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HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix SV-001-OR003

Sound, noise and vibration

Off-route works: Annandale depot

Baseline and construction sound, noise and vibration report

M258

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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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1 Introduction

1.1.1 This report is an appendix to the sound, noise and vibration assessment. It provides details of the sound, noise and vibration baseline data and construction sound, noise and vibration assessment relevant to the Proposed Scheme in relation to the off-route works in the Annandale depot area.

1.1.2 This appendix should be read in conjunction with Volume 4, Off-route effects.

1.1.3 An introduction to policy relevant to sound, noise and vibration and the assessment methodology can be found in Volume 5, Appendix SV-001-00000.

2 Baseline and construction

2.1 Regional and local policy guidance

2.1.1 As part of the engagement with local authorities where the Proposed Scheme would operate, information regarding any specific local planning guidance in respect of noise and vibration was requested. The guidance within the Dumfries and Galloway Council Local Development Plan 2, 2019[1], has been considered when applying the impact and significance criteria set out in the Environmental Impact Assessment Scope and Methodology Report (SMR), (see Appendix CT-001-00001).

2.2 Engagement

2.2.1 Details of engagement on a route-wide basis with the local and county authorities' Environmental Health Practitioners is set out in Volume 1.

2.2.2 A meeting[2] has been held with representatives of Dumfries and Galloway Council regarding the approach taken to baseline monitoring within this area, the identification of noise and vibration sensitive receptors, the selection of assessment locations and the development of the mitigation to be included in the Proposed Scheme. Changes suggested during this meeting have influenced the assessment locations used.

2.2.3 Local engagement provided opportunities for local stakeholders to confirm building uses and to review the draft list of non-residential properties to be considered in the assessment.

2.3 Methodology

2.3.1 The methodology used for the assessment of airborne sound, ground-borne sound and vibration impacts and the determination of significant effects is defined in the SMR. Further information is contained in Volume 5, Appendix SV-001-00000.

2.4 Assumptions

2.4.1 Route-wide assumptions are outlined in Volume 1, Section 8, and are further detailed in Volume 5, Appendix SV-001-00000. Local assumptions that apply to the assessment of construction sound, noise and vibration at the Annandale depot area are set out in Volume 4, Off-route effects.

[1] Dumfries and Galloway Council (2019), *Local Development Plan 2.* Available online at: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000.

[2] Meeting by Microsoft Teams held on 6 May 2021.

2.5 Limitations

2.5.1 The route-wide limitations and the approach adopted to ensure that they will not compromise the robust assessment of sound, noise and vibration are presented in Volume 5, Appendix SV-001-00000 and Volume 4.

3 Baseline

3.1 Existing baseline data collection methodology

3.1.1 The overall approach to baseline data collection for sound noise and vibration is described in Volume 5, Appendix SV-001-00000.

3.1.2 Access has not been available currently for existing baseline sound measurement locations local to the proposed Annandale depot. On a precautionary basis, baseline noise levels have been assumed to be sufficiently low such that the construction sound and noise assessment can use Category A of the BS5228-1[3] 'ABC Method'.

3.2 Future baseline methodology

Construction

3.2.1 The assessment of noise from construction activities assumes a future baseline year of 2026. As a conservative assumption it has been assumed that no change in baseline sound levels will occur between the existing baseline year of 2018 and the future baseline year of 2026.

[3] British Standards Institute (2009), *BS 5228-1:2009: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (+A1:2014)*. BSI, London, UK.

4 Construction

4.1 Introduction

4.1.1 This section provides a quantitative assessment of construction noise and vibration impacts/effects and a qualitative assessment of likely significant effects, based on the impacts/effects identified and other local context information consistent with the scope and methodology defined for the Proposed Scheme.

4.2 Evaluation of impacts and effects

4.2.1 Indirect effects arising from temporary changes in traffic patterns on the existing road network as a consequence of constructing the Proposed Scheme are reported where they are likely to occur within the study area as defined in Volume 5, Appendix SV-001-00000.

4.2.2 In undertaking the assessment of sound, noise and vibration, consistent with the Environmental Impact Assessment Directive[4] and Planning Advice Note 1/2011 Planning and Noise[5] a differentiation between impacts, effects, adverse effects and significant effects is made. Further information is provided in Volume 5, Appendix SV-001-00000.

4.2.3 The assessment of impacts and effects has been undertaken at assessment locations that are representative of a number of dwellings or other sensitive receptors. The construction assessment locations employed in this assessment are presented on Map Series SV-03 in the Volume 5, Sound, noise and vibration Map Book.

4.3 Effects during construction

Introduction

4.3.1 The assessment is reported first for ground-borne sound and vibration and then for airborne sound. Under each of these headings, the results of the identification of impacts, effects and significant effects are presented. The significant effects and the evidence used to support these conclusions are presented in Volume 4, Off-route effects, Section 3.

[4] *Directive 85/337/EEC, as amended by 97/11/EC, 2003/35/EC, 2011/92/EC and 2014/52/EU ('the EIA Directive') of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.* Strasbourg, European Parliament and European Council.

[5] *Planning Advice Note PAN1/2011: Planning and Noise.* Available online at: https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/pages/3/.

Avoidance and mitigation measures

4.3.2 These are set out in Volume 4, Off-route effects, Section 6.

Identification of impacts and effects

4.3.3 Assessment locations defined for the quantitative assessment of impacts are shown on Volume 5 Sound, noise and vibration Map Book, Map Series SV-03.

4.3.4 For each assessment location, the assessment results are presented in Table 2. Explanation of the information in Table 2 and Table 3 is provided in Volume 5: Appendix SV-001-00000, with the following additional notes in Table 1.

Table 1: Explanatory notes for assessment results – direct construction effects

Symbol	Explanation
	Where the significant effect column is highlighted in pink, then a significant effect is identified at the referenced residential community area.
	For residential receptors yellow denotes a minor ground-borne vibration impact.
	For residential receptors orange denotes a moderate ground-borne vibration impact.
	For residential receptors red denotes a major ground-borne vibration impact.
*	For residential receptors this indicates a potentially significant effect where the quantitative impact methodology has identified an impact at this receptor which, based upon further qualitative receptor information, (see assessment text) does not give rise to a significant effect. For non-residential receptors this indicates the predicted noise levels are above screening criteria which, based upon further qualitative receptor information, (see assessment text) does not give rise to a significant effect.
~	When considered under the significance criteria set out in Volume 5: Appendix SV-001-00000, Annex A, Section 1.3, these adverse effects are not considered to be significant on a community basis.
A	For residential Assessment Locations (AL) - Construction sound or vibration levels from the Proposed Scheme exceed Lowest Observed Adverse Effect Level (LOAEL): the significance criteria set out in Volume 5: Appendix SV-001-00000, Annex A, Section 1.3 are considered when establishing significant effects. For non-residential AL and external amenity spaces - Construction sound or vibration levels from the Proposed Scheme exceed the screening criteria in the SMR Section 18.
S	Sound levels from the Proposed Scheme exceed Significant Observed Adverse Effect Level (SOAEL): noise insulation (or temporary rehousing at higher noise levels) therefore provided.
NA	Sound or vibration levels from the Proposed Scheme do not exceed LOAEL, therefore generally no adverse effect.
R	Type of receptor – residential.
A1 – A4	Type of receptor (airborne sound) - (A1) large and small auditoria; concert halls, sound recording and broadcast studios and theatres, (A2) places of meeting for religious worship, courts, cinemas, lecture theatres, museums and small auditoria or halls, (A3) schools; colleges; hospitals, hotels and libraries, (A4) offices and amenity spaces.
V1 – V4	Type of receptor (ground-borne vibration) – (V1) vibration sensitive research and manufacturing; hospitals with vibration sensitive equipment/operations; universities with vibration sensitive research equipment/operations, (V2) hotels, hospital wards and education dormitories, (V3) offices, schools and places of worship, (V4) workshops.

Symbol	Explanation
T	Receptor design – typical.
SP	Receptor design – special.
+	The use and sensitivity of this non-residential receptor or land use is very sensitive to noise and has been included in the detailed assessment (presented in Volume 4) where there is a change less than 3dB. In each case specific information is presented in an associated footnote.
$	The impact methodology for non-residential receptors includes a screening criterion for A2 building use of 50dB$L_{pAeq,07:00-23:00}$, A3 building use of 50dB$L_{pAeq,07:00-23:00}$, and 45dB$L_{pAeq,23:00-07:00}$ and for A4 building use 55dB$L_{pAeq,07:00-23:00}$ (except for A4 buildings containing lower sensitivity offices, in which case the relevant A and B categories from the BS5228 ABC method will be used to assess the noise impact). At the receptor denoted, the screening criteria is met but a change of 3dB or greater has not been identified and therefore no impact is identified. Further information is provided in Volume 5: Appendix SV-001-00000.
H	Existing environment – high existing airborne ambient noise levels, day >75dB, evening >65dB or night >55dBL_{pAeq} at the façade.
L	Existing environment – low existing airborne ambient noise levels, day and evening ≤45dB, or night ≤35dBL_{pAeq} at the façade.
D,E,N	Impact duration (months) – duration of impact during the day (D), evening (E) or night (N).
O, CT, V	Combined impact: If noise or vibration impacts from other construction activities occur at this location: onsite activities (O), off-site construction traffic activities (CT), or construction vibration (V).
NI	Mitigation effect - identified as likely to qualify for noise insulation under the draft Code of Construction Practice (CoCP) Volume 5: Appendix CT-002-00000.
TR	Mitigation effect - identified as likely to qualify for temporary rehousing under the draft CoCP.

Ground-borne sound and vibration

4.3.5 Activities associated with the construction phases of the Proposed Scheme will generate ground-borne sound and vibration. The assessment of the likely impacts and significant effects as a result of the construction noise has considered the effects on:

- residential receptors, both as individual dwellings and communities; and
- non-residential receptors.

4.3.6 The results, impact criteria and significance criteria for the assessment of the scheme at residential and non-residential receptors are presented in Table 2. Explanation of the information within Table 2 is provided in Volume 5, Appendix SV-001-00000, with the additional notes presented in Table 1.

Table 2: Assessment of construction induced ground-borne vibration at residential and non-residential receptors

Assessment location		Impact criteria				Significance criteria							Significant effect
Reference	Area represented	Peak particle velocity (PPV) [mm/s] on foundation	Typical/highest monthly indoor vibration dose value (VDV) [m/s$^{1.75}$]		Construction activity resulting in highest forecast vibration	Type of effect	Number of properties represented	Type of receptor	Receptor design	Unique feature	Combined impact	Impact duration [m]	
			Day 07:00 – 23:00	Night 23:00 – 07:00									
614013	Cranberry Cottage	0.3	0.04/0.24	-/-	Top soil strip works (vibratory roller)	A	1	R	T	-	-	D 1	~
614002	Grahamshill Railway Cottages, Lockerbie	1	0.04/<0.8 [6]	-/-	Top soil strip works (vibratory roller)	A	1	R	T	-	-	D 1	~
614014	Herdwick, Roman Road, Lockerbie	0.2	-/0.06	-/-	Top soil strip works (vibratory roller)	NA	1	R	T	-	-		

[6] Construction methods will be selected to ensure that on a monthly basis the significant adverse effect level is not exceeded.

Airborne sound: direct impacts and effects

4.3.7 Activities associated with the construction phases of the Proposed Scheme will generate airborne noise. The assessment of the likely impacts and significant effects as a result of the construction noise has considered the effects on:

- residential receptors, both as individual dwellings and communities; and
- non-residential receptors, including quiet areas.

4.3.8 For each type of receptor, the typical and highest monthly $L_{Aeq,T}$ noise levels from construction activities have been calculated at the façade of all assessment locations. This is subject to the screening distances identified and based upon supplied plant information from engineers.

4.3.9 The results, impact criteria and significance criteria for the assessment of the Proposed Scheme at residential and non-residential receptors are presented in Table 3 and Table 4 respectively. Explanation of the information within Table 3 and Table 4 is provided in Volume 5, Appendix SV-001-00000, with the additional notes presented in Table 1.

Table 3: Assessment of construction noise at residential receptors

Assessment location		Impact criteria				Significance criteria									Significant effect
Reference	Area represented	Typical/highest monthly outdoor L_{pAeq} [dB] at the facade [Assessment category A/B/C]			Construction activity resulting in highest forecast noise levels	Type of effect	Number of properties represented	Type of receptor	Receptor design	Existing environment	Unique feature	Impact duration (Months)	Combined impact	Mitigation effect	
		Day 07:00 – 19:00	Evening 19:00 – 23:00	Night 23:00 – 07:00											
614001	Roman Road, Lockerbie	56/62[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	2	R	T	-	-	-	-	-	
614002	Grahamshill Railway Cottages, Lockerbie	62/68[A]	-/-[A]	-/-[A]	Day: Earthworks	A	1	R	T	-	-	D5	V	-	~
614003	WIlliamsfield Cottage, Lockerbie	55/59[A]	-/-[A]	-/-[A]	Day: Highway works	NA	2	R	T	-	-	-	-	-	
614004	Cranberry Farm, Lockerbie	62/67[A]	-/-[A]	-/-[A]	Day: Overbridge construction	A	1	R	T	-	-	D4	-	-	~
614005	Bensmoor Road, Gretna Green	52/56[A]	-/-[A]	-/-[A]	Day: Highway works	NA	6	R	T	-	-	-	-	-	
614007	Roman Road, Lockerbie	52/57[A]	-/-[A]	-/-[A]	Day: Overbridge construction	NA	6	R	T	-	-	-	-	-	
614009	Roman Road, Lockerbie	58/62[A]	-/-[A]	-/-[A]	Day: Pumping station construction	NA	2	R	T	-	-	-	-	-	
614010	Redhall Castle, Lockerbie	51/56[A]	-/-[A]	-/-[A]	Day: Pond construction	NA	1	R	T	-	-	-	-	-	
614011	Whinnyrig, Gretna	56/60[A]	-/-[A]	-/-[A]	Day: Pumping station construction	NA	1	R	T	-	-	-	-	-	

Assessment location		Impact criteria				Significance criteria									Significant effect
Reference	Area represented	Typical/highest monthly outdoor L_{pAeq} [dB] at the facade [Assessment category A/B/C]			Construction activity resulting in highest forecast noise levels	Type of effect	Number of properties represented	Type of receptor	Receptor design	Existing environment	Unique feature	Impact duration (Months)	Combined impact	Mitigation effect	
		Day 07:00 – 19:00	Evening 19:00 – 23:00	Night 23:00 – 07:00											
614012	Faith Cottage	54/60[A]	-/-[A]	-/-[A]	Day: Highway works	NA	2	R	T	-	-	-	-	-	
614013	Cranberry Cottage	69/73[A]	-/-[A]	-/-[A]	Day: General site works	A	1	R	T	-	-	D21	V	-	~
614014	Herdwick, Roman Road, Lockerbie	61/65[A]	-/-[A]	-/-[A]	Day: Pond construction	NA	1	R	T	-	-	-	-	-	
614016	Roman Road, Lockerbie	34/38[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	9	R	T	-	-	-	-	-	
614017	Roman Road, Lockerbie	-/34[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	6	R	T	-	-	-	-	-	
614018	Eden Grove, Lockerbie	-/34[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	38	R	T	-	-	-	-	-	
614019	Victoria Terrace, Lockerbie	-/35[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	15	R	T	-	-	-	-	-	
614020	Bruce Court, Lockerbie	-/33[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	6	R	T	-	-	-	-	-	
614021	Cove Railway Cottages, Lockerbie	-/33[A]	-/-[A]	-/-[A]	Day: Earthworks	NA	3	R	T	-	-	-	-	-	

Assessment location		Impact criteria				Significance criteria									Significant effect
Reference	Area represented	Typical/highest monthly outdoor L_{pAeq} [dB] at the facade [Assessment category A/B/C]			Construction activity resulting in highest forecast noise levels	Type of effect	Number of properties represented	Type of receptor	Receptor design	Existing environment	Unique feature	Impact duration (Months)	Combined impact	Mitigation effect	
		Day 07:00 – 19:00	Evening 19:00 – 23:00	Night 23:00 – 07:00											
614027	Red House Farm, Roman Road, Lockerbie	62/67[A]	-/-[A]	-/-[A]	Day: Highway works	A	1	R	T	-	-	D2	-	-	~

Table 4: Assessment of construction noise at non-residential receptors

Assessment location		Impact criteria					Significance criteria								Significant effect
Reference	Area represented	Typical/highest monthly outdoor L_{pAeq} [dB] at the façade		Change during month with highest noise level		Construction activity resulting in highest forecast noise levels	Number of properties represented	Type of receptor	Receptor design	Existing environment	Unique feature	Impact duration (months)	Combined impact	Mitigation effect	
		Day 07:00 – 19:00	Night 23:00 – 07:00	Day 07:00 – 19:00	Night 23:00 – 07:00										
614000	The Mill Forge (Wedding Venue), Lockerbie	57/63	-/-	>3	-	Day: Earthworks	1	A2	T	-	-	D26	CT	-	ADEP-C-N1
614008	Days Inn M74, Gretna Green	44/49	-/-	>3	-	Day: Overbridge construction	1	A3	T	-	-	-	-	-	
614015	Kirkpatrick Fleming Primary School, Lockerbie	38/42	-/-	<3	-	Day: Earthworks	1	A3	T	-	-	-	-	-	
614022	Cove House (Hotel), Lockerbie	-/33	-/-	0	-	Day: Earthworks	1	A3	T	-	-	-	-	-	
614023	The Meadows B&B, Lockerbie	38/42	-/-	<3	-	Day: Earthworks	1	A3	T	-	-	-	-	-	
614024	Berryburn Country House (Holiday Let), Lockerbie	35/39	-/-	0	-	Day: Earthworks	1	A3	T	-	-	-	-	-	

Assessment location		Impact criteria					Significance criteria								Significant effect
Reference	Area represented	Typical/highest monthly outdoor L_{pAeq} [dB] at the façade		Change during month with highest noise level		Construction activity resulting in highest forecast noise levels	Number of properties represented	Type of receptor	Receptor design	Existing environment	Unique feature	Impact duration (months)	Combined impact	Mitigation effect	
		Day 07:00 – 19:00	Night 23:00 – 07:00	Day 07:00 – 19:00	Night 23:00 – 07:00										
614025	Kirkpatrick House (Holiday Let), Lockerbie	36/40	-/-	0	-	Day: Earthworks	1	A3	T	-	-	-	-	-	
614026	Victoria Hall (Community Hall), Lockerbie	38/42	-/-	<3	-	Day: Earthworks	1	A2	T	-	-	-	-	-	
614028	Caravan Park (Short-term only)	-/32	-/-	0	-	Day: Earthworks	1	A3	T	-	-	-	-	-	

Airborne sound: indirect effects

4.3.10 Construction road traffic associated with the construction phases of the Proposed Scheme would generate airborne noise. Based upon traffic information for the Proposed Scheme, the change in traffic noise level at a reference distance of 10m from the edge of the nearside carriageway for a given road has been predicted. Data have been produced for a typical month during the construction period and for a worst-case month during the construction period. The results for potentially significant road links are presented in Table 6.

4.3.11 Explanation of the information within Table 6 is provided in Volume 5, Appendix SV-001-00000, with the following additional notes in Table 5.

Table 5: Explanatory notes for assessment results - Indirect construction effects

Colour	Explanation
	Where the significant effect column is highlighted, then a significant effect is identified on nearby communities.
	Yellow denotes a minor impact – a change is of ≥ 3dB – <5dB, or ≥ 1dB – <3dB where a high existing sound level is identified.
	Orange denotes a moderate impact – a change is of ≥5dB – <10dB, or ≥3dB – <5dB where a high existing sound level is identified.
	Red denotes a major impact – a change is of ≥10 dB, or ≥5dB where a high existing sound level is identified.
~	When considered under the significance criteria set out in Volume 5: Appendix SV-001-00000, Annex A, Section 1.3, these adverse effects are not considered to be significant on a community basis.
*	For non-residential receptors this indicates the predicted noise levels are above screening criteria which, based upon further qualitative receptor information, (see footnote) does not give rise to a significant effect.
O, V	Combined impact: If noise or vibration impacts from other construction activities occur at this location: onsite activities (O) or construction vibration (V).
R, NR	Number of properties affected (approx.) – identified by type of receptor: R: total number of residential (total number of residential in community). NR: total number of non-residential.

Table 6: Assessment of construction traffic noise levels

Road name	Portion of road affected	Number of properties affected (approx.)	Daytime traffic sound levels $L_{Aeq,16hr}$ dB			Change compared to current traffic sound level (dB)		Combined impact	Significant effect
			Without the Proposed Scheme (2030)	Typical month during construction	Peak month during construction	Typical month during construction	Peak month during construction		
B7076	Between A74(M) exit slip road and Site Access Road	R:0 NR: 1	65.6	66.3	67.1	0.7	1.5	O	-

Airborne sound levels used in other assessments

4.3.12 There are no locations of interest to other disciplines in their assessments.

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