

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix LQ-001-0MA01

Land quality

MA01: Hough to Walley's Green

Land quality report

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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 Hough to Walley's Green area, it comprises:
- a summary of engagement undertaken;
 - details on committed developments relevant to land quality that form part of the future baseline; and
 - detailed risk assessments associated with land contamination.
- 1.1.2 This appendix should be read in conjunction with:
- Volume 2, Community area reports;
 - Volume 3, Route-wide effects;
 - Volume 4, Off-route effects; and
 - Background Information and Data (BID) (BID LQ-002)¹.
- 1.1.3 Maps referred to throughout this report are contained in the Volume 5: Land quality Map Book (Maps LQ-01-300 to LQ-01-304a). Sites carried through to assessment are given a reference number. In this report they are referred to as MA01-205 and on the maps they are referred to as 01-205.
- 1.1.4 Further information regarding receptors in relation to each site or group of sites is set out in the BID.
- 1.1.5 Minerals baseline data, information about Local Geological Sites and geological Sites of Special Scientific Interest (SSSI) and site visit records are set out in the BID document.
- 1.1.6 The Environmental Impact Assessment Scope and Methodology Report (SMR), (see Appendix CT-001-00001) should be referred to for details of the Land quality assessment.

¹ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background and Information Data, Land quality baseline data*. BID LQ-002-0MA01. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-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 section of the Environmental Statement (ES) for the Hough to Walley's Green area, 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 Hough to Walley's Green area

Organisation	Method/dates of contact	Information provided and/or specific concerns
Cheshire East Council (CEC)	Meeting (15 May 2018)	Presentation and workshop on land quality assessment approach.
	Telephone call to CEC Contaminated Land Officer (7 August 2018)	Discussion on the scope of requirements for land quality engagement.
	Email to CEC (8 August 2018)	Provision of example data and confirm scope of request.
	Email from CEC (14 September 2018)	CEC sent requested data as shapefiles and excel document.
	Meeting (5 June 2019)	Presentation on land quality progress, scope of assessment in relation to salt working and Working Draft Environmental Statement (WDES) consultation responses.
	Email to CEC (15 October 2020)	Confirm scope of data request with larger study area.
	Meeting (22 October 2020)	Presentation and update on land quality progress following the scheme update.
	Telephone call to CEC minerals planner (29 October 2020)	Meeting to discuss minerals in the area and in particular salt extraction around Warmingham Brinefield.
	Email from CEC (30 October 2020)	CEC forwarded planning application data in relation to Warmingham Brinefield.
	Email from CEC (11 November 2020)	CEC supplied land contamination data.
Email to CEC (19 January 2021)	Request for further information on Parkfield	

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Organisation	Method/dates of contact	Information provided and/or specific concerns
		Farm extension to Warmingham Brinefield planning status.
	Email from CEC (8 February 2021)	Information on Parkfield Farm received from CEC.
Environment Agency	Meeting (15 May 2018)	Presentation and workshop on land quality approach. No specific concerns raised but introductions made to Environment Agency HS2 team.
	Meeting (14 September 2018)	Meeting to discuss acquiring Environment Agency landfill data. Agreed procedure for acquiring detailed, site specific data and contacts with local area officers. Priority landfills along the route discussed and general information provided. Detailed information to be provided by local area officers at subsequent meeting.
Cheshire Regionally Important Geological Sites (RIGS)	Email to Cheshire RIGS (15 October 2018)	Initial contact outlining proposed engagement.
	Telephone call (1 November 2018)	Discussion on local and regional geological sites in the Land Quality study area.
	Email from Cheshire RIGS (1 November 2018)	Transmittal of documents relating to geoconservation in the study area.
Animal and Plant Health Agency	Email to APHA (24 April 2019)	Request for data on animal burials in the study area.
	Email from APHA (29 April 2019)	APHA detailed that they have no register of animal burials in the study area.

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 Sections 3.2 to 3.5 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 Where nearby sites present a similar contamination risk, they have been grouped and considered together. For example, in rural areas, small historical backfilled ponds and pits have been grouped together for assessment purposes.
- 3.1.9 Where sites have been grouped together, only one CSM has been prepared for those sites. The sites in the Hough to Walley's Green area have been listed as follows in Table 2.
- 3.1.10 For clarity, 'on-site' in this document means 'within the land required for the construction of the Proposed 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 Hough to Walley's Green area

Site group	Site title (site ID) and land use class ²
On-site	
Railway land	Current London and North Western Railway/other junctions (MA01-205), Class 2
Works	Current works (MA01-35), Class 2
Farm	Current Bridge Farm (MA01-190), Class 1
Historical infilled land	Historical mound of unknown material (MA01-184), Class 2
Off-site	
Tanks, likely for fuel storage, petrol filling stations and power stations	Current industrial estate/electrical sub-station/tank (MA01-37), Class 3 Current petrol filling station (MA01-137), Class 3 Current petrol filling station (MA01-180), Class 3
Former and current works, garages, coal wharf, depot and scrapyards	Former sidings and historical sand pit (MA01-09), Class 2 Current works (MA01-28), Class 2 Former Cumberland Coal Wharf with warehouse (MA01-136), Class 2 Current MOT test centre (MA01-139), Class 2 Current depot (MA01-141), Class 2 Current garage mechanics (MA01-146), Class 2
Cemetery	Current Crewe Cemetery (MA01-149), Class 2
Railway land	Current railway land with infrastructure (MA01-21), Class 2 Current railway land (MA01-230), Class 2 Current railway land (MA01-234), Class 2 Current railway land (MA01-235), Class 2

3.1.11 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 CLR 8³. Although this report has been withdrawn by the Environment Agency, it remains technically valid and there has been no subsequent authoritative replacement.

3.1.12 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 Volume 5, Land Quality Map Book, Maps LQ-01-300 to LQ-01-304a.

3.1.13 The following abbreviations are used in these tables:

- CoCP – Code of Construction Practice;
- PAH – polycyclic aromatic hydrocarbons;

² As defined by the SMR.

³ Department for Environment, Food and Rural Affairs and Environment Agency (2002), *Potential Contaminants for the Assessment of Land*. R&D Publication CLR8.

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- PCB – polychlorinated biphenyls;
- PPE – personal protective equipment; and
- VOC – volatile organic compounds.

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3.2 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment for railway land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination in made ground (e.g. ballast): PCB, metals, asbestos, PAH and chlorinated hydrocarbons); potentially low levels of ground gas (methane, carbon dioxide and VOC)	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and workers in commercial/industrial areas	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 Secondary Undifferentiated aquifer of the glacial till Secondary B Aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Ecological receptors - LWS at Spring Plantation Grassland and Mossbridge Marsh (both adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Minor	Very low

Notes/assumptions:

- site assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 1 for details of receptors to the site; and
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed.

Table 4: Baseline CSM and qualitative risk assessment for works (on-site)

Source	Receptor	Pathway	Probability	Consequences	Risk at baseline phase
Contamination from ongoing activities residual contamination from current and former activities - hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Commercial/industrial 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 - Railway staff, and commercial/industrial 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	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequences	Risk at baseline phase
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- sites assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 2 for details of receptors relevant to groups of sites; and
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed.

Table 5: Baseline CSM and qualitative risk assessment for farm (on-site)

Source	Receptor	Pathway	Probability	Consequences	Risk at baseline phase
Contamination from ongoing activities residual contamination from current and former activities - hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Residents, farm 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, walkers, nearby 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 Secondary Undifferentiated aquifers of the glacial till	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequences	Risk at baseline phase
	Secondary B aquifers of the Sidmouth Mudstone Formation				
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- site assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 3 for details of receptors to the site; and
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed.

Table 6: Baseline CSM and qualitative risk assessment for historical infilled land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Potential contamination from possible infilling activities. Composition of infill (if any) is unknown. Depending upon the source of the infill this could comprise inert materials or those that could include a range of organic and inorganic contaminants including: petroleum and diesel range hydrocarbons, PAH, metals and asbestos.	Existing site users - walkers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents, 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

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Potentially low levels of ground gas (methane and carbon dioxide) if bio-degradable infill used.	Controlled waters - groundwater Secondary Undifferentiated aquifers of the glacial till Secondary B aquifers of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Unlikely	Minor	Very low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- site assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 4 for details of receptors to the site; and
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed.

Table 7: Baseline CSM and qualitative risk assessment for tanks, likely for fuel storage, petrol filling stations and power stations grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination from former and current activities: contaminants primarily comprising petroleum and diesel range hydrocarbons, pesticides. Potentially low levels of ground gas	Existing site users - Commercial/industrial 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 -	Direct contact, ingestion, inhalation of dusts and	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase	
(methane and carbon dioxide)	Residents and commercial industrial site workers and visitors	vapours from contaminated soils and waters				
		Inhalation of ground gases	Unlikely	Medium	Low	
	Controlled waters - groundwater Secondary Undifferentiated aquifers of the glacial till Secondary B aquifers of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low	
		Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low	

Notes/assumptions:

- sites assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 5 for details of receptors relevant to groups of sites;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- MA01-37 is near to land required for construction of the Proposed Scheme (within 10m buffer) and near to shaft site; and
- MA01-180 is 250m away from where Proposed Scheme is exiting tunnel and likely in cutting.

Table 8: Baseline CSM and qualitative risk assessment for former and current works, garages, coal wharf, depot and scrapyards grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination from former and current activities:	Existing site users -	Direct contact, ingestion, inhalation of dusts and	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
contaminants primarily comprising petroleum and diesel range hydrocarbons, pesticides. Potentially low levels of ground gas (methane and carbon dioxide)	Commercial/industrial site workers and visitors, and walkers	vapours from contaminated soils and waters			
		Inhalation of ground gases	Low likelihood	Medium	Moderate/low
	Adjacent site users - Residents, commercial industrial site workers and visitors, walkers, railway staff and school users	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 Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Controlled waters – surface water Gresty Brook and Basford Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
	Buildings/underground structures and services	Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- sites assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 6 for details of receptors relevant to groups of sites;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- adjacent visitors and school users are included in the future baseline for MA01-28;
- MA01-28 is located in proximity to Gresty Brook and Basford Brook, and their associated LWS (Mere Gutter with Basford Brook);
- Secondary A aquifer partially underlies MA01-141, and
- MA01-139 is mostly underlain by alluvium (Secondary A aquifer) and partially underlain by glacial till (Secondary (undifferentiated) aquifer), MA01-09 is underlain by glaciofluvial deposits (Secondary A aquifer), and MA01-28 and MA01-146 are both underlain by glacial till (Secondary (undifferentiated) aquifer).

Table 9: Baseline CSM and qualitative risk assessment for cemetery (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination from former and current activities contaminants primarily comprising metals, semi-metals, pathogens, potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Cemetery visitors and workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and commercial/industrial site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Minor	Very low
		Inhalation of ground gases	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Controlled waters - groundwater Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifers of the glacial till Secondary B aquifers of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Low likelihood	Minor	Low

Notes/assumptions:

- site assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 7 for details of receptors relevant to the site; and
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed.

Table 10: Baseline CSM and qualitative risk assessment for railway land (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
Residual contamination in made ground (e.g. ballast): PCB, metals, asbestos, PAH and chlorinated hydrocarbons);	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
potentially low levels of ground gas (methane, carbon dioxide and VOC)		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents, walkers, commercial/industrial site workers and visitors and railway staff	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 Secondary A aquifer of the alluvium and glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Controlled waters – surface water Gresty Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (existing)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
		Direct contact with contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at baseline phase
	Property receptors - buildings, foundations and services (existing and adjacent)	Exposure to ground gases/vapours	Unlikely	Minor	Very low

Notes/assumptions:

- sites assessed without construction of the Proposed Scheme;
- see BID document Section 2 Table 8 for details of receptors relevant to groups of sites;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- Gresty Brook intersects MA01-21 flowing underground beneath the site;
- Mere Gutter with Basford Brook LWS is assessed as an existing receptor on MA01-21;
- alluvium underlies MA01-21 and MA01-230;
- glaciofluvial deposits underlies MA01-234; and
- glacial till underlies MA01-21, MA01-230 and MA01-235.

3.3 Construction risk assessment

Table 11: Construction CSM and qualitative risk assessment for railway land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Residual contamination in made ground (e.g. ballast): PCB, metals, asbestos, PAH and chlorinated hydrocarbons); potentially low levels of ground gas (methane, carbon dioxide and VOC)	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and workers in commercial/industrial areas	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
		Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Ecological receptors – LWS at Spring Plantation Grassland and Mossbridge Marsh (adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Minor	Very low

Notes/assumptions:

- *site investigation will be required prior to construction of the Proposed Scheme;*
- *sites which lie within the land required for construction of the Proposed Scheme may require remediation;*
- *remediation will be restricted to mitigation of land quality effects arising from the Proposed 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 (Volume 5, Appendix CT-002-00000). Construction workers have been excluded from assessment due to the use of PPE/risk management protocols and in accordance with the SMR;*
- *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; and*
- *railway workers/staff and property receptors are assumed to remain present on-site during the construction phase.*

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Table 12: Construction CSM and qualitative risk assessment for works (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Contamination from ongoing activities residual contamination from current and former activities – hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Commercial/industrial workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A
	Adjacent site users - Railway staff and commercial/industrial 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	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- site investigation will be required prior to construction of the Proposed Scheme;
- sites which lie within the land required for construction of the Proposed Scheme may require remediation;
- sites located on the land required for the construction of the Proposed Scheme are assumed to be unoccupied during construction, therefore on-site construction risks to human health receptors are labelled as not applicable (N/A);

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- it is assumed that existing on-site properties will be demolished during the construction stage and so risks to them have not been assessed;
- remediation will be restricted to mitigation of land quality effects arising from the Proposed Scheme;
- existing site users and adjacent site users in the receptor column refer to users at or near to the potentially contaminated area;
- for groups of sites where different sensitivities of receptors have been identified, a risk range has been provided based on the least and most sensitive receptors;
- during construction, standard mitigation procedures are assumed to be implemented in accordance with the draft CoCP. Construction workers have been excluded from the 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 13: Construction CSM and qualitative risk assessment for farm (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Residual contamination from former and current activities: contaminants primarily comprising petroleum and diesel range hydrocarbons, pesticides and herbicides. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Residents, farm workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A
	Adjacent site users - Residents, walkers nearby 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 Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- site investigation will be required prior to construction of the Proposed Scheme;
- sites which lie within the land required for construction of the Proposed Scheme may require remediation;
- sites located on the land required for the construction of the Proposed Scheme are assumed to be unoccupied during construction, therefore on-site construction risks to human health receptors are labelled as not applicable (N/A);
- it is assumed that existing on-site properties will be demolished during the construction stage and so risks to them have not been assessed;
- remediation will be restricted to mitigation of land quality effects arising from the Proposed 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 14: Construction CSM and qualitative risk assessment for historical infilled land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Potential contamination from possible infilling activities. Composition of infill (if any) is unknown. Depending upon the source of the infill this could comprise inert materials or	Existing site users - walkers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
those that could include a range of organic and inorganic contaminants including: petroleum and diesel range hydrocarbons, PAH, metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide) if bio-degradable infill used.	Adjacent site users - Residents, 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 Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
		Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Unlikely	Minor
	Exposure to ground gases/vapours		Unlikely	Medium	Low

Notes/assumptions:

- site investigation will be required prior to construction of the Proposed Scheme;
- sites which lie within the land required for construction of the Proposed Scheme may require remediation;
- sites located on the land required for the construction of the Proposed Scheme are assumed to be unoccupied during construction, therefore on-site construction risks to human health receptors are labelled as not applicable (N/A);
- it is assumed that existing on-site properties will be demolished during the construction stage and so risks to them have not been assessed;
- remediation will be restricted to mitigation of land quality effects arising from the Proposed 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

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• 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 15: Construction CSM and qualitative risk assessment for tanks, likely for fuel storage, petrol filling stations and power stations grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase	
Residual contamination from former and current activities: contaminants primarily comprising petroleum and diesel range hydrocarbons, pesticides. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Commercial/industrial 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 and commercial industrial 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	Unlikely	Medium	Low	
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation		Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- site investigation may be required prior to construction of the Proposed 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.

Table 16: Construction CSM and qualitative risk assessment for former and current works, garages, coal wharf, depot and scrapyards grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Contamination from ongoing activities residual contamination from current and former activities – hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos. Potentially low levels of ground gas	Existing site users - Commercial/industrial site workers and visitors, and walkers	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, school users, commercial industrial	Direct contact, ingestion, inhalation of dusts and vapours from	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
(methane and carbon dioxide)	site workers, walkers, railway staff and school users	contaminated soils and waters			
		Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Controlled waters – surface water Gresty Brook and Basford Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations	Direct contact of fabric of buildings and services	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	and services (existing and adjacent)	(e.g. foundations, and water supply pipes).			
		Migration of hazardous vapours to confined spaces via permeable strata or conduits	Unlikely	Medium	Low

Notes/assumptions:

- site investigation may be required prior to construction of the Proposed Scheme;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- residential receptors and school users associated with future baseline for MA01-28 as a result of a planning allocation at Basford East (MA01/031);
- 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 17: Construction CSM and qualitative risk assessment for cemetery (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Residual contamination from former and current activities contaminants primarily comprising metals, semi-metals, pathogens, potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Cemetery visitors and workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and commercial/industri	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Minor	Very low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	al site workers and visitors	Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Low likelihood	Minor	Low

Notes/assumptions:

- site investigation may be required prior to construction of the Proposed 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

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• 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 18: Construction CSM and qualitative risk assessment for railway land (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
Residual contamination from former and current activities contaminants primarily comprising metals, semi-metals, pathogens, potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents, walkers, commercial/industrial site workers and visitors and railway staff	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 Secondary A aquifer of the alluvium and glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at construction phase
	Secondary B aquifer of the Sidmouth Mudstone Formation				
	Controlled waters – surface water Gresty Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (existing)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Minor	Very low

Notes/assumptions:

- site investigation may be required prior to construction of the Proposed 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.

3.4 Post-construction risk assessment

Table 19: Post-construction CSM and qualitative risk assessment for railway land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination in made ground (e.g. ballast): PCB, metals, asbestos, PAH and chlorinated hydrocarbons); potentially low levels of ground gas (methane, carbon dioxide and VOC)	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and workers in commercial/industrial areas	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 Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Ecological receptors - LWS at Spring Plantation Grassland and Mossbridge Marsh (adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Minor	Very low

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Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are left open;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed;
- excludes rail passengers (as whilst within trains, will at all routine times be within a controlled environment) and maintenance workers; but includes people at stations/depots or in areas returned to public land after construction; and
- the site comprises existing rail land that will remain operational, therefore railway workers/staff and property receptors are assumed to remain present on-site during the post-construction phase.

Table 20: Post-construction CSM and qualitative risk assessment for works (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Contamination from ongoing activities residual contamination from current and former activities – hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos	Existing site users - Commercial/industrial workers and visitors,	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A
	Adjacent site users - Railway staff, and commercial/industrial workers and visitors	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 Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Unlikely	Minor	Very low
		Direct contact with contaminated soils and waters	Unlikely	Minor	Very low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
	Property receptors - buildings, foundations and services (adjacent)	Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are left open;
- as human health receptors are no longer present at the post-construction stage the risks are labelled as not applicable (N/A);
- it is assumed that existing properties are no longer present on-site at the post-construction stage and so risks to them have not been assessed;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed; and
- excludes rail passengers (as whilst within trains, will at all routine times be within a controlled environment) and maintenance workers; but includes people at stations/depots or in areas returned to public land after construction.

Table 21: Post-construction CSM and qualitative risk assessment for farm (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination from former and current activities: contaminants primarily comprising petroleum and diesel range hydrocarbons, pesticides and herbicides. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Residents, farm workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A
	Adjacent site users - Residents, walkers nearby 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	Leaching, vertical and lateral migration from contaminated soils and waters	Unlikely	Negligible	Very low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
	Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation				
	Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Unlikely	Minor	Very low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are left open;
- as human health receptors are no longer present at the post-construction stage the risks are labelled as not applicable (N/A);
- it is assumed that existing properties are no longer present on-site at the post-construction stage and so risks to them have not been assessed;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed; and
- excludes rail passengers (as whilst within trains, will at all routine times be within a controlled environment) and maintenance workers; but includes people at stations/depots or in areas returned to public land after construction.

Table 22: Post-construction CSM and qualitative risk assessment for historical infilled land (on-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Potential contamination from possible infilling activities. Composition of infill (if any) is unknown. Depending upon the source of the infill this could comprise inert materials or those that could include a range of organic and inorganic contaminants including: petroleum and diesel range	Existing site users - walkers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	N/A	N/A	N/A
		Inhalation of ground gases	N/A	N/A	N/A
	Adjacent site users - Residents, walkers and farm workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
hydrocarbons, PAH, metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide) if bio-degradable infill used.		Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Unlikely	Minor	Very low
		Property receptors - buildings, foundations and services (adjacent)	Direct contact with contaminated soils and waters	Unlikely	Minor
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are left open;
- as human health receptors are no longer present at the post-construction stage the risks are labelled as not applicable (N/A);
- it is assumed that existing properties are no longer present on-site at the post-construction stage and so risks to them have not been assessed;
- existing site users and adjacent site users in the receptor column refer to users at or near to the areas assessed; and
- excludes rail passengers (as whilst within trains, will at all routine times be within a controlled environment) and maintenance workers; but includes people at stations/depots or in areas returned to public land after construction.

Table 23: Post-construction CSM and qualitative risk assessment for tanks, likely for fuel storage, petrol filling stations and power stations grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination from former and current activities: contaminants primarily comprising petroleum and diesel	Existing site users - Commercial/industrial site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
range hydrocarbons, pesticides. Potentially low levels of ground gas (methane and carbon dioxide)		Inhalation of ground gases	Low likelihood	Medium	Moderate/low
	Adjacent site users - Residents and commercial industrial 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	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are open;
- 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.

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Table 24: Post-construction CSM and qualitative risk assessment for former and current works, garages, coal wharf, depot and scrapyards grouped for assessment (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Contamination from ongoing activities residual contamination from current and former activities – hydrocarbons including waste oils, phenols, PCB, chlorinated hydrocarbons, heavy metals, semi-metals and asbestos. Potentially low levels of ground gas (methane and carbon dioxide)	Existing site users - Commercial/industrial site workers and visitors, and walkers	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, school users, commercial industrial site workers, walkers, railway staff and school users	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 Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
	Controlled waters – surface water Gresty Brook and Basford Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (adjacent)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations and services (existing and adjacent) Buildings/underground structures and services	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Medium	Low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are open;
- 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.

Table 25: Post-construction CSM and qualitative risk assessment for cemetery (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination from former and current activities contaminants primarily	Existing site users - Cemetery visitors and workers	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Medium	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
comprising metals, semi-metals, pathogens, potentially low levels of ground gas (methane and carbon dioxide)		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents and commercial/industrial site workers and visitors	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Unlikely	Minor	Very low
		Inhalation of ground gases	Unlikely	Medium	Low
	Controlled waters - groundwater Secondary A aquifers of the alluvium and the glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till Secondary B aquifer of the Sidmouth Mudstone Formation	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Low likelihood	Minor	Low

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Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are open;
- 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.

Table 26: Post-construction CSM and qualitative risk assessment for railway land (off-site)

Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
Residual contamination in made ground (e.g. ballast): PCB, metals, asbestos, PAH and chlorinated hydrocarbons); potentially low levels of ground gas (methane, carbon dioxide and VOC)	Existing site users - Railway staff	Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters	Low likelihood	Medium	Moderate/low
		Inhalation of ground gases	Unlikely	Medium	Low
	Adjacent site users - Residents, walkers, commercial/industrial site workers and visitors and railway staff	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 Secondary A aquifer of the alluvium and glaciofluvial deposits	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Medium	Moderate/low
	Controlled waters - groundwater Secondary Undifferentiated aquifer of the glacial till	Leaching, vertical and lateral migration from contaminated soils and waters	Low likelihood	Minor	Low

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Source	Receptor	Pathway	Probability	Consequence	Risk at post-construction phase
	Secondary B aquifer of the Sidmouth Mudstone Formation				
	Controlled waters – surface water Gresty Brook	Lateral migration through groundwater Direct runoff from site	Low likelihood	Minor	Low
	Ecological receptors – LWS at Mere Gutter with Basford Brook (existing)	Vertical and lateral migration, direct contact	Unlikely	Minor	Very low
	Property receptors - buildings, foundations and services (existing and adjacent)	Direct contact with contaminated soils and waters	Low likelihood	Minor	Low
		Exposure to ground gases/vapours	Unlikely	Minor	Very low

Notes/assumptions:

- assumes construction works are complete and remediation has been carried out where necessary. No pathways are open;
- 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.

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

3.5.1 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.

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Table 27: Railway land (on-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Exposure of existing site users through inhalation of ground gases	Low	Low	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 adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Low	Neutral effect	Neutral effect
Exposure of ecological sites through vertical or lateral migration, or direct contact (Spring Plantation Grassland and Mossbridge Marsh)	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of property via direct contact to 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 property and underground structures/services to explosive gases	Very low	Very low	Very low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect

Notes/assumptions:

• 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area.

Table 28: Works (on-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	N/A	N/A	N/A	N/A
Exposure of existing site users through inhalation of ground gases	Moderate/low	N/A	N/A	N/A	N/A
Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters impacting adjacent site users	Moderate/low	Moderate/low	Low	Neutral effect	Minor beneficial
Exposure of adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to	Low	Low	Very low	Neutral effect	Minor beneficial

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Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
groundwater (Secondary Undifferentiated and Secondary B aquifers)					
Exposure of property via direct contact to contaminated soils and waters	Low	Low	Very low	Neutral effect	Minor beneficial
Exposure of property and underground structures/services to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral to minor beneficial effect

Notes/assumptions:

- 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area;
- as human health receptors are no longer present during the construction and post-construction stages the risks are labelled as not applicable (N/A); and
- it is assumed that existing on-site properties are demolished during the construction and post-construction stages and so risks to them have not been assessed.

Table 29: Farm (on-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	N/A	N/A	N/A	N/A
Exposure of existing site users through inhalation of ground gases	Moderate/low	N/A	N/A	N/A	N/A

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Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
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 adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Very low	Neutral effect	Minor beneficial
Exposure of property via direct contact to contaminated soils and waters	Low	Low	Very low	Neutral effect	Minor beneficial
Exposure of property and underground structures/services to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral to minor beneficial effect

Notes/assumptions:

- 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area;
- as human health receptors are no longer present during the construction and post-construction stages the risks are labelled as not applicable (N/A); and
- it is assumed that existing on-site properties are demolished during the construction and post-construction stages and so risks to them have not been assessed.

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Table 30: Historical infilled land (on-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	N/A	N/A	N/A	N/A
Exposure of existing site users through inhalation of ground gases	Low	N/A	N/A	N/A	N/A
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 adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Very low	Neutral effect	Minor beneficial
Exposure of property via direct contact to contaminated soils and waters	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of property and underground structures/services to explosive gases	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
Overall significance				Neutral effect	Neutral to minor beneficial effect

Notes/assumptions:

- 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area;
- as human health receptors are no longer present during the construction and post-construction stages the risks are labelled as not applicable (N/A); and
- it is assumed that existing on-site properties are demolished during the construction and post-construction stages and so risks to them have not been assessed.

Table 31: Tanks, likely for fuel storage, petrol filling stations and power stations grouped for assessment (off-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	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
Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and waters impacting adjacent site users	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Exposure of adjacent off-site land users through inhalation of ground gases	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
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property via direct contact to contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property and underground structures/services to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect

Notes/assumptions:

• 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area.

Table 32: Former and current works, garages, coal wharf, depot and scrapyards (off-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	Moderate/low	Moderate/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 existing site users through inhalation of ground gases	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 adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary A aquifers)	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination and/or direct runoff from site to surface waters (Gresty Brook and Basford Brook)	Low	Low	Low	Neutral effect	Neutral effect
Exposure of ecological sites through vertical or lateral migration, or direct contact (Mere Gutter with Basford Brook)	Very low	Very low	Very 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 property via direct contact to contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property and underground structures/services to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect

Notes/assumptions:

• 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area.

Table 33: Cemetery (off-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Low	Low	Low	Neutral effect	Neutral effect
Exposure of existing site users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and	Very low	Very low	Very low	Neutral effect	Neutral effect

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Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
waters impacting adjacent site users					
Exposure of adjacent off-site users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary A aquifers)	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property via direct contact to contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property and underground structures/services to explosive gases	Low	Low	Low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect

Notes/assumptions:

- 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area.

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Table 34: Railway land (off-site) - significance of effect assessment

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Exposure of existing site users to contamination through direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and dusts	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Exposure of existing site users through inhalation of ground gases	Low	Low	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 adjacent off-site land users through inhalation of ground gases	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary A aquifers)	Moderate/low	Moderate/low	Moderate/low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination to groundwater (Secondary Undifferentiated and Secondary B aquifers)	Low	Low	Low	Neutral effect	Neutral effect
Lateral and vertical migration of mobile contamination and/or direct runoff from site to surface waters (Gresty Brook)	Low	Low	Low	Neutral effect	Neutral effect
Exposure of ecological sites through vertical or lateral migration, or direct contact (Mere Gutter with Basford Brook)	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of property via direct contact to contaminated soils and waters	Low	Low	Low	Neutral effect	Neutral effect
Exposure of property and underground structures/services to explosive gases	Very low	Very low	Very low	Neutral effect	Neutral effect
Overall significance				Neutral effect	Neutral effect

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Notes/assumptions:

- 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. Mitigation measures over and above the draft CoCP are detailed in the Volume 2 report for this study area.*

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