

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

Volume 5: Appendix LQ-001-OR003

Land quality

Land quality report

Off-route works: Annandale depot

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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 land quality assessment for the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES) off-route works at the Annandale depot, it comprises:
- a summary of engagement undertaken; and
 - detailed risk assessments associated with land contamination.
- 1.1.2 This appendix provides details of changes to the land quality assessment since the production of the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES) published in 2022¹ (the main ES). This report is structured into two parts: Part 1 – SES2, and Part 2 – AP2 ES.
- 1.1.3 This appendix should be read in conjunction with:
- the SES2 and AP2 ES Volume 4, Off-route effects; and
 - Background Information and Data² (BID), Land quality baseline data (see BID LQ-002-OR003 SES2 and AP2 ES³).
- 1.1.4 Sites (for example ADEP-35) referred to in this appendix are contained in the SES2 and AP2 ES Volume 5, Land quality Map Book: Map Series LQ-01 – Land Quality.
- 1.1.5 Further information regarding receptors in relation to each site or group of sites is set out in BID LQ-002-OR003 SES2 and AP2 ES.
- 1.1.6 Minerals baseline data, information about Local Geodiversity Sites (LGS) and geological Sites of Special Scientific Interest (SSSI) and site visit records are also set out in BID LQ-002-OR003 SES2 and AP2 ES.

¹ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

² High Speed Two Ltd (2023), High Speed Rail (Crewe – Manchester), *Background Information and Data accompanying Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-2-and-additional-provision-2-environmental-statement>.

³ High Speed Two Ltd (2023), High Speed Rail (Crewe – Manchester), *Background Information and Data accompanying Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement, Land quality baseline report*, BID LQ-002-OR003 SES2 and AP2 ES. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-2-and-additional-provision-2-environmental-statement>.

- 1.1.7 The Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR)⁴ (see main ES Volume 5, Appendix: CT-001-00001) should be referred to for details of the land quality assessment.
- 1.1.8 In order to differentiate between the original scheme and the subsequent changes, the following terms are used:
- ‘the original scheme’ – the Bill scheme submitted to Parliament in 2022, which was assessed in the main ES;
 - ‘the SES1 scheme’ – the original scheme with any changes described in SES1 that are within the existing powers of the Bill;
 - ‘the AP1 revised scheme’ – the original scheme as amended by SES1 changes and AP1 amendments;
 - ‘the SES2 scheme’ – the original scheme with any changes described in SES1 (submitted in July 2022) and the SES2; and
 - ‘the AP2 revised scheme’ – the original scheme as amended by SES1 and SES2 changes (as relevant) and AP2 amendments.

1.2 Scope of the assessment

- 1.2.1 The scope of the assessment in this report is limited to SES2 design changes and AP2 amendments which are considered likely to introduce a new significant effect, remove a significant effect, or result in a materially different significant effect on land quality than reported in the main ES.

⁴ High Speed Two Ltd (2022), High Speed Rail (Crewe - Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report*, Volume 5, Appendix: CT-001-00001. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

2 Engagement

2.1.1 Table 1 sets out the organisations that have been engaged with during the preparation of the land quality assessment of the SES2 scheme for the Annandale depot area⁵, the types of information that have been provided to the assessment team and any specific concerns raised.

Table 1: Engagement on land quality issues undertaken for the Annandale depot area

Organisation	Method/dates of contracts	Information provided and/or specific concerns
Dumfries and Galloway Council (DGC)	Email to DGC (21 October 2022)	Request to DGC to provide any updated land quality priority sites data within the provided AP2 study area.

⁵ The study area is defined as the land required for the construction of the AP2 revised scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased to 1km.

3 Risk assessment

- 3.1.1 A four-stage process, comprising stages A to D, has been carried out in accordance with the methodology set out in the SMR. At each stage, professional judgement has been used to check that the screening and assessment process is highlighting significant sites.
- 3.1.2 Stage A highlights potentially contaminative sites based on their potential impact. Sites with a moderate to high potential impact move through to stage B where they are assessed based on receptor proximity.
- 3.1.3 Sites with a high potential impact pass through stage B to detailed assessment irrespective of receptor proximity. Sites with a moderate potential impact and moderate to high receptor proximity also go through to detailed assessment.
- 3.1.4 For those sites which pass through stage B, a further detailed risk assessment (stages C and D) has been carried out.
- 3.1.5 The results of stage C are presented in three conceptual site models (CSM) as qualitative risk assessments covering baseline, construction and post-construction scenarios. Stage D then compares the risk of impact at construction and post-construction stages with the baseline to determine the change in risk and hence the potential for a significant effect.
- 3.1.6 Section 4 (Part 1: SES2) and Section 5 (Part 2: AP2 ES) present assessments for potentially contaminated sites which have passed through the screening process within the study area. For each site the following data are presented:
- baseline risk assessment;
 - construction risk assessment;
 - post-construction risk assessment;
 - assessment of temporary (construction) effects; and
 - assessment of permanent (post-construction) effects.
- 3.1.7 The construction and post-construction risk assessments assume that appropriate mitigation has been undertaken and that the operation of the railway is in accordance with environmental legislation.
- 3.1.8 The sites in the SES2 scheme and AP2 revised scheme study areas are listed in Table 2.
- 3.1.9 For clarity, 'on-site' in this document means 'within the land required for the construction of the SES2 scheme and AP2 revised scheme' and 'off-site' refers to 'land beyond this boundary, but within the study area'.

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Table 2: Sites included in the risk assessment within the SES2 and AP2 ES study area

Site group	Site title (site ID) and land use class ⁶
On-site	
Wastewater treatment works	Wastewater treatment works (ADEP-36), Class 2
Off-site	
Petrol filling station	Petrol filling station (ADEP-35), Class 3

- 3.1.10 Contaminant types included within the risk assessments are based on the Department of the Environment, Farming and Rural Affairs (Defra) and Environment Agency (2002) Priority Contaminants Report CLR8⁷. Although this report has been withdrawn by the Environment Agency, it remains technically valid as there has been no subsequent authoritative replacement.
- 3.1.11 The remainder of this section presents the risk assessment for the sites going through to stages C and D of the assessment. These sites are shown on the SES2 and AP2 ES Volume 5, Land quality Map Book: Map Series LQ-01, map LQ-01-803.
- 3.1.12 The following abbreviations are used in Table 3 to Table 8:
- CoCP – Code of Construction Practice (draft CoCP⁸);
 - MTBE – methyl-tert butyl ether;
 - PAH – polycyclic aromatic hydrocarbons;
 - PCB – polychlorinated biphenyls; and
 - PPE – personal protective equipment.

⁶ As defined by the SMR.

⁷ Department for Environment, Food and Rural Affairs and Environment Agency (2002), *Potential Contaminants for the Assessment of Land*, R&D Publication CLR8.

⁸ High Speed Two Ltd (2022), High Speed Rail (Crewe - Manchester), *Environmental Statement, draft Code of Construction Practice*, Volume 5, Appendix: CT-002-00000. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

Part 1: Supplementary Environmental Statement 2

4 SES2 scheme risk assessment

- 4.1.1 The screening process for the SES2 scheme has not identified additional potentially contaminated sites.

Part 2: Additional Provision 2 Environmental Statement

5 AP2 revised scheme risk assessment

5.1.1 The screening process for the AP2 revised scheme has identified two sites that are now required to be taken through to detailed assessment.

5.2 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment for wastewater treatment works (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase	
Potential contamination from current activities: metals and metalloids, inorganic ions, organic contaminants, acids/alkalis, microorganisms, fuel oils. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low	
		Inhalation of ground gases	Low likelihood	Medium	Moderate/low	
	Adjacent site users – residents, motorway services users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low	
		Inhalation of ground gases	Unlikely	Medium	Low	
	Controlled waters – groundwater High productivity aquifer of the St Bees Sandstone Member		Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Medium to high productivity aquifer of the River Terrace Deposits				
	Property receptors – buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to explosive gases	Unlikely	Medium	Low
Notes/assumptions:					
<ul style="list-style-type: none"> • site assessed without construction of the AP2 revised scheme; • see BID report (that accompanies SES2 and AP2 ES) Section 7, Table 1 for details of receptors to the site; • existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed; • aquifer designations in Scotland differ to those in England and Wales. Consequence from contamination has been assessed as that of a Principal aquifer for the high productivity bedrock aquifer and as a Secondary A aquifer for the moderate to high productivity superficial aquifer (http://nora.nerc.ac.uk/id/eprint/511413/1/OR15028.pdf); and • it is assumed that the superficial and bedrock aquifers are in connectivity. 					

Table 4: Baseline CSM and qualitative risk assessment for petrol filling station (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination from former and current activities: petroleum and diesel range hydrocarbons, lead and methyl-tert butyl ether (MTBE)	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Adjacent site users – residents, service station users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters Inhalation of ground gases	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Controlled waters – groundwater High productivity aquifer of the St Bees Sandstone Member Medium to high productivity aquifer of the River Terrace Deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Property receptors – buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to explosive gases/vapours	Low likelihood	Medium	Moderate/low

Notes/assumptions:

- site assessed without construction of the AP2 revised scheme;
- see BID report (that accompanies SES2 and AP2 ES) Section 7, Table 2 for details of receptors to the site;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- aquifer designations in Scotland differ to those in England and Wales. Consequence from contamination has been assessed as that of a Principal aquifer for the high productivity bedrock aquifer and as a Secondary A aquifer for the moderate to high productivity superficial aquifer (<http://nora.nerc.ac.uk/id/eprint/511413/1/OR15028.pdf>); and
- it is assumed that the superficial and bedrock aquifers are in connectivity.

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5.3 Construction risk assessment

Table 5: Construction CSM and qualitative risk assessment for wastewater treatment works (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase	
Potential contamination from current activities: metals and metalloids, inorganic ions, organic contaminants, acids/alkalis, microorganisms, fuel oils and potentially low levels of ground gas (methane and carbon dioxide)	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low	
		Inhalation of ground gases	Low likelihood	Medium	Moderate/low	
	Adjacent site users – residents, motorway service users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low	
		Inhalation of ground gases	Unlikely	Medium	Low	
	Controlled waters – groundwater High productivity aquifer of the St Bees Sandstone Member Medium to high productivity aquifer of the River Terrace Deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Likely	Medium	Moderate	
		Property receptors – buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
			Exposure to explosive gases	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Notes/assumptions:					
<ul style="list-style-type: none"> • site investigation will be required prior to construction of the AP2 revised scheme; • sites which lie within the land required for construction of the AP2 revised scheme may require remediation; • human health and property receptors are assumed to remain present on-site during the construction phase; • remediation will be restricted to mitigation of land quality effects arising from the AP2 revised scheme; • existing site users and adjacent site users in the receptor column refer to users at or near to the potentially contaminated area; • during construction, standard mitigation procedures are assumed to be implemented in accordance with the draft CoCP. Construction workers have been excluded from assessment due to the use of PPE/risk management protocols and in accordance with the SMR; and • while the draft CoCP will make it unlikely that there will be adverse consequences associated with construction e.g. the control of surface runoff and dust, it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. The adoption of the draft CoCP generally results in a low to unlikely probability of a consequence, but in some cases the actual consequence may temporarily increase from that defined at baseline. 					

Table 6: Construction CSM and qualitative risk assessment for petrol filling station (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Residual contamination from former and current activities: petroleum and diesel range hydrocarbons, lead and MTBE	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Adjacent site users – residents, service station users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low
	Controlled waters – groundwater	Leaching, vertical and lateral migration from	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	High productivity aquifer of the St Bees Sandstone Member Medium to high productivity aquifer of the River Terrace Deposits	contaminated soils and waters			
	Property receptors – buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to explosive gases/vapours	Low likelihood	Medium	Moderate/low

Notes/assumptions:

- site investigation may be required prior to construction of the AP2 revised scheme;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- during construction, standard mitigation procedures are assumed to be implemented in accordance with the draft CoCP. Construction workers have been excluded from assessment due to the use of PPE/risk management protocols and in accordance with the SMR; and
- while the draft CoCP will make it unlikely that there will be adverse consequences associated with construction e.g. the control of surface runoff and dust, it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. The adoption of the draft CoCP generally results in a low to unlikely probability of a consequence, but in some cases the actual consequence may temporarily increase from that defined at baseline.

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5.4 Post-construction risk assessment

Table 7: Post-construction CSM and qualitative risk assessment for wastewater treatment works (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Potential contamination from current activities: metals and metalloids, inorganic ions, organic contaminants, acids/alkalis, microorganisms, fuel oils. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Low likelihood	Medium	Moderate/low
	Adjacent site users – residents, motorway service users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low
		Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters – groundwater High productivity aquifer of the St Bees Sandstone Member Medium to high productivity aquifer of the River Terrace Deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Property receptors – buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor
		Exposure to explosive gases	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Notes/assumptions:					
<ul style="list-style-type: none"> • assumes construction works are complete and remediation has been carried out where necessary. No pathways are left open; • human health and property receptors are assumed to remain present on-site at the post-construction phase; and • existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed. 					

Table 8: Post-construction CSM and qualitative risk assessment for petrol filling station (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination from former and current activities: petroleum and diesel range hydrocarbons, lead and MTBE.	Existing site users – site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Adjacent site users – residents, service station users, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low
	Controlled waters – groundwater High productivity aquifer of the St Bees Sandstone Member Medium to high productivity aquifer of the River Terrace Deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Property receptors – buildings, foundations and	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
	services (existing and adjacent)	Exposure to explosive gases/vapours	Low likelihood	Medium	Moderate/low
Notes/assumptions:					
<ul style="list-style-type: none"> • assumes baseline conditions will not change at post-construction; and • existing site users and adjacent site users in the receptor column refer to users within/near to the areas assessed. 					

5.5 Assessment of temporary (construction) and permanent (post-construction) effects

5.5.1 The significance of the effects of land contamination is assessed by comparing the difference in risk of each contaminant linkage at baseline to those at construction and at post-construction stages. This provides a way of assessing both the adverse and beneficial effects during construction and the post-construction period.

Table 9: Wastewater treatment works (on-site) – significance of effect assessments

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of human receptors to contamination by direct contact, ingestion and inhalation of dusts and vapours from contaminated soils and waters	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Exposure of existing site users through inhalation of ground gases	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Exposure of adjacent human receptors to contamination by direct contact, ingestion and inhalation of dusts and vapours from contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect

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Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of adjacent site users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Exposure of groundwater to vertical and lateral migration of contaminated groundwater/leachate (High productivity aquifer and Moderate to high productivity aquifer)	Moderate/low	Moderate	Moderate/low	Minor adverse	Neutral effect
Direct contact of property with contaminated soils and water	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral to minor adverse effect	Neutral effect
Notes/assumptions:					
<ul style="list-style-type: none"> the significance column may report a range of outcomes for a site. The draft CoCP is designed to mitigate effects, and it is considered that only temporary minor adverse effects during the construction period will occur from ground disturbance; and mitigation measures over and above the draft CoCP are detailed in the Volume 4 report. 					

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Table 10: Petrol filling station (off-site) – significance of effect assessments

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of human receptors to contamination by direct contact, ingestion and inhalation of dusts and vapours from contaminated soils and waters	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters impacting adjacent site users	Low	Low	Low	Neutral effect	Neutral effect
Exposure of groundwater to vertical and lateral migration of contaminated groundwater/leachate (High productivity aquifer and Moderate to high productivity aquifer)	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Direct contact of property with contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property to explosive gases	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect
Notes/assumptions:					
<ul style="list-style-type: none"> the significance column may report a range of outcomes for a site. The draft CoCP is designed to mitigate effects, and it is considered that only temporary minor adverse effects during the construction period will occur from ground disturbance; and mitigation measures over and above the draft CoCP are detailed in the Volume 4 report. 					

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