibration

Appendices

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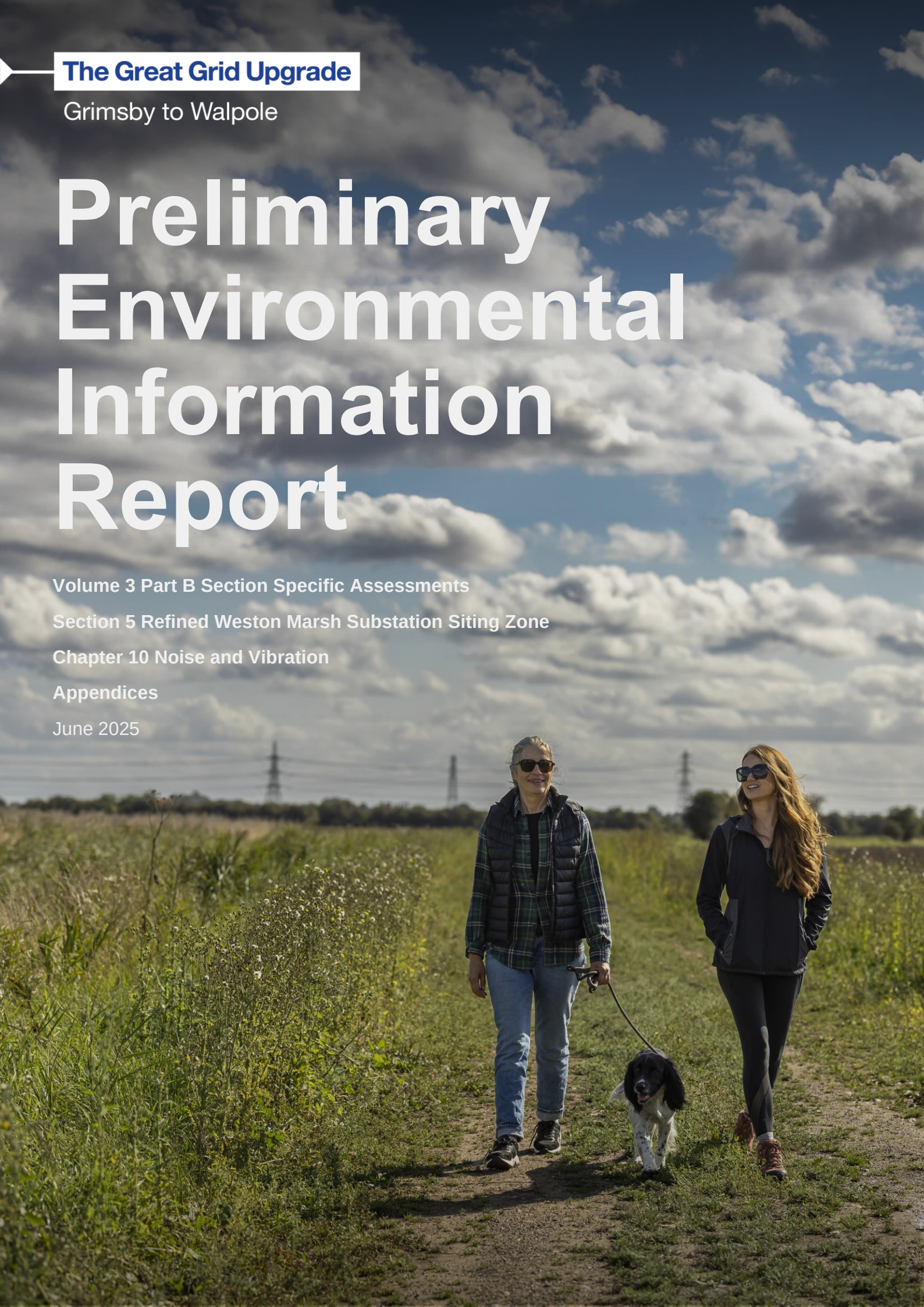

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10A. Construction Noise and Vibration Data

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10A. Construction Noise and Vibration Data

10A.1 Introduction

10A.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 Refined Weston Marsh Substation Siting Zone Section (Section 5) as part of the Grimsby to Walpole Project (the Project). This appendix includes:

i. construction noise data; and

ii. construction vibration data.

10A.2 Construction Noise

10A.2.1 The construction noise assessment has been undertaken with reference to 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

10A.2.2 Indicative construction plant and data associated with each proposed construction activity is presented in **Table 10A.1**. The table provides the average expected sound power level for each activity. For the purposes of the assessment, attenuation from mitigation measures is not included such that noise 'hot spots' can be identified, and specific mitigation measures can be identified as required.

Table 10A.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	
	Telehandler	2	C4.55	50	70	

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
Substation assembly	Generator	2	C3.33	100	57	82
	Vibratory piling rig	1	C3.8	25	88	

10A.3 Construction Vibration

10A.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).

10A.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

10A.3.3 Peak particle velocity (PPV) vibration levels in 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

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

Where:

i. Vres = Resultant PPV, in millimetres per second (mm/s).

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

iii. nd = 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. Ld = 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. Vres = Resultant PPV, in millimetres per second (mm/s).

ii. Kp = 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

10A.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

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

Table 10A.2 Indicative Construction Vibration Threshold Distances

Activity	Distance Within Which SOAEL May Be Exceeded (m)	Distance Within Which Cosmetic Building 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

10B. Initial Construction Traffic Noise Assessment

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10B. Initial Construction Traffic Noise Assessment

10B.1 Introduction

10B.1.1 This appendix presents the initial assessment of construction traffic noise affecting Noise and Vibration sensitive receptors (NSR) in the Refined Weston Marsh Substation Siting Zone Section (Section 5) of the Grimsby to Walpole Project (the Project).

10B.2 Assessment Methodology

10B.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

10B.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 projected numbers of heavy goods vehicles (HGV) based upon preliminary construction and logistics plans.

Study Area

10B.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

10B.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.

10B.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.

10B.2.6 Calculations are based on the Annual Average Weekday Traffic (AAWT) 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).

10B.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.

10B.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.

10B.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.

10B.3 Assessment

10B.3.1 The results of the construction traffic noise assessment are provided in **Table 10B.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)

10B.3.2 Construction traffic noise impacts have been assessed on eight construction traffic road links in Section 5 where data is available. The assessment indicates that construction traffic would lead to the following impacts:

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

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

iii. a small increase in noise level on three road links (none of which include NIAs).

10B.3.3 No medium or large magnitude construction traffic noise impacts are expected in Section 5. 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 5.

Table 10B.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		
LK86	A151	13519	12.7	13818	15.3	74.1	74.6	0.5	Negligible magnitude. Not significant.
CR11-3	A16	21679	15.3	22048	16.4	76.5	76.8	0.3	Negligible magnitude. Not significant.
LK65	Marsh Road	156	14.0	659	43.1	very low flow	very low flow	very low flow	Negligible magnitude. Not significant.
W41-1	A151	14543	10.3	14630	10.3	72.6	72.6	0.0	No change. Not significant.
W41-2	A151	13123	6.5	13210	6.5	71.4	71.4	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.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com