The Great Grid Upgrade

Grimsby to Walpole

Preliminary Environmental Information Report

Volume 3 Part B Section Specific Assessments

Section 6 Refined Weston Marsh Substation Siting Zone to New Walpole B Substation

Chapter 10 Noise and Vibration

Appendices

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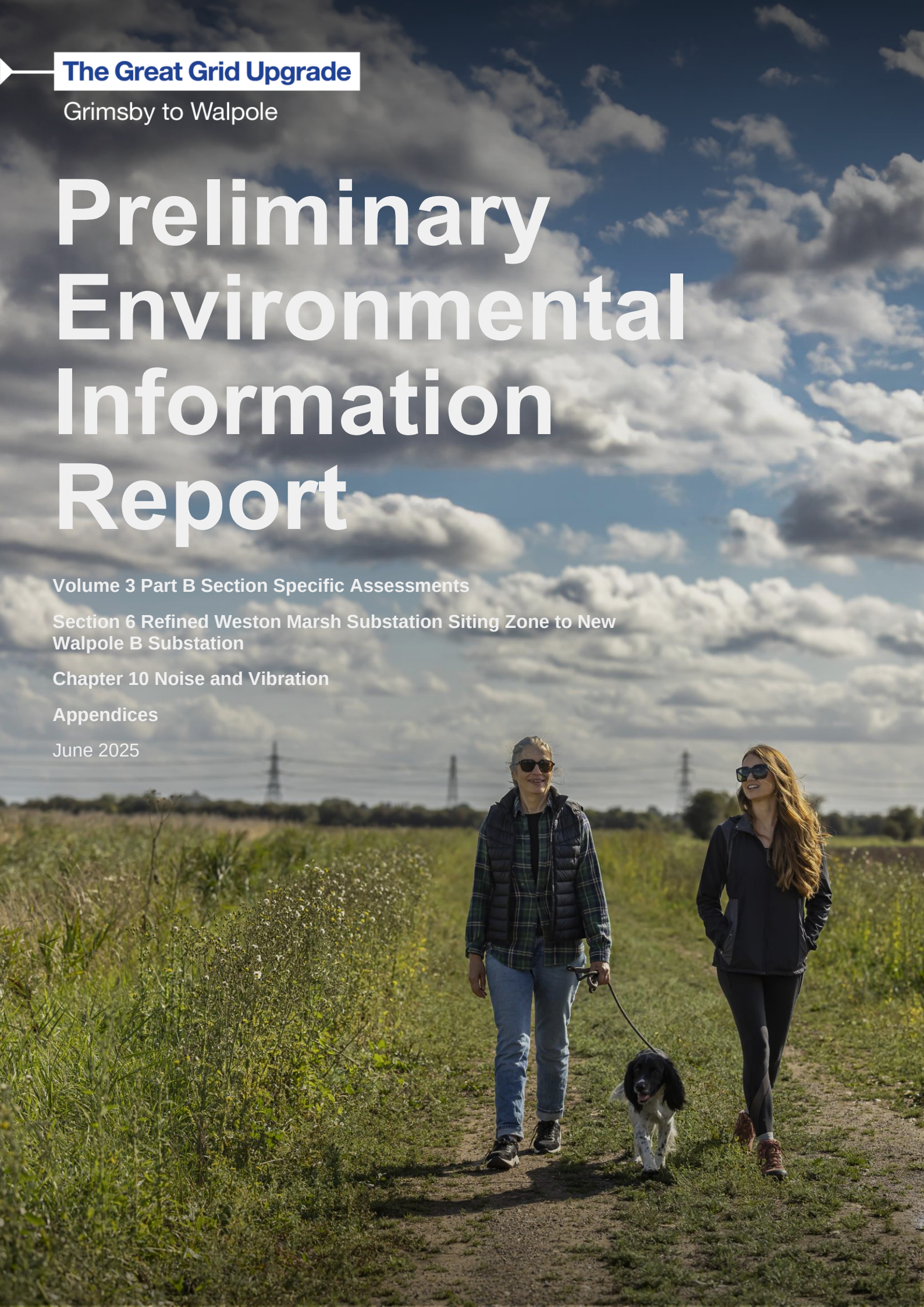

Contents

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10A. Construction Noise and Vibration Data

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Contents

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 to New Walpole B Substation Section (Section 6) 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 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

10A.2.2 Indicative construction plant and data associated with each proposed construction activity is **Table 10A.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 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	

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.

Prediction of Construction Vibration

10A.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

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 25kJ; and
- scaling factor of 1.5 representative of typical soil conditions.

Vibration prediction results

10A.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 12.5 mm/s PPV respectively). The calculated distances in **Table 10A.2** are used in the preliminary assessment to identify areas where NSR, and buildings and structures 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 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

10B. Initial Construction Traffic Noise Assessment

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Contents

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 to New Walpole B Substation Section (Section 6) as part 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 proposed numbers of heavy goods vehicles (HGV).

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 26 construction traffic road links in Section 6 where data is available. The assessment indicates that construction traffic would lead to the following impacts:

i. no change in noise level on nine road links; and

ii. a negligible increase in noise level on 17 road links.

10B.3.3 No medium or large magnitude construction traffic noise impacts are expected in Section 6. 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 6.

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		
LK79	A151	17712	9.9	18025	12.0	71.8	72.3	0.5	Negligible magnitude. Not significant
CR12-1	A16	17378	14.8	17716	16.1	75.5	75.8	0.3	Negligible magnitude. Not significant
CR12-2	A16	18790	11.1	19098	12.4	75.3	75.6	0.3	Negligible magnitude. Not significant
CR12-3	A16	18927	12.7	19222	14.1	73.4	73.7	0.3	Negligible magnitude. Not significant
CR27	A47	41423	6.2	41870	7.5	78.7	79	0.3	Negligible magnitude. Not significant
CR11-4	A16	25658	13.3	26025	14.2	77	77.2	0.2	Negligible magnitude. Not significant
CR13-1	A47	41575	9.2	41902	10.2	79.2	79.4	0.2	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		
CR13-2	A47	17416	9.5	17591	10.8	74.8	75	0.2	Negligible magnitude. Not significant
CR13-3	A47	17122	12.3	17325	13.5	75.1	75.3	0.2	Negligible magnitude. Not significant
CR13-4	A47	21855	11.4	22058	12.4	76	76.2	0.2	Negligible magnitude. Not significant
CR13-5	A47	27068	10.6	27300	11.4	76.8	77	0.2	Negligible magnitude. Not significant
CR13-6	A47	18460	11.3	18692	12.4	75.3	75.5	0.2	Negligible magnitude. Not significant
CR23	A1101	6691	11.4	6785	12.4	70.9	71.1	0.2	Negligible magnitude. Not significant
LK91	B1168	3981	12.6	4014	13.3	68.8	68.9	0.1	Negligible magnitude. Not significant
LK12	B1166	5154	11.1	5190	11.7	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		
LK90	B1165 Raven's Bank	2400	12.4	2424	12.7	66.2	66.3	0.1	Negligible magnitude. Not significant
W61	Eye Road	16219	6.6	16297	6.5	73.9	74	0.1	Negligible magnitude. Not significant
CR22-2	A17	26124	7.4	26324	7.7	76.2	76.2	0.0	No change. Not significant.
LK69	B1357 Hall Gate	1425	11.2	1429	11.3	62.6	62.6	0.0	No change. Not significant.
W44	A1175 Littleworth Drove	8126	5.4	8157	5.4	70.7	70.7	0.0	No change. Not significant.
W48	A151 Bourne Road/Dozens Bank	6038	5.9	6064	5.9	69.5	69.5	0.0	No change. Not significant.
W62	A1139 Frank Perkins Parkway	41199	10.4	41276	10.4	79.4	79.4	0.0	No change. Not significant.
W63-1	A1101 Sutton Road	9180	14.7	9199	14.7	71.3	71.3	0.0	No change. Not significant.
W63-2	A1101 Sutton Road	9009	9.1	9032	9.1	70.3	70.3	0.0	No change. 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		
W64	A1101 Churchill Road	16308	4.8	16318	4.8	70.1	70.1	0.0	No change. Not significant.
LK78	Church Lane	690	9.8	739	15.1	very low flow	very low flow	very low flow	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