

The Great Grid Upgrade

Chesterfield to Willington

Preliminary Environmental Information Report

Volume 1: Chapter 10 Geology and Hydrogeology

March 2026

nationalgrid

Contents

10.	Geology and Hydrogeology	10-1
10.1	Overview	10-1
10.2	Legislation, and Planning Policy and Guidance Context	10-3
	Legislation	10-3
	National Planning Policy	10-4
	Other National Policy	10-10
	Regional and Local Policy	10-10
	Guidance	10-10
10.3	Scoping Opinion and Consultation	10-11
	Scoping Opinion and Stakeholder Engagement	10-11
10.4	Assessment Methodology	10-21
	Technical Guidance	10-21
	Preliminary Assessment Assumptions and Limitations	10-28
	Further Assessment within the ES	10-28
10.5	Baseline Conditions	10-28
	Study Area	10-28
	Data Collection	10-29
	Further Data to be Collected to Inform the ES	10-30
	Existing Baseline Conditions	10-30
	Future Baseline	10-54
10.6	Design Embedded and Good Practice Mitigation Measures	10-55
	Design Embedded Mitigation Measures	10-55
	Good Practice Mitigation Measures	10-55
10.7	Preliminary Assessment of Effects	10-56
	Likely Significant Effects	10-56
10.8	Potential Additional Mitigation Measures	10-61
	Construction	10-61
	Operation	10-63
10.9	Monitoring	10-63
10.10	Residual Effects	10-63
10.11	Summary	10-63

Table 10.1: NPSs relevant to geology and hydrogeology	10-5
Table 10.2: Summary of Planning Inspectorate’s Scoping Opinion comments in relation to geology and hydrogeology	10-11
Table 10.3: Summary of stakeholder Scoping Opinion responses in relation to geology and hydrogeology	10-14
Table 10.4: Summary of stakeholder engagement in relation to geology and hydrogeology	10-16
Table 10.5: Summary of Stage 1 (non-statutory) consultation in relation to geology and hydrogeology	10-18
Table 10.6: Criteria for determining sensitivity of geology and hydrogeology	10-22
Table 10.7: Criteria for determining magnitude of impact on geology and hydrogeology	10-24

Table 10.8: Summary of artificial ground within geology Study Area and hydrogeology Study Area	10-31
Table 10.9: Geological units and aquifers within the geology Study Area and hydrogeology Study Area	10-32
Table 10.10: Regionally important geological sites within or within 250 m of the draft Order Limits	10-41
Table 10.11: Local authorities' responses to data request	10-46
Table 10.12: Section 5 – groundwater abstractions identified within the 500 m hydrogeology Study Area	10-48
Table 10.13: Section 6 – groundwater abstractions identified within the 500 m hydrogeology Study Area	10-48
Table 10.14: Groundwater flood risk within the 500 m hydrogeology Study Area	10-52
Table 10.15: Springs identified within the 500 m hydrogeology Study Area	10-53
Table 10.16: GWDTE identified within and close to the 500 m hydrogeology Study Area	10-54
Table 10.17: Summary of residual effects for geology and hydrogeology	10-64

References	10-66
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10. Geology and Hydrogeology

10.1 Overview

10.1.1 This chapter reports the preliminary assessment of the likely significant geology and hydrogeology effects that could result from the Chesterfield to Willington Project (the 'Project') during construction and operation and describes:

- relevant legislation and planning policy context;
- consultation and engagement undertaken to date;
- the methodology for assessment;
- relevant baseline information;
- potential effects of the construction phase;
- potential effects of the operational phase;
- potential additional mitigation measures; and
- residual effects.

10.1.2 This chapter covers effects on the following receptors in relation to geology and hydrogeology during construction and operation. An assessment of potential effects associated with contaminated land is also included within geology and hydrogeology:

- geology:
 - mineral resources; and
 - geological features.
- hydrogeology:
 - Principal and Secondary Aquifers;
 - springs;
 - groundwater abstractions; and
 - Groundwater Dependent Terrestrial Ecosystems (GWDTE).
- contaminated land:
 - controlled waters (surface water and groundwater); and
 - human health (construction workers and future site users).

10.1.3 The draft Order Limits are presented on **Figure 1.1 Proposed Project Location and Route** in **Volume 2**.

- 10.1.4 This chapter should be read in conjunction with the following chapters:
- **Chapter 7 Ecology and Biodiversity.** This chapter includes elements which relate to ecology and biodiversity.
 - **Chapter 8 Historic Environment.** This chapter includes elements which relate to geology and hydrogeology and covers buried archaeology.
 - **Chapter 9 Hydrology and Land Drainage.** This chapter includes elements which relate to land drainage.
 - **Chapter 11 Agriculture and Soils.** This chapter includes elements relating to changes in agricultural land use, practices and soil types.
 - **Chapter 13 Air Quality.** This chapter includes elements relating to dust and particulate matter mobilisation.
 - **Chapter 16 Health and Wellbeing.** This chapter includes elements relating to human health and contamination.
 - **Chapter 17 Cumulative Effects.** This chapter includes both intra and inter cumulative effect interactions, including those related to geology and hydrogeology, as well as interactions with other topics areas and other committed schemes.
- 10.1.5 This chapter is supported by the following figures in **Volume 2** and appendices in **Volume 3**. These include:
- **Figure 10.1 Artificial Ground;**
 - **Figure 10.2 Superficial Geology;**
 - **Figure 10.3 Bedrock Geology;**
 - **Figure 10.4 Mineral Resources;**
 - **Figure 10.5 Coal Mining Features;**
 - **Figure 10.6 Unexploded Ordnance (UXO);**
 - **Figure 10.7 Potential Contaminative Land Uses;**
 - **Figure 10.8 Landfill Sites;**
 - **Figure 10.9 Source Protection Zones & Groundwater Abstraction Licence Points;**
 - **Figure 10.10 Groundwater Vulnerability;**
 - **Figure 10.11 Groundwater Dependent Terrestrial Ecosystems;** and
 - **Appendix 10A Geo-Environmental Preliminary Risk Assessment.**

10.2 Legislation, and Planning Policy and Guidance Context

Legislation

10.2.1 A summary of the key legislation considered in the scope of effects on geology and hydrogeology is outlined below:

- Environmental Protection Act 1990 (Ref 10.1) and associated statutory guidance on contaminated land (Contaminated Land Statutory Guidance, 2012) (Ref 10.2). This regulatory regime relates to historical land contamination. Part 2A of the Environmental Protection Act 1990 describes a regulatory role for local authorities in dealing with contaminated land.
- Environment Act 1995 (Ref 10.3). This Act creates a system whereby the local authority must identify and if necessary, arrange for the remediation of contaminated areas. The provisions are set out in section 57, which inserts Part 2A into the Environmental Protection Act 1990. In addition to these requirements, the operation of the regime is subject to regulation and statutory guidance. Contaminated land related risks associated with the Project are addressed in accordance with this legislation.
- The Contaminated Land (England) (Amendment) Regulations 2012 (Ref 10.4). Regulation 2 of these Regulations amends the Contaminated Land (England) Regulations 2006, including to amend the circumstances in which '*contaminated land*' affecting controlled waters is required to be designated as a special site and takes into account the updated definition of controlled waters. The 2006 Regulations set out the responsibilities of the local authority and the Environment Agency in the identification and management of contaminated land. Contaminated land assessment works associated with the Project are to be conducted in accordance with these Regulations.
- The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 10.5). These Regulations aim to prevent serious environmental effects or ensure that remediation is carried out if required. The duty to prevent or remediate falls on operators of activities. The Regulations specifically define three types of environmental damage: biodiversity damage – to European Union protected species and habitats, and Sites of Special Scientific Interest (SSSIs); water damage; and land damage.
- The Environmental Permitting (England and Wales) Regulations 2016 (Ref 10.6). These Regulations relate to the regulation of discharges to controlled waters. The Regulations transposed the Groundwater Directive 1980, the Water Framework Directive (WFD) and Groundwater Daughter Directive 2006 into UK law.
- Water Resources Act 1991 (Ref 10.7). Legislation concerned with the pollution of controlled waters, both surface water and groundwater.
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 10.8). Legislation that seeks to establish an integrated approach to the protection and sustainable use of the water environment.
- The Water Supply (Water Quality) Regulations 2016 (Ref 10.9). The Regulations establish safe water quality standards for water supplies within the UK.

- Planning Act 2008 (Ref 10.10). The Planning Act 2008 provides a separate consenting route for Nationally Significant Infrastructure Projects (NSIPs). Under the Planning Act 2008, NSIPs require development consent from the Secretary of State (SoS), rather than planning permission from the local planning authority.
- Health and Safety at Work etc. Act 1974 (Ref 10.11). The Health and Safety at Work etc. Act 1974 outlines the general duties of employers, employees and others to ensure a safe working environment.
- The Confined Spaces Regulations 1997 (Ref 10.12). The Regulations provide a definition of a confined space and outline the duties of employers to ensure that working in confined spaces is undertaken under specific risk assessments and method statements.

National Planning Policy

National Policy Statements

10.2.2 **Chapter 2 Legislative, Regulatory and Planning Policy Context** of this Preliminary Environmental Information Report (PEIR) sets out the overarching policy relevant to the Project including the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref 10.13) and the NPS for Electricity Networks Infrastructure (NPS EN-5) (Ref 10.14). **Table 10.1** sets out the requirements of both NPSs relevant to geology and hydrogeology and how these have been considered within this chapter.¹

¹ The updated NPSs came into force on 6 January 2026; however, this post-dated the drafting and assessment work within this chapter and so are not reflected within the relevant policy descriptions in this chapter, which are instead based on the 2023 versions of the NPSs that were in force at the time of preparing the Chapter. These sections will be updated in the ES as part of the Application; however, after initial review and consideration, it is not anticipated that the updates to the NPS will result in any material changes to the assessment methodology or the conclusions in this chapter.

Table 10.1: NPSs relevant to geology and hydrogeology

Policy Reference	Policy Context	How It Will Be Considered
Overarching National Policy Statement for Energy (EN-1) (Ref 10.13)		
Paragraph 5.4.17 (part)	<i>‘Where the development is subject to EIA [Environmental Impact Assessment], the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance...’</i>	Sites designated for their geological conservation importance have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed.
Paragraph 5.4.19	<i>‘The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.’</i>	Sites designated for their geological conservation importance have been identified when establishing the baseline conditions. A preliminary assessment of the likely effects has been completed alongside the identification of any potential opportunities to enhance biodiversity and geological conservation interests.
Paragraph 5.4.38	<i>‘To further minimise any adverse impacts on geodiversity, where appropriate applicants are encouraged to produce and implement a Geodiversity Management Strategy to preserve and enhance access to geological interest features, as part of relevant development proposals.’</i>	Sites designated for their geological conservation importance have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed. The Regionally Important Geological Sites (RIGS) which have been identified will be considered further in the Environmental Statement (ES) and considered as the Project design evolves. The location of the RIGS within the draft Order Limits will be considered in the Foundation Works Risk Assessment which is to be completed once the foundation solution for the individual pylons is known.
Paragraph 5.4.42	<i>‘As a general principle, and subject to the specific policies below, development should, in line with the mitigation hierarchy, aim to avoid significant</i>	Sites designated for their geological conservation importance have been identified when establishing the baseline conditions and a preliminary assessment of the

Policy Reference	Policy Context	How It Will Be Considered
	<p><i>harm to biodiversity and geological conservation interests, including through consideration of reasonable alternatives (as set out in section 4.3 above). Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought.'</i></p>	<p>likely effects has been completed. The mitigation hierarchy has been followed and where reasonably practicable the proposed route alignment has been sited to avoid geologically sensitive sites. The preliminary assessment of effects in section 10.7 has identified a not significant effect at the one pylon location located within a RIGS, which will be assessed further in the ES.</p>
<p>Paragraph 5.11.8</p>	<p><i>'The ES (see section 4.3) should identify existing and proposed land uses near the project, any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing. Applicants should also assess any effects of precluding a new development or use proposed in the development plan. The assessment should be proportionate to the scale of the preferred scheme and its likely impacts on such receptors. For developments on previously developed land, the applicant should ensure that they have considered the risk posed by land contamination and how it is proposed to address this.'</i></p>	<p>In establishing the baseline conditions, areas of previously developed land within the draft Order Limits have been identified and their potential to present a potential source of contamination have been assessed. A preliminary assessment of the likely effects in relation to land contamination has been completed. A preliminary geo-environmental risk assessment to include baseline conditions is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment. The significance of effects posed by land contamination will be assessed further in the ES.</p>
<p>Paragraph 5.11.17</p>	<p><i>'Applicants should ensure that a site is suitable for its proposed use, taking account of ground conditions and any risks arising from land instability and contamination.'</i></p>	<p>A ground investigation will be carried out pre-construction to obtain further information in relation to ground conditions to inform design and suitability of ground conditions/land stability risks prior to construction. Potential sources of contamination have been identified when establishing the baseline conditions, and a preliminary geo-environmental risk assessment to include baseline conditions is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment.</p>

Policy Reference	Policy Context	How It Will Be Considered
Paragraph 5.11.18	<i>'For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination, and where contamination is present, applicants should consider opportunities for remediation where possible. It is important to do this as early as possible as part of engagement with the relevant bodies before the official pre-application stage.'</i>	Potential sources of contamination have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed. A preliminary geo-environmental risk assessment to include baseline conditions is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment . Initial engagement with the Environment Agency has been undertaken, and is summarised in Table 10.4 , the Environment Agency response is provided in Annex A10.8 of Appendix 10A Geo-Environmental Preliminary Risk Assessment . Initial engagement with the local planning authorities with respect to private water supplies has also been undertaken and the responses provided in Annex A10.8 of Appendix 10A Geo-Environmental Preliminary Risk Assessment , further engagement with the local planning authorities will be completed as the Project progresses.
Paragraph 5.11.19	<i>'Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place.'</i>	Mineral resources have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed.
Paragraph 5.11.28	<i>'Where a proposed development has an impact upon a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.'</i>	Mineral resources have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed in section 10.7 below.
Paragraph 5.16.7 (part)	<ul style="list-style-type: none"> • <i>'The ES should in particular describe...</i> • <i>existing physical characteristics of the water environment (including quantity and dynamics</i> 	Surface water bodies and groundwater Source Protection Zones (SPZs) crossed by the Study Area have been identified when establishing the baseline conditions and a

Policy Reference	Policy Context	How It Will Be Considered
	<p><i>of flow) affected by the proposed project and any impact of physical modifications to these characteristics</i></p> <ul style="list-style-type: none"> <i>any impacts of the proposed project on water bodies and source protection zones (SPZs) around potable groundwater abstractions.'</i> 	<p>preliminary assessment of the likely effects has been completed. A preliminary geo-environmental risk assessment to include baseline conditions is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment.</p>
<p>National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref 10.14)</p>		
<p>Paragraph 2.2.10 (part)</p>	<p><i>'... applicants must take into account Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to "have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and ...do what [they] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects."</i></p>	<p>The mitigation hierarchy has been followed and where reasonably practicable, the proposed route alignment has been sited to avoid conservation areas, including sites of geological importance. Geological receptors have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed.</p> <p>A preliminary geo-environmental risk assessment to include baseline conditions is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment.</p>
<p>Paragraph 2.9.25 (part)</p>	<p><i>'In such cases the Secretary of State should only grant development consent for underground or subsea sections of a proposed line over an overhead alternative if they are satisfied that the benefits accruing from the former proposal clearly outweigh any extra economic, social, or environmental impacts that it presents, the mitigation hierarchy has been followed, and that</i></p>	<p>The Project is currently proposed to predominantly comprise overhead lines with limited sections of underground cables only where considered essential (such as some diversionary works of existing infrastructure). In addition, the undergrounding of cables will be kept to a minimum, with clear rationality for their need provided in Chapter 3 Main Alternatives Considered. Geological receptors which may be</p>

Policy Reference	Policy Context	How It Will Be Considered
	<p><i>any technical obstacles associated with it are surmountable. In this context it should consider: [...]</i></p> <p><i>the potentially very disruptive effects of undergrounding on local communities, habitats, archaeological and heritage assets, marine environments, soil (including peat soils), hydrology, geology, and, for a substantial time after construction, landscape and visual amenity. (Undergrounding an overhead line will mean digging a trench along the length of the route, and so such works will often be disruptive – albeit temporarily – to the receptors listed above than would an overhead line of equivalent rating);’</i></p>	<p>impacted have been identified when establishing the baseline conditions and a preliminary assessment of the likely effects has been completed.</p>

Other National Policy

10.2.3 A summary of other relevant national policy considered in the scope of effects on geology and hydrogeology includes:

- National Planning Policy Framework (NPPF) (Ref 10.15). The NPPF seeks to contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, geological conservation interests and soils. In addition, geology and geomorphological features which are considered to be of national importance are designated as SSSIs and have some level of legal protection.

Regional and Local Policy

10.2.4 **Chapter 2 Legislative, Regulatory and Planning Policy Context** sets out relevant regional and local policy considered by this Project.

10.2.5 Relevant local policy specific to geology and hydrogeology includes:

- Derby and Derbyshire Minerals Local Plan (amended 2002), adopted in 2000 (Ref 10.16);
- Derbyshire and Derby Minerals Local Plan (2022-2038), Pre-submission Draft Plan and Policies Maps, January 2023 (Ref 10.17);
- South Derbyshire District Council, Adopted Local Plan Part 1 and 2 2017 (Ref 10.18 and Ref 10.19);
- Erewash Core Strategy 2014 (Ref 10.20);
- Adopted North East Derbyshire Local Plan 2014-2034 (Ref 10.21);
- Local Plan for Bolsover District 2020 (Ref 10.22);
- Chesterfield Borough Local Plan July 2020 (Ref 10.23);
- Amber Valley Borough Emerging Local Plan (Ref 10.24); and
- East Midlands Vision for Growth (Ref 10.25).

Guidance

10.2.6 Relevant guidance, specific to geology and hydrogeology, that has informed this PEIR and will inform the assessment within the ES, includes:

- Land Contamination: Risk Management (LCRM) (Ref 10.26);
- The Environment Agency's Approach to Groundwater Protection, Version 1.2 (Ref 10.27);
- BS10175:2001+A2:2017 Investigation of Potentially Contaminated Sites. Code of Practice (Ref 10.28);
- BS5930:2015+A1:2020 Code of Practice for Ground Investigations (Ref 10.29);
- BS EN 1997-1:2004+A1:2013 (Eurocode 7). Geotechnical Design – General Rules (Ref 10.30);

- Chartered Industry Research and Information (CIRIA) 552 Contaminated Land Risk Assessment, A guide to good practice (Ref 10.31);
- CIRIA C811 Environmental good practice on site guide (fifth edition) (Ref 10.32);
- CIRIA C532 Control of Water Pollution from Construction Sites (Ref 10.33);
- Design Manual for Roads and Bridges (DMRB) LA 109 Geology and Soils (Ref 10.34);
- DMRB LA 113: Road Drainage and the Water Environment (Ref 10.35);
- Institute of Environmental Management and Assessment (IEMA), guide to: Materials and Waste in Environmental Impact Assessment. Guidance for a proportionate approach (Ref 10.36). Note: IEMA now rebranded as Institute of Sustainability and Environmental Professionals (ISEP) as of July 2025;
- IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment (Ref 10.37);
- Environment Agency Guidance: Protect groundwater and prevent groundwater pollution (Ref 10.38); and
- Control of Asbestos Regulations (2012) (CAR 2012). Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials (Ref 10.39).

10.3 Scoping Opinion and Consultation

Scoping Opinion and Stakeholder Engagement

- 10.3.1 A Scoping Report (Ref 10.40) was prepared and submitted by National Grid to the Planning Inspectorate in October 2024. The Planning Inspectorate provided a Scoping Opinion (Ref 10.41) on behalf of the SoS for Energy Security and Net Zero in December 2024. The responses from the Planning Inspectorate in relation to geology and hydrogeology and how these requirements will be addressed by the applicant are set out in **Table 10.2**.

Table 10.2: Summary of Planning Inspectorate’s Scoping Opinion comments in relation to geology and hydrogeology

ID	Planning Inspectorate’s Comments	National Grid's Response
3.5.1	<p>Geohazards and land instability – Construction and operation (including maintenance): <i>The Scoping Report states that the Proposed Development would be designed with due consideration of site-specific ground conditions, potential ground instability and geohazard risks.</i></p> <p><i>The Inspectorate agrees that the construction, operation and maintenance of the Proposed Development would not be adversely affected by geohazards and land instability and that this matter can be scoped out of the ES.'</i></p>	Noted and agreed to scope out the assessment of geohazards and land instability during construction and operation.

ID	Planning Inspectorate's Comments	National Grid's Response
3.5.2	<p>Degradation of geological resources and sites of geological importance – Construction and operation (including maintenance): <i>‘Subject to confirmation within the ES of the absence of sites of geological importance in the Study Area, the Inspectorate agrees that geological conservation sites can be scoped out of the ES.</i></p> <p><i>Should sites be identified, an assessment of potential impacts should be presented, where significant effects are likely.’</i></p>	<p>In completion of the Preliminary Risk Assessment (PRA) (Appendix 10A Geo-Environmental Preliminary Risk Assessment) three RIGS have been identified within the Study Area.</p> <p>Further assessment of RIGS will be included within the ES.</p>
3.5.3	<p>Changes to groundwater quality – Operation (including maintenance): <i>‘The Scoping Report states that works carried out during the operational phase, including maintenance, are not anticipated to result in any changes to groundwater quality through new flow paths.</i></p> <p><i>The Inspectorate agrees that significant effects are not likely and that this matter can be scoped out of the ES.’</i></p>	<p>Noted and agreed to scope out of the assessment changes to groundwater quality during operation.</p>
3.5.4	<p>Introduction of new contamination – Construction and operation (including maintenance): <i>‘Good practice controls would be set out within the CoCP to manage the storage and handling of construction materials, excavated soils and wastes whilst protocols would be established to manage accidental spillages and emergencies.</i></p> <p><i>Subject to these measures, the Inspectorate agrees that significant effects are not likely and that this matter can be scoped out of the ES.’</i></p>	<p>Noted and agreed to scope out of the assessment the introduction of new contamination during construction and operation.</p> <p>Execution of the Project will be completed in accordance with best practice. A draft outline Code of Construction Practice (CoCP) is included as Appendix 4A Draft Outline Code of Construction Practice of the PEIR. The draft outline CoCP includes the requirement for measures to manage the storage of construction materials including fuels, oils and chemicals, the requirement for emergency spill procedures to be in place, the management of excavated materials and waste and protocols for the event of unexpected contamination being encountered.</p>

ID	Planning Inspectorate's Comments	National Grid's Response
3.5.5	<p>Disturbance and mobilisation of existing contamination – Operation (including maintenance): <i>'Subject to the appropriate management of any identified contamination as part of the construction phase, the Inspectorate agrees that significant effects during the operation (and maintenance) phase are not likely and that this matter can be scoped out of the ES.'</i></p>	<p>Noted and agreed to scope the disturbance and mobilisation of existing contamination during operation out of the assessment. Appendix 4A Draft Outline Code of Construction Practice outlines the measures to be employed to manage identified contamination as part of the construction phase.</p>
3.5.6	<p>Discovery and disturbance of unforeseen contamination – Construction: <i>'The Scoping Report confirms that a watching brief protocol would be specified for earthwork activities to observe for any unforeseen contamination and that suspected contaminated material would be handled and stored separately from other materials. Subject to these measures, the Inspectorate agrees that significant effects are not likely and that this matter can be scoped out of the ES.'</i></p>	<p>Noted and agreed to scope the discovery and disturbance of unforeseen contamination during construction out of the assessment. The requirement for the establishment of a protocol in the event of any unexpected contamination being discovered during the construction phase is included in Appendix 4A Draft Outline Code of Construction Practice.</p>
3.5.7	<p>Significance of effect: <i>'Paragraph 10.8.5 states that significance would be derived using the matrix set out in Chapter 5. However, the magnitude criterion used in Table 10.5 do not accord with those presented in Table 5.3. The Applicant should ensure consistency in its approach or provide clear explanations where aspect specific approaches depart from the overarching methodology.'</i></p>	<p>Noted and agreed that the magnitude criterion was not consistent between chapters in the Scoping Report. An explanation of the magnitude criterion specific to the assessment of geology and hydrogeology is provided in Table 10.7 of this chapter.</p>
3.5.8	<p>Land contamination Preliminary Risk Assessment (PRA): <i>'The Inspectorate concurs with the Environment Agency's advice to produce a contaminated land PRA.'</i></p>	<p>Appendix 10A Geo-Environmental Preliminary Risk Assessment presents a Geo-Environmental PRA for the Project.</p>

10.3.2 **Table 10.3** provides a summary of the consultation feedback from specific stakeholders provided as part of the Scoping Opinion to inform the geology and hydrogeology assessment to date.

Table 10.3: Summary of stakeholder Scoping Opinion responses in relation to geology and hydrogeology

Consultee	Summary of Key Topics Raised	Response
Canal and River Trust	The Canal and River Trust advised that ‘...depending on the proximity to the Trent & Mersey Canal, consideration of the potential for construction operations to affect the stability and structural integrity of the canal, this should be a consideration in the identification and assessment of land stability risks in the ES’.	The hierarchal approach of avoid wherever practicable will be applied during design and construction operations will be sited as far as reasonably practicable from Canal and River Trust assets. The potential for construction operations to affect the stability and structural integrity of the canal will be addressed within the design.
Canal and River Trust	It was acknowledged that significant effects from the mobilisation of existing contamination are to be further assessed, and it was requested that measures to address the risk of adversely affecting the water quality in the Trent and Mersey Canal are considered and incorporated into a Construction Environmental Management Plan.	An intrusive ground investigation will be completed to include assessment of potential contamination sources and the potential for contaminant mobilisation during construction. Appendix 4A Draft Outline Code of Construction Practice has been prepared for the Project.
Environment Agency	The Environment Agency requested that the effects of deep foundations associated with construction of the substation on the groundwater regime are scoped in for further assessment.	Once foundation solutions are known, Foundation Works Risk Assessments would be undertaken in accordance with CL:AIRE guidance Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination (Ref 10.42) to further assess the effects on the groundwater regime.
Environment Agency	A land contamination PRA is requested to include a conceptual site model and detailed review of historical mapping.	A PRA for the Project has been completed and is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment . The PRA includes a detailed review of historical mapping.
Environment Agency	It is noted that the geology along the route is highly variable with locations within a Principal bedrock aquifer with no superficial deposits. It is noted that groundwater flooding can occur in both the superficial and bedrock aquifers. It is recommended that groundwater levels are monitored during the proposed intrusive site investigation works.	The intrusive ground investigation will be completed ahead of the construction phase. A programme of groundwater level monitoring will be included within the scope of works.

Consultee	Summary of Key Topics Raised	Response
Environment Agency	It is noted that the watching brief protocol should extend to all intrusive works, including piling and that all groundworkers should have basic training in the identification of contamination.	It is noted in the CoCP, Appendix 4A Draft Outline Code of Construction Practice in Volume 3 , that all staff and operatives working on the Project will undergo briefings to increase their awareness of environmental issues as applicable to their role on the Project. These briefings, where relevant, will include the recognition of and protocols for dealing with contaminated material.
Environment Agency	It is noted that further research is required into the presence of historical landfill sites within the draft Order Limits.	A PRA for the Project has been completed and is presented as Appendix 10A Geo-Environmental Preliminary Risk Assessment . Further detail in relation to the presence of historical landfill sites is included within the PRA.
Environment Agency	Advice is provided on the characterisation of contaminated materials and the requirement for wastes to be handled under the relevant legislation.	National Grid has noted the advice provided.
The Coal Authority (now known as and from herein referenced as the Mining Remediation Authority)	The Mining Remediation Authority notes and agrees that geohazards and land stability are to be scoped out of the ES. It is noted that the Project should be <i>‘...supported by adequate coal mining information, including a robust assessment of the risks posed by coal mining features to new ground based infrastructure where this is required to support the overhead line’</i> .	Further engagement with the Mining Remediation Authority will be ongoing throughout design of the Project. A coal mining risk assessment will be completed for the Project to inform design.

10.3.1 **Table 10.4** provides a summary of the consultations undertaken to inform the geology and hydrogeology assessment to date.

Table 10.4: Summary of stakeholder engagement in relation to geology and hydrogeology

Date and Method of Consultation	Consultee	Summary of Key Topics Discussed and Key Outcomes
October 2025 Email correspondence	Environment Agency	<p>An information request was submitted to the Environment Agency in August 2025 to request information held that could inform the geology and hydrogeology assessment. A 500 m buffer site search zone was provided to inform the Environment Agency of the approximate location of the Project.</p> <p>A response from the Environment Agency was received in October 2025 which provided the following summarised information.</p> <p>A search database was returned that included closed pollution incidents within the site search zone. A filtered list was also provided that included incidents reported that could have led to lasting contamination of soil or groundwater.</p> <p>A search database was returned of landfill or waste transfer activities located within 500 m of the buffer search zone.</p> <p>The Environment Agency were not aware of any soil or groundwater remedial works carried out within the site search zone. In addition, the Environment Agency were not aware of any burial pits or sites that have been or are likely to be designated as Contaminated Land under Part 2A of the Environmental Protection Act 1990 (Ref 10.1).</p> <p>The Environment Agency confirmed that geological sites of importance would fall under the remit of Natural England, so were not able to provide any further information.</p> <p>Information received from the Environment Agency, that was not already available from the existing sources of information, is included within the PRA (as provided in Appendix 10A Geo-Environmental Preliminary Risk Assessment).</p>
July 2025 Email correspondence	Responses from Bolsover District Council and North East Derbyshire District Council	<p>Information requests were submitted to the local planning authorities in July 2025 to request information relating to private groundwater supply data for commercial and domestic properties. Responses received from Bolsover District Council and North East Derbyshire District Council are provided in Annex A10.8 of Appendix 10A Geo-Environmental Preliminary Risk Assessment.</p>

Date and Method of Consultation	Consultee	Summary of Key Topics Discussed and Key Outcomes
February 2025 Email correspondence	Environment Agency	<p>An information request was submitted to the Environment Agency in February 2025 to request information in relation to abstraction points within the Study Area boundary.</p> <p>The Environment Agency provided a spreadsheet summarising the abstraction licences within and close to the Study Area, as provided in Annex A10.8 of Appendix 10A Geo-Environmental Preliminary Risk Assessment. The Environment Agency also confirmed that they do not hold information in relation to unlicensed abstractions.</p>

10.3.2 Non-statutory (Stage 1) consultation was held between May and September 2024. The principal feedback received from Stage 1 consultation of relevance to this chapter is included in **Table 10.5**, together with a response on how the comments were considered in the Scoping Report and this PEIR.

Table 10.5: Summary of Stage 1 (non-statutory) consultation in relation to geology and hydrogeology

Consultee	Summary of Key Topics Discussed and Key Outcomes	Response
Environment Agency	Cinderhill Tar Pits is within the site boundary. This is designated as a special site under section 78C of Part 2A of the Environmental Protection Act 1990 (Ref 10.1). Other historical acid tar pits are located on the west side of the A38 in this area. These should be considered in future reports and routeing.	Potential interactions and impacts on the Cinderhill Tar Pits and other historical acid tar pits will be considered, including in terms of construction activities.
Environment Agency	Within the proposed corridor, there are several historical landfill sites, and one active/authorised landfill, which will need to be considered. Some of these landfill sites are below the water table, and any disturbance could open a pathway to controlled waters.	Potential interactions and impacts on these features will be considered, including in terms of construction activities.
Environment Agency	The north of the site is in a Coal Mining Reporting Area. Care will be needed when siting of masts, where shallow (coal) mine workings are present. The British Geological Survey (BGS) records extensive artificial deposits and infilled land, including mine and quarry waste, in this area. There is also significant faulting across the site, which can be a preferential pathway for contaminants to migrate into controlled waters.	Potential interactions and impacts on these features will be considered as part of the engineering design development, including in terms of construction activities and methods.
Mining Remediation Authority	There are recorded coal mining features present at surface and shallow depth identified within the emerging preferred corridor present at surface and shallow depth which include but are not limited to: mine entries, coal workings, former surface mine highwalls, mine gas sites and reported surface hazards. These features may pose a potential risk to surface stability, public safety and the environment.	Potential interactions with these features will be considered as part of the engineering design development, including in terms of construction activities and methods.

Consultee	Summary of Key Topics Discussed and Key Outcomes	Response
Mining Remediation Authority	A summary commentary has been provided of the predominant coal mining legacy recorded within the emerging preferred corridor.	A summary of the coal mining features is provided in the Existing Baseline Conditions section below (paragraphs 10.5.41 – 10.5.44). There will continue to be engagement with the Mining Remediation Authority throughout the development of the design.
Mining Remediation Authority	Regarding site specific requirements for the proposed infrastructure to be undergrounded, considering the recorded mining legacy for a significant length of the emerging preferred corridor such requirements will bring the infrastructure into direct contact with potential ground instability associated with coal mining features. The Mining Remediation Authority expressed the importance of <i>'identifying any areas which could conceivably require undergrounding so that the influence of mining legacy might be identified at an early a stage as possible due to the specific design challenges might arise. These could include, but not be limited to, mitigation or elimination of differential settlement, inundation settlement resulting from changes in groundwater hydrology and mine gas which could create hazardous environments either during construction or over the future operational timescales.'</i>	A Mining Remediation Authority Consultants Coal Mining Report has been obtained for the Project and is provided in Annex 10A.3 of Appendix 10A Geo-Environmental Preliminary Risk Assessment . Information provided within the Consultants Coal Mining Report will be applied in the preparation of a coal mining risk assessment for the Project. Where applicable coal mining information will also be referenced prior to non-intrusive and intrusive survey access.
Mining Remediation Authority	Outside of former surface mining excavation areas where natural ground is expected to be encountered any early excavation into that natural ground at the locations of proposed pylons would be encouraged including any known features that may conceivably affect those locations.	There will continue to be engagement with the Mining Remediation Authority throughout the development of the design and National Grid will seek to avoid known mine entries and associated zones of influence where possible.

Consultee	Summary of Key Topics Discussed and Key Outcomes	Response
Mining Remediation Authority	The occurrence of shallow mine workings where it is unavoidable can generally be mitigated by remedial design solutions like drilling and pressure grouting, undertaken in accordance with industry guide CIRIA 758D. Investigations need to be comprehensive, site specific and determine the risk from former coal mining to sufficient depth.	CIRIA 758D Abandoned mine workings manual (Ref 10.43) would be adhered to in relevant circumstances.
Mining Remediation Authority	Construction works and associated temporary works need due consideration in regard to recorded coal mining features present.	Potential interactions with these features will be considered, including in terms of construction activities.
Mining Remediation Authority	The adequacy, specification for remediation and associated recommendations is something that the Mining Remediation Authority can comment on through the pre-application advice service.	There will continue to be engagement with the Mining Remediation Authority throughout the development of the design and impacts on these features will be considered as part of the engineering design development, including in terms of construction activities and methods.

10.4 Assessment Methodology

10.4.1 **Chapter 5 Approach to Preliminary Environmental Information Report** sets out the overarching approach which has been used in developing the PEIR. This section describes the technical methods used to determine the baseline conditions, receptor sensitivity and magnitude of change. This section also identifies further surveys and assessment that will be undertaken and reported in the ES.

Technical Guidance

10.4.2 This section sets out the proposed methodology for the geology and hydrogeology assessment of the PEIR. The assessment methodology is primarily based on guidance set out in DMRB LA 109: Geology and Soils (Ref 10.34), DMRB LA 113: Road Drainage and the Water Environment (Ref 10.35) and IEMA guide to: Materials and Waste in Environmental Impact Assessment. Guidance for a proportionate approach (Ref 10.36). General industry guidance as referenced in section 10.2 is referred to as applicable. The assessment methodology also draws on professional judgement and technical experience.

10.4.3 The methodology comprises the following:

- review of available baseline data for the Project – **Appendix 10A Geo-Environmental Preliminary Risk Assessment** of the PEIR comprises a review of publicly available information and environmental data purchased for the Project and presents a preliminary geo-environmental risk assessment and preliminary geotechnical risk assessment;
- based on the baseline data review, identification of key geology and hydrogeology receptors;
- based on the baseline data review, identification of potential sources of contamination;
- a preliminary assessment of the sensitivity of each of the identified receptors;
- a preliminary assessment of the magnitude of impact should an identified receptor be adversely affected; and
- an overall preliminary assessment of the likely significance of the effects.

10.4.4 The geology and hydrogeology assessment is split into three broad categories. The three categories are reflective of both the receptors and the potential effects and are as follows:

- geology and minerals;
- hydrogeology; and
- contaminated land.

10.4.5 The following sections outline the approach to assessing the sensitivity of the identified geology and hydrogeology receptors and the magnitude of impact should the receptor be affected.

Sensitivity

10.4.6 **Table 10.6** sets out the criteria which have been used to determine the sensitivity of receptors specific to geology and hydrogeology. These criteria are derived from Table 3.70 of DMRB LA 113, Table 3.11 of DMRB LA 109, Environment Agency LCRM (Ref 10.26), CIRIA C552 (Ref 10.31) and professional judgement.

Table 10.6: Criteria for determining sensitivity of geology and hydrogeology

Sensitivity/Value	General Criteria
Very High	<p>Geology:</p> <ul style="list-style-type: none"> Very rare and of international importance with no potential for replacement (e.g. United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites, UNESCO Global Geoparks, SSSIs and Geological Conservation Review where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such. <p>Minerals:</p> <ul style="list-style-type: none"> Existing minerals sites. <p>Contamination/Hydrogeology:</p> <p><i>Human Health:</i></p> <ul style="list-style-type: none"> very high sensitivity land use such as residential or allotments. <p><i>Surface Water:</i></p> <ul style="list-style-type: none"> watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and $Q95 \geq 1.0 \text{ m}^3/\text{s}$; and site protected/designated under European Commission (EC) or UK legislation (Special Areas of Conservation, Special Protection Areas, SSSIs, Ramsar site). Species protected by EC legislation. <p><i>Groundwater:</i></p> <ul style="list-style-type: none"> Principal Aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation; groundwater locally supports GWDTE; and groundwater SPZ1.
High	<p>Geology:</p> <ul style="list-style-type: none"> Rare and of national importance with little potential for replacement (e.g. geological SSSIs, Areas of Special Scientific Interest, National Nature Reserves). Geology meeting national designation citation criteria which is not designated as such. <p>Minerals:</p> <ul style="list-style-type: none"> Mineral Preferred (Allocated) Areas. <p>Contamination/Hydrogeology:</p> <p><i>Human Health:</i></p> <ul style="list-style-type: none"> high sensitivity land use such as public open space.

Sensitivity/Value General Criteria

Surface Water:

- watercourse having a WFD classification shown in an RBMP and $Q95 < 1.0 \text{ m}^3/\text{s}$; and
- species protected under EC or UK legislation.

Groundwater:

- Principal Aquifer providing locally important resource or supporting a river ecosystem;
 - groundwater supports a GWDTE; and
 - SPZ2.
-

Medium

Geology:

- Regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation criteria which is not designated as such.

Minerals:

- Mineral Safeguarded Areas and Mineral Consultation Area.

Contamination/Hydrogeology:*Human Health:*

- medium sensitivity land use such as commercial or industrial.
- *Surface Water:*
- watercourses not having a WFD classification shown in an RBMP and $Q95 > 0.001 \text{ m}^3/\text{s}$.

Groundwater:

- aquifer providing water for agricultural or industrial use with limited connection to surface water;
 - extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming/animal estates); and
 - SPZ3.
-

Low

Geology:

- Local importance/interest with potential for replacement (e.g. non designated geological exposures, former quarries/mining sites).

Minerals:

- Mineral present but outside of any Mineral Preferred Areas, Mineral Safeguarded Areas and Mineral Consultation Areas.

Contamination/Hydrogeology:*Human Health:*

- low sensitivity land use such as highways and rail.
- *Surface Water:*
- watercourses not having a WFD classification shown in an RBMP and $Q95 \leq 0.001 \text{ m}^3/\text{s}$.

Groundwater:

- unproductive strata.
-

Sensitivity/Value General Criteria	
Negligible	<p>Geology:</p> <ul style="list-style-type: none"> No geological exposures, little/no local interest. <p>Minerals:</p> <ul style="list-style-type: none"> No mineral identified. <p>Contamination:</p> <p><i>Human Health:</i></p> <ul style="list-style-type: none"> undeveloped surplus land/no sensitive land use proposed.

Magnitude

10.4.7 **Table 10.7** summarises the criteria that have been used to assess the magnitude of impact on receptors specific to geology and hydrogeology. These criteria are based on Table 3.71 of DMRB LA 113 (Ref 10.35), Table 3.12 of DMRB LA 109, section 10.3 of IEMA guide to: Materials and Waste in Environmental Impact Assessment (Ref 10.36) and professional judgement. The wording of the magnitude criteria descriptions has been altered from those set out in the above guidance in order to maintain consistency with **Chapter 5 Approach to Preliminary Environmental Information Report** and in accordance with Scoping Opinion comment **ID 3.5.7** in **Table 10.2**.

10.4.8 It is noted that descriptions included in **Table 10.7** that relate to highways (as per DMRB LA 113) have been included for those elements of the Project that relate to the construction of new, permanent roads.

Table 10.7: Criteria for determining magnitude of impact on geology and hydrogeology

Magnitude	Description
Large	<p>Geology:</p> <p>Loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p>Minerals:</p> <p>More than one allocated mineral site is substantially (e.g. greater than 50% per site) sterilised by the development rendering it inaccessible for future use.</p> <p>Contamination/Hydrogeology:</p> <p><i>Human Health:</i></p> <ul style="list-style-type: none"> significant contamination identified; contamination levels significantly exceed background levels and relevant generic assessment criteria with potential for significant harm to human health; and contamination heavily restricts future use of land. <p><i>Surface Water:</i></p> <ul style="list-style-type: none"> failure of both acute-soluble and chronic-sediment related pollutants in Highways England Water Risk Assessment Tool (HEWRAT; note National Highways was formerly known as Highways England) and exceedance of

Magnitude	Description
	<p>assessment criteria protective of surface waters (e.g. Environmental Quality Standards);</p> <ul style="list-style-type: none"> • risk of pollution from a spillage $\geq 2\%$ annually (spillage assessment); • loss or extensive change to a fishery; • loss of regionally important public water supply; • loss or extensive change to a designated nature conservation site; and • reduction in water body WFD classification. <p><i>Groundwater:</i></p> <ul style="list-style-type: none"> • loss of, or extensive change to, an aquifer; • loss of regionally important water supply; • significant exceedance of assessment criteria protective of groundwater; • potential high risk of pollution to groundwater from routine runoff – risk score > 250 (Groundwater quality and runoff assessment); • risk of pollution from spillages $\geq 2\%$ annually (Spillage assessment); • loss of, or extensive change to, GWDTE or baseflow contribution to protected surface water bodies; • reduction in water body WFD classification; and • loss of, or significant damage to, major structures through subsidence or similar effects.
Medium	<p>Geology: Partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p>Minerals: One allocated mineral site is substantially sterilised (e.g. greater than 50%) by the development rendering it inaccessible for future use.</p> <p>Contamination/Hydrogeology: <i>Human Health:</i></p> <ul style="list-style-type: none"> • contaminant concentrations exceed background levels and generic assessment criteria; • significant contamination can be present; and • control/remediation measures are required to reduce risks to human health/make land suitable for intended use. <p><i>Surface Water:</i></p> <ul style="list-style-type: none"> • localised or marginal exceedances of assessment criteria protective of surface waters; • calculated risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually; • partial loss in productivity of a fishery; • degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies; and • contribution to reduction in water body WFD classification.

Magnitude	Description
Small	<p><i>Groundwater:</i></p> <ul style="list-style-type: none"> • partial loss or change to an aquifer; • degradation of regionally important public water supply or loss of significant commercial/industrial/agricultural supplies; • localised or marginal exceedances of assessment criteria protective of groundwater; • potential medium risk of pollution to groundwater from routine runoff – risk score 150–250; • risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually; • partial loss of the integrity of GWDTE; • contribution to reduction in water body WFD classification; and • damage to major structures through subsidence or similar effects or loss of minor structures.
	<p>Geology: Minor measurable change in geological feature/designation attributes, quality or vulnerability; minor loss of, or alteration to, one or more key characteristics, features or elements.</p> <p>Minerals: The development has the potential to present minimal loss or sterilisation (e.g. up to 10% loss per site) to one or more allocated mineral site.</p> <p>Contamination/Hydrogeology:</p> <p><i>Human Health:</i></p> <ul style="list-style-type: none"> • Contaminant concentrations are below relevant generic assessment screening criteria. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health. <p><i>Surface Water:</i></p> <ul style="list-style-type: none"> • failure of either acute-soluble or chronic-sediment related pollutants in HEWRAT; • risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually; • minor effects on water supplies; and • minor, localised exceedance of generic assessment criteria protective of surface waters. <p><i>Groundwater:</i></p> <ul style="list-style-type: none"> • potential low risk of pollution to groundwater from routine runoff – risk score < 150; • calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually; • minor effects on an aquifer, GWDTE, abstractions and structures; and • minor, localised exceedance of generic assessment criteria protective of groundwater.

Magnitude	Description
Negligible	<p>Geology: Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected.</p> <p>Minerals:</p> <ul style="list-style-type: none"> • The development has no or limited potential to adversely impact access to specific areas of allocated mineral sites, therefore reducing the minerals available². • Contamination/Hydrogeology: <p><i>Human Health:</i></p> <ul style="list-style-type: none"> • contaminant concentrations substantially below levels outlined in relevant generic assessment criteria; and • no requirement for control measures to reduce risks to human health/make land suitable for intended use. <p><i>Surface Water:</i></p> <ul style="list-style-type: none"> • risk of pollution from spillages < 0.5%; and • no measurable impact on surface waters. <p><i>Groundwater:</i></p> <ul style="list-style-type: none"> • no measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages < 0.5%.
No Change	<p>Geology: No temporary or permanent loss or disturbance of characteristics, features or elements.</p> <p>Minerals No mineral sterilisation.</p> <p>Contamination/Hydrogeology: Limited potential for contamination identified or could reasonably be expected based on findings of both desk based and intrusive assessment.</p> <ul style="list-style-type: none"> • human health: reported contaminant concentrations below background levels; • surface water: no loss or alteration of characteristics, features or elements; no observable impact in either direction; and • groundwater: no loss or alteration of characteristics, features or elements; no observable impact in either direction.

Significance of effects

10.4.9 Significance of effect has been derived by considering the sensitivity of the geology and hydrogeology receptors in the Study Area (as set out in section 10.5), and the magnitude of impact likely to be caused by the activities of the Project. These factors are combined to give an overall significance of effect.

² Professional judgement applied as there is no definition for the criteria in IEMA guidance (Ref 10.36).

- 10.4.10 Significance has been derived using the matrix set out in **Chapter 5 Approach to Preliminary Environmental Information Report**. This has been supplemented by professional judgement which, where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the Infrastructure Planning (EIA) Regulations 2017 (the 'EIA Regulations') (Ref 10.44), are considered to be effects of moderate or greater significance.

Preliminary Assessment Assumptions and Limitations

- 10.4.11 The assessment has been undertaken based on the preliminary Project design information, as outlined in **Chapter 4 Description of the Project**. This information is iterative and will be updated in the ES as the design evolves and any changes are made. As the Project evolves, there are a number of factors which could result in the change in type or severity of the potential effects assessed herein. These include but are not limited to design changes (including routeing), construction methodologies, changes in guidance or good practice standards and mitigation measures implemented.
- 10.4.12 This chapter has been prepared based on desk based environmental baseline data available at the time of writing and a targeted walkover survey. The environmental baseline data and walkover survey information is presented in detail within **Appendix 10A Geo-Environmental Preliminary Risk Assessment**, with a summary provided in section 10.5.
- 10.4.13 Derbyshire County Council are currently in the process of drafting a new minerals local plan up to 2038 (pre-submission draft Minerals Local Plan (2023) (Ref 10.17)). If adopted it will replace the current local plan adopted in 2000 (Ref 10.16) with a first alteration already adopted in 2002. The pre-submission draft Minerals Local Plan is available and has been reviewed as part of this chapter. It is assumed that no major changes to the local plan will be implemented. This will be kept under review and any updates considered as necessary.

Further Assessment within the ES

- 10.4.14 A full programme of data gathering to include the completion of non-intrusive and intrusive surveys will be undertaken ahead of construction and will further inform the baseline assessment to be included within the ES.
- 10.4.15 Non-intrusive surveys will include detailed desk-based Unexploded Ordnance (UXO) risk assessment, topographical surveys and utility mapping surveys. Intrusive ground investigation will include a variety of intrusive exploratory methods to include the drilling of boreholes and excavation of trial pits. Chemical laboratory analysis of soils and groundwater will be completed as part of the intrusive investigation. To inform baseline conditions and design, a programme of groundwater level monitoring and ground gas monitoring will be completed following completion of the intrusive works. It is anticipated that the monitoring programme will be completed ahead of the construction phase.

10.5 Baseline Conditions

Study Area

- 10.5.1 The Study Area for geology, which includes minerals and contaminated land (human health and controlled waters (surface water and groundwater)) comprises the draft Order Limits plus a 250 m buffer (herein referred to as the geology Study Area). This 250 m buffer is illustrated on **Figure 10.1** to **Figure 10.8** presented in **Volume 2**.

- 10.5.2 With regards to ground conditions and contamination, the Study Area is defined to reflect the surrounding geological, hydrogeological and environmental features and the distance over which significant effects can reasonably be considered to have the potential to occur. A review of such features will be undertaken during the preparation of the ES.
- 10.5.3 The hydrogeology Study Area comprises the draft Order Limits plus a 500 m buffer (herein referred to as the hydrogeology Study Area). This buffer is illustrated on **Figure 10.9** to **Figure 10.11** presented in **Volume 2**. **Figure 10.9** and **Figure 10.11** are presented at a smaller scale, and as such, a 5 km buffer is also shown to provide context. This is considered to be a proportionate and suitable approach for the assessment. Hydrogeological receptors further from the draft Order Limits are more susceptible to effects from the Project than human health receptors due to the mobile nature of groundwater in comparison to soils and corresponding potential for the Project to affect receptors at a greater distance.
- 10.5.4 These are considered appropriate Study Areas and align with the Study Area defined within the Scoping Report. The Study Areas are based on professional judgement, knowledge of similar projects and DMRB LA 109 and, whilst not directly relevant for this Project, the Guidance for the Safe Development of Housing on Land Affected by Contamination (Ref 10.45).

Data Collection

- 10.5.5 The baseline assessment has been informed by **Appendix 10A Geo-Environmental Preliminary Risk Assessment** which has drawn on the following information sources:
- Groundsure, Enviro+Geo Insight reports (Ref 10.46), provided in **Annex 10A.2 of Appendix 10A Geo-Environmental Preliminary Risk Assessment**:
 - Section 1: WSP-OT5-7MI-AZ4-MQD;
 - Section 2: WSP-3BQ-IR5-Z4J-JMR;
 - Section 3: WSP-W5W-PTQ-ZKK-OH1;
 - Section 4: WSP-SJB-SJ2-WDM-DZA;
 - Section 5: WSP-7U8-TWZ-H6V-Z7D; and
 - Section 6: WSP-ZNX-NFD-PUC-SOP.
 - Groundsure Interactive Viewer (Ref 10.47);
 - BGS, 2012, Chesterfield, England and Wales Sheet 112, Bedrock and Superficial Deposits, 1:50,000 (Ref 10.48);
 - BGS, 2014, Derby, England and Wales Sheet 125, Bedrock and Superficial Deposits, 1:50,000 (Ref 10.49);
 - BGS, 2001, Loughborough, England and Wales Sheet 141, Solid and Drift Geology, 1:50,000 Scale (Ref 10.50);
 - BGS, 1967, Geology of the country around Chesterfield, Matlock and Mansfield. Explanation of one-inch geological sheet 112, New Series (Ref 10.51);
 - BGS, 1979, Geology of the country north of Derby. Memoir for 1:50 000 Sheet 125 (Ref 10.52);

- BGS, 2002, Geology of the Loughborough district - a brief explanation of the geological map Sheet 141, Loughborough (Ref 10.53);
- BGS GeoIndex, accessed in July 2025 (Ref 10.54);
- The Mining Remediation Authority Consultants Coal Mining Reports, provided in **Annex 10A.3 of Appendix 10A Geo-Environmental Preliminary Risk Assessment**;
- The Mining Remediation Authority – Interactive Maps (Ref 10.55);
- Ordnance Survey (OS) Mapping, OS layer on Bing (Ref 10.56);
- Derbyshire County Council – Minerals Local Plan and Policies Maps (Ref 10.16 and Ref 10.17);
- BGS – Mineral Resources Map (Ref 10.57);
- BGS – BGS lexicon of named rock units (Ref 10.58);
- Environment Agency – Groundwater protection and vulnerability sources (Ref 10.38);
- Google Earth (Ref 10.59);
- Natural England online information (Ref 10.60);
- Environment Agency website Flood Risk Map (Ref 10.61);
- Department for Environment, Food and Rural Affairs (Defra) Multi-Agency Geographic Information for the Countryside (MAGIC) Map (Ref 10.62); and
- Zetica Limited UXO Desk Study and Constraints Assessment (Ref 10.63).

Further Data to be Collected to Inform the ES

- 10.5.6 In addition to the data collected for this PEIR, the ES will be informed by additional non-intrusive and intrusive surveys to include detailed UXO risk assessment, topographical surveys, utility mapping and intrusive ground investigation. The surveys are provisionally scheduled to commence in early 2026. The surveys will be undertaken within the draft Order Limits and will be designed to obtain sufficient data to inform design and geo-environmental assessment.
- 10.5.7 Additional engagement with the local authority and the Mining Remediation Authority throughout the design stages and prior to construction to avoid mineral sterilisation where reasonably practicable will also be undertaken.

Existing Baseline Conditions

- 10.5.8 Baseline conditions have been gathered from desk-based information and presented with reference to the section of the Project that they are located in.
- 10.5.9 The baseline described is supported by **Figure 10.1 to Figure 10.11 in Volume 2**.

Published geology and hydrogeology

Artificial ground

- 10.5.10 The published artificial ground records were taken from the Groundsure Enviro+Geo Insight reports, BGS online viewer and BGS mapping (Ref 10.48 to Ref 10.53).
- 10.5.11 The details of the artificial ground anticipated to be present beneath the draft Order Limits are presented in **Appendix 10A Geo-Environmental Preliminary Risk Assessment** and shown on **Figure 10.1 Artificial Ground** in **Volume 2**.

Table 10.8 summarises the artificial ground identified for each Section across the draft Order Limits.

Table 10.8: Summary of artificial ground within geology Study Area and hydrogeology Study Area

Route Section	Summary
Section 1: Chesterfield to Tibshelf	<p>Mapped artificial ground is located across large extents of the draft Order Limits of Section 1 from Chesterfield to Astwith.</p> <p>The frequency of artificial ground present within the draft Order Limits of Section 1 decreases from Astwith to Tibshelf.</p>
Section 2: Tibshelf to Ripley	<p>Mapped artificial ground is located across large extents of the draft Order Limits of Section 2 from Tibshelf to Alfreton.</p> <p>The frequency of artificial ground present within the draft Order Limits of Section 2 decreases from Alfreton to Ripley.</p>
Section 3: Ripley to Morley	<p>Mapped artificial ground is located across areas of the draft Order Limits of Section 3 from Ripley to Belper.</p> <p>The frequency of artificial ground present within the draft Order Limits of Section 3 decreases from Belper to Morley.</p>
Section 4: Morley to Ockbrook	<p>Mapped artificial ground is limited across the draft Order Limits of Section 4 with only two areas of artificial ground being identified.</p>
Section 5: Ockbrook to Aston-on-Trent	<p>Mapped artificial ground is limited across the draft Order Limits of Section 5 with only two areas of artificial ground being identified.</p>
Section 6: Aston-on-Trent to Willington Substation	<p>Mapped artificial ground is limited across the draft Order Limits of Section 6 with only five areas of artificial ground being identified.</p>

Geological units and aquifer designations

- 10.5.12 The published geology and aquifer designations were taken from the Groundsure Enviro+Geo Insight reports, BGS online viewer and available information on the Defra MAGIC viewer.
- 10.5.13 The details of the geological units and aquifer designations present beneath the draft Order Limits are presented in **Appendix 10A Geo-Environmental Preliminary Risk Assessment** and shown on **Figure 10.2 Superficial Geology** and **Figure 10.3 Bedrock Geology** in **Volume 2**.
- 10.5.14 **Table 10.9** summarises the geological units (superficial and bedrock) and the corresponding aquifer designations for each Section across the draft Order Limits.

Table 10.9: Geological units and aquifers within the geology Study Area and hydrogeology Study Area

Section	Geology	Aquifer Designation*
Section 1: Chesterfield to Tibshelf	Superficial Deposits (where present)	
	Alluvium (clay, silt, sand and gravel)	Secondary A
	Bedrock Geology	
	Pennine Lower Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Lower Coal Measures Formation (sandstone)	Secondary A
	Pennine Middle Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Middle Coal Measures Formation (sandstone)	Secondary A
	Pennine Lower Coal Measures – Top Hard Rock (sandstone) ¹	Secondary A
	Pennine Lower Coal Measures – Deep Hard Rock (sandstone) ¹	Secondary A
	Pennine Lower Coal Measures – Silkstone Rock (sandstone) ¹	Secondary A
Section 2: Tibshelf to Ripley	Superficial Deposits (where present)	
	Alluvium (clay, silt, sand and gravel)	Secondary A
	Glacial Till (diamicton)	Secondary (undifferentiated)

Section	Geology	Aquifer Designation*
	Bedrock Geology	
	Pennine Lower Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Lower Coal Measures Formation (sandstone)	Secondary A
	Pennine Middle Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Middle Coal Measures Formation (sandstone)	Secondary A
	Pennine Lower Coal Measures – Top Hard Rock (sandstone) ¹	Secondary A
	Pennine Lower Coal Measures – Deep Hard Rock (sandstone) ¹	Secondary A
	Tupton Rock (sandstone)	Secondary A
Section 3: Ripley to Morley	Superficial Deposits (where present)	
	Alluvium (clay, silt, sand and gravel)	Secondary A
	Glacial Till (diamicton)	Secondary (undifferentiated)
	Head deposits (clay, silt, sand and gravel)	Secondary A
	Bedrock Geology	
	Pennine Lower Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Lower Coal Measures Formation (sandstone)	Secondary A
	Pennine Middle Coal Measures Formation (mudstone, siltstone and sandstone)	Secondary A
	Pennine Lower Coal Measures – Deep Hard Rock (sandstone) ¹	Secondary A
	Rossendale Formation (mudstone and siltstone)	Secondary A
Rossendale Formation – Rough Rock (sandstone) ²	Secondary A	

Section	Geology	Aquifer Designation*
	Loxley Edge Rock (sandstone)	Secondary A
	Wingfield Flags (sandstone)	Secondary A
	Crawshaw Sandstone (sandstone)	Secondary A
	Marsden Formation (mudstone and siltstone)	Secondary A
	Chatsworth Grit (sandstone)	Secondary A
	Tarporley Siltstone Formation (sandstone)	Secondary B
	Tarporley Siltstone Formation (mudstone and siltstone)	Secondary B
	Tupton Rock (sandstone)	Secondary A
Section 4: Morley to Ockbrook	Superficial Deposits (where present)	
	Alluvium (clay, silt, sand and gravel)	Secondary A
	Glacial Till (diamicton)	Secondary (undifferentiated)
	Bedrock Geology	
	Pennine Lower Coal Measures Formation (mudstone, siltstone, sandstone and coal seams)	Secondary A
	Pennine Lower Coal Measures Formation (sandstone)	Secondary A
	Moira Formation (breccia)	Secondary B
	Tarporley Siltstone Formation (mudstone and siltstone)	Secondary B
	Tarporley Siltstone Formation (sandstone)	Secondary B
	Chester Formation (sandstone, gravelly)	Principal
	Crawshaw Sandstone (sandstone)	Secondary A
	Lenton Sandstone Formation (sandstone)	Principal
	Wingfield Flags (sandstone)	Secondary A
	Superficial Deposits (where present)	
	Alluvium (clay, silt sand and gravel)	Secondary A

Section	Geology	Aquifer Designation*
Section 5: Ockbrook to Aston-on-Trent	Glacial Till (diamicton)	Secondary (undifferentiated)
	Head (clay, silt, sand and gravel)	Secondary A
	Borrowash Sand and Gravel	Secondary A
	Allenton Terrace Deposits (sand and gravel)	Secondary A
	Hemington Member (silt and gravel)	Secondary A
	Thrussington Member (diamicton)	Secondary (undifferentiated)
	Bedrock Geology	
	Tarporley Siltstone Formation (mudstone and siltstone)	Secondary B
	Tarporley Siltstone Formation (sandstone)	Secondary B
	Gunthorpe Member (mudstone/siltstone/sandstone)	Secondary B
Section 6: Aston-on-Trent to Willington Substation	Superficial Deposits (where present)	
	Alluvium (clay, silt sand and gravel)	Secondary A
	Oadby Member (diamicton)	Secondary (undifferentiated)
	Glaciolacustrine Deposits (clay, silt and sand)	Secondary A
	Glaciofluvial Deposits (sand and gravel)	Secondary A
	Thrussington Member (diamicton)	Secondary (undifferentiated)
	Beeston Sand and Gravel Member	Secondary A
	Head (clay, silt, sand and gravel)	Secondary A
	Holme Pierrepont Sand and Gravel Member	Secondary A
	Hemington Member (silt and gravel)	Secondary A
	Etwall Sand and Gravel Member	Secondary A

Section	Geology	Aquifer Designation*
	Eagle Moor Sand and Gravel Member	Secondary A
	Bedrock Geology	
	Branscombe Mudstone Formation	Secondary B
	Edwalton Member (mudstone)	Secondary B
	Gunthorpe Member (mudstone)	Secondary B
	Cotgrave Sandstone Member	Secondary A
	Arden Sandstone Formation	Secondary A

¹ These are major named sandstone beds within the Lower and Middle Pennine Coal Measure Formation.

² This is a major named bed within the Rossendale Formation.

*Aquifer Designations defined by the Environment Agency (Ref 10.38) as follows:

1) Principal Aquifers: rock layers that ‘provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands’.

2) Secondary A Aquifers: ‘permeable layers that can support local water supplies and may form an important source of base flow to rivers’.

3) Secondary B Aquifers: as ‘mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers’.

4) Secondary (undifferentiated): ‘where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.’

Minerals safeguarding/sterilisation

- 10.5.15 This section provides a brief overview of the mineral resources, Existing Permitted Areas and Allocated Areas identified in the Study Area.
- 10.5.16 Mineral safeguarding is the process of ensuring that non-mineral development does not unnecessarily prevent the future extraction of mineral resources (also known as mineral sterilisation) of local and national importance. Mineral Planning Authorities (MPAs) designate strategic sites as preferred and/or reserve mineral sites for extraction within their spatial development plans, identifying sites where the principle of extraction has been accepted and the need for the release of minerals is proven.
- 10.5.17 Mineral Safeguarding Areas (MSAs) identify where resources are located to make relevant parties aware of the presence of the resources and ensure that their presence is considered when determining the acceptability of planning applications, so that these resources are not needlessly sterilised. The relevant MPA for the Project is Derbyshire who has established the Derby and Derbyshire Minerals Local Plan, adopted in 2000 (amended in 2002) (Ref 10.16) (herein referred to as the Minerals Local Plan (2002)). The Minerals Local Plan is in the process of being updated with a drafted plan and policies maps available for review known as the Pre-submission Draft Plan and Policies Maps, published in January 2023 (Ref 10.17) (herein referred to as the pre-submission draft Minerals Local Plan (2023)).
- 10.5.18 The draft Order Limits for the Project are within an oil and gas licensed area (associated with some of the coal measures) as seen in the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023). It is unclear exactly

which Sections of the Study Area it falls in due to Derbyshire and Derby's poor map quality (titled Petroleum Exploration and Development Licences 2021, in the pre-submission draft Minerals Local Plan (2023)). However, roughly, it appears that Section 1, the northern part of Section 2, the southern part of Section 4, and Section 5 fall within the oil and gas licensed areas. Further engagement with the MPA will be undertaken to confirm the extent within the Study Area to inform the ES.

- 10.5.19 Whilst development affecting areas of coal resources is covered by a separate system of consultation operated by the Mining Remediation Authority it is noted that surface coal measures are either no longer considered for safeguarding (as noted in paragraph 3.4 of the Derbyshire and Derby Minerals Local Plan 2022-2038, Background Paper: Mineral Safeguarding, June 2024 (Ref 10.64) and quoted in paragraph 10.5.20), or any extraction planning proposals would be challenging to get approved as highlighted in Policy SP15 (contained in section 8.1 of the pre-submission draft Minerals Local Plan (2023)), as quoted in paragraph 10.5.21:
- 10.5.20 *'...although national planning policy in the NPPF still requires mineral planning authorities to define MSAs for minerals of local and national importance, including shallow coal resources, this approach is considered to be out of step with the general presumption against the extraction of coal set out in the NPPF. It is also contrary to the current lack of any significant UK domestic market for coal and also with the Government's priorities for mitigating the impacts of climate change and commitments to meeting its net zero target by 2050, particularly by reducing the reliance on fossil fuels for future energy production. Importantly, this position is acknowledged by the Coal Authority, which has indicated that it no longer requires local planning authorities to safeguard the surface coal resources in their areas. The Surface Mined Coal resource, is therefore, not considered for safeguarding'.*
- 10.5.21 *'Policy SP15: Coal Extraction and Colliery Spoil Disposal:*
- 1. Proposals for the extraction of coal and the associated disposal of colliery spoil will not be supported unless the need for the proposal is for markets other than electricity generation and it can be demonstrated that:*
- a) it is environmentally acceptable, or can be made so by planning conditions and/or obligations; and*
- b) greenhouse gas emissions are capable of being managed to ensure that the proposal will have a 'net zero' impact on climate change for the lifetime of the development (including restoration and aftercare).*
- In the assessment of greenhouse gas emissions, the MPA will have regard to the requirements of Policy SP2: Climate Change.*
- 2. Where development proposals are unable to demonstrate the requirements of 1) above, planning permission will only be granted where proposals can be demonstrated to provide national, local or community benefits of scale which clearly outweigh the likely impacts (taking all relevant matters into account, including any residual environmental impacts)'.*
- 10.5.22 A review of the Minerals Local Plan (2002), pre-submission draft Minerals Local Plan (2023) and policies maps and the BGS Mineral Resources map (Ref 10.57) has been undertaken to assess the following mineral resources.

- 10.5.23 Mapped MSAs and mapped Existing Permitted Areas/Allocated Areas for the minerals at and nearby the draft Order Limits are provided in **Figure 10.4 Mineral Resources in Volume 2**.

Section 1: Chesterfield to Tibshelf

- 10.5.24 A review of the available data indicates that Section 1 is located within a coal measures safeguarded resource area.
- 10.5.25 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there are no Existing Permitted Areas or Allocated Areas within Section 1.
- 10.5.26 A review of the Minerals Local Plan (2002) indicates that there is one area of proposed opencast constraint within the draft Order Limits of Section 1 named Hardwick Hall.

Section 2: Tibshelf to Ripley

- 10.5.27 A review of the available data indicates that Section 2 is located within a coal measures safeguarded resource area.
- 10.5.28 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there are no Existing Permitted Areas or Allocated Areas within Section 2.

Section 3: Ripley to Morley

- 10.5.29 A review of the available data indicates that Section 3 is located within a coal measures safeguarded resource area. Part of the area is also within a sandstone/gritstone safeguarded area.
- 10.5.30 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there are no Existing Permitted Areas or Allocated Areas within Section 3.
- 10.5.31 A review of the Minerals Local Plan (2002) indicates that there is one area of proposed opencast constraint within the draft Order Limits of Section 3 named Horsley.

Section 4: Morley to Ockbrook

- 10.5.32 A review of the available data indicates that the northern half of Section 4 is located within a coal measures safeguarded resource area. The southern half of Section 4 is not located within an area designated as a safeguarded resource area.
- 10.5.33 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there are no Existing Permitted Areas or Allocated Areas within Section 4.

Section 5: Ockbrook to Aston-on-Trent

- 10.5.34 A review of the available data indicates that the majority of Section 5 is located within a Sand and Gravel safeguarded resources area.

- 10.5.35 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there is one Existing Permitted Area within the draft Order Limits of Section 5. The Existing Permitted Area is named Elvaston and is located between the villages of Elvaston and Ambaston (see **Sheet 13 of Figure 10.4 Mineral Resources in Volume 2**).
- 10.5.36 The nearest Allocated Area is located approximately 1 km west of the draft Order Limits for Section 5.

Section 6: Aston-on-Trent to Willington Substation

- 10.5.37 A review of the available data indicates that the majority of Section 6 is located within a Sand and Gravel safeguarded resource area (see **Sheets 14 to 16 of Figure 10.4 Mineral Resources in Volume 2**).
- 10.5.38 A review of the Minerals Local Plan (2002) and pre-submission draft Minerals Local Plan (2023) and policies maps indicates that there are no Existing Permitted Areas or Allocated Areas within Section 6.
- 10.5.39 The nearest Allocated Area is located approximately 390 m south of the draft Order Limits for Section 6.
- 10.5.40 The nearest Existing Permitted Area is located approximately 90 m east of the draft Order Limits for Section 6.

Coal mining

- 10.5.41 The information in the paragraphs that follow provides a brief overview of the coal mining and associated features identified in the draft Order Limits. Information relating to coal mining has been sourced from Project specific Mining Remediation Authority Consultants Coal Mining Reports (provided in **Annex 10A.3 of Appendix 10A Geo-Environmental Preliminary Risk Assessment**) and the Mining Remediation Authority interactive map viewer (Ref 10.55).
- 10.5.42 Coal mining features such as Development High Risk Areas (DHRA), coal outcrops, shafts/mine entries/adits, shallow workings and surface ground workings are shown on **Figure 10.5 Coal Mining Features in Volume 2**.
- 10.5.43 The Mining Remediation Authority interactive map viewer indicates that Sections 1, 2, 3, and much of Section 4 display coal outcrops, potential shallow mine workings, areas of past and present surface mining, mine entries and zones that may be influenced by mine entries. Sections 5, 6, and the southern third of Section 4 do not show coal outcrops as these locations are outside the boundaries of the East Midlands coalfield.
- 10.5.44 Given that a significant proportion of the proposed route alignment lies within coal mining DHRAs, a coal mining risk assessment will be completed to determine the potential for coal mining hazards to affect the structural integrity of the new pylons. The coal mining risk assessment will include information provided by the Mining Remediation Authority (Consultants Coal Mining Reports (provided in **Annex 10A.3 of Appendix 10A Geo-Environmental Preliminary Risk Assessment**)) and further engagement with the Mining Remediation Authority. Further engagement with the Mining Remediation Authority will include discussion in relation to micro-siting of the pylons and the necessary permits required during construction and preceding ground investigation. Each pylon location in DHRAs will be assessed to determine the ultimate risk rating, which will be presented as either High, Medium or Low.

Unexploded Ordnance (UXO)

10.5.45 A UXO Desk Study and Constraints Assessment has been completed by Zetica UK Ltd (Ref 10.63). A summary of the nearby UXO records and associated historical hazards (anti-aircraft defences, anti-invasion defences, small arms ranges, aircraft crashes, military airfields, explosives and ordnance factories, munitions depots and disposal areas and military training areas) and 500 m buffer zones is presented in the following sections and is shown in **Figure 10.6 Unexploded Ordnance (UXO)** in **Volume 2**.

Section 1

10.5.46 No UXO or associated historical hazards were identified within the draft Order Limits of Section 1 of the Project. The nearest identified hazard is located 550 m west of pylon 32 (pylon 32 is to the east of Pilsley) and is detailed as an aircraft crash. The UXO report indicated a low hazard level to Section 1.

Section 2, Section 3 and Section 4

10.5.47 No UXO or associated historical hazards were identified within or within 1 km of the draft Order Limits of Sections 2, 3 and 4.

Section 5

- 10.5.48 One UXO/associated historical hazard is located within the draft Order Limits of Section 5. This hazard is located a maximum of 10 m within the draft Order Limits and is located 155 m west of pylon 145 (to the east of Thulston). The hazard is detailed as a searchlight position with a possible Light Anti-Aircraft gun and associated accommodation camp. The UXO report indicated a low hazard level to Section 5.
- 10.5.49 The 500 m hazard buffer zones associated with two bombing decoy sites extend to within the draft Order Limits of Section 5 of the Project; further details are provided below.
- 10.5.50 The first bombing decoy site is located 445 m south east of pylon 141 (to the east of Ambaston). The 500 m hazard buffer zone encompasses pylons 141 and 142. This hazard is detailed as a bombing decoy site that used lighting to simulate an urban area and intended to deflect bombing away from central Derby. The UXO report indicates this constraint presents a high UXO hazard level.
- 10.5.51 The second bombing decoy site is located 600 m south east of pylon 152 (to the east of Chellaston). The 500 m hazard buffer zone is located 100 m south of pylon 152 and 90 m east of pylon 153. This hazard is detailed as a bombing decoy site that used both lighting and controlled fires to simulate an urban area/burning urban area, respectively. The UXO report indicates this constraint presents a high UXO hazard level.

Section 6

10.5.52 One UXO/associated historical hazard is located within the draft Order Limits of Section 6, approximately 118 m north east of pylon 179 (to the north of Twyford). The hazard is detailed as a small arms range (Derby Rifle and Pistol Club) which had three ranges used for competition shooting. The UXO report indicated a low hazard level to Section 6.

10.5.53 The 500 m hazard buffer zone that surrounds one bombing decoy site extends to within the draft Order Limits of Section 6. The bombing decoy site is located 640 m north of pylon 167 (to the north east of Barrow upon Trent). The 500 m hazard buffer zone is located 138 m north of pylon 166, 142 m north of pylon 167 and 40 m north east of pylon 168. The hazard is detailed as a bombing decoy site that used lighting to simulate an urban area and intended to deflect bombing away from central Derby. The UXO report indicates this constraint presents a high UXO hazard level.

Geo-conservation

10.5.54 A review of the Groundsure Enviro+Geo Insight reports and available information on the Defra MAGIC viewer indicates that there are no UNESCO Global Geoparks or geological SSSIs within the Study Area.

10.5.55 Three RIGS have been identified within the Study Area as summarised in **Table 10.10**.

Table 10.10: Regionally important geological sites within or within 250 m of the draft Order Limits

RIGS Name	Location	Description
Coxbench Quarries	Section 3 Eastern extent of the RIGS is approximately 200 m to the south west of the draft Order Limits, approximately 68 m to the south west of pylon 99.	Coarse sandstone showing cross-bedding and large ferruginous concretions. Historic interest, exposures are overgrown but the adjacent later and larger Coxbench Quarry has been infilled.
Dunnshill	Section 4 Eastern extent of the RIGS encroaches slightly into the draft Order Limits. Boundary of the RIGS approximately 370 m to the north east of pylon 120.	Exposures of Lower Mottled Sandstone and junction with Bunter Pebble Beds. Numerous dry valley features in the escarpment, together with surface gravels (possibly periglacial), head deposits and cambering.
Sinfin Moor	Section 6 Pylon 163 is situated within the RIGS. The RIGS extensive area extending to the north of the draft Order Limits.	A large area that has been identified as a glacial lake. Underlain by gleyed, calcareous blue-grey lacustrine clays containing a molluscan fauna.

Potentially contaminative land uses

- 10.5.56 Potentially contaminative land uses identified within the Groundsure Enviro+Geo Insight reports are detailed within **Appendix 10A Geo-Environmental Preliminary Risk Assessment in Volume 3** and their locations are shown on **Figure 10.7 Potential Contaminative Land Uses in Volume 2**, and the locations of historical and authorised landfills are shown on **Figure 10.8 Landfill Sites in Volume 2**.
- 10.5.57 Whilst the majority of the Study Area appears to be agricultural land, areas of potentially contaminative land uses were identified. The following potential sources of contamination were identified across the Study Area:
- mineral extraction features (opencasts, collieries, spoil heaps, shafts);
 - railway land;
 - waste exemptions (storage of sludge);
 - potentially infilled land;
 - waste activities (landfill and construction and demolition waste);
 - a licensed pollutant release (unloading of petrol into tanks);
 - licensed discharge of sewage;
 - sewage works; and
 - a power station.

10.5.58 Based on this evidence there is potential for contaminated land to exist within the draft Order Limits.

10.5.59 A summary of the potentially contaminative land uses identified at each Section with the potential to be disturbed and mobilised during the construction of the Project is provided below.

Section 1: Chesterfield to Tibshelf

10.5.60 The land use of Section 1 is characterised as agricultural but has a history of mineral extraction (coal mining) which is highlighted by the number of opencasts, outcrops and shafts/adits identified on **Figure 10.5 Coal Mining Features in Volume 2**. A total of 27 sources were identified in relation to mineral extraction in Section 1.

10.5.61 Other examples of potentially contaminative land uses identified in Section 1 include:

- three sources related to railway land;
- three sources related to waste exemptions (storage of sludge); and
- one source related to a licensed pollutant release (unloading of petrol into tanks).

10.5.62 No active or recent landfill sites were recorded within 250 m of the draft Order Limits for Section 1.

10.5.63 There are three historical landfills recorded within the draft Order Limits for Section 1. No historical landfill sites are located within 250 m of the draft Order Limits. None of the identified historical landfill sites were considered as a potential source of contamination to the Project due to their distance and location from the Project.

Section 2: Tibshelf to Ripley

10.5.64 The land use of Section 2 is characterised as agricultural but has a history of mineral extraction (coal mining) which is highlighted by the number of opencasts, outcrops

and shafts/adits identified on **Figure 10.5 Coal Mining Features in Volume 2**. A total of 10 sources were identified in relation to mineral extraction in Section 2.

- 10.5.65 Other examples of potentially contaminative land uses identified in Section 2 include:
- one source related to railway land;
 - three sources related to potentially infilled land;
 - one source related to waste activity landfill;
 - one source related to a licensed discharge of sewage; and
 - one source related to a sewage works.
- 10.5.66 No active or recent landfill sites were recorded within 250 m of the draft Order Limits.
- 10.5.67 There is one historical landfill recorded within the draft Order Limits of Section 2. The landfill has been considered as a potentially contaminative land use. No historical landfill sites are located within 250 m of the draft Order Limits.

Section 3: Ripley to Morley

- 10.5.68 The land use of Section 3 is characterised as agricultural but has a history of mineral extraction (coal mining) which is highlighted by the number of opencasts, outcrops and shafts/adits identified on **Figure 10.5 Coal Mining Features in Volume 2**. A total of 11 sources were identified in relation to mineral extraction in Section 3.
- 10.5.69 Other examples of potentially contaminative land uses identified in Section 3 include:
- eight sources related to railway land;
 - one source related to a licensed discharge of sewage;
 - two sources related to a sewage works; and
 - one source related to waste activity (landfill).
- 10.5.70 No active or recent landfill sites were recorded within 250 m of the draft Order Limits.
- 10.5.71 There is one historical landfill recorded within the draft Order Limits for Section 3. The landfill has been considered as a potentially contaminative land use in Section 3.
- 10.5.72 One historical landfill site is located within 250 m of the draft Order Limits of Section 3. This historical landfill is located approximately 294 m east of pylon 85 and is named Cinderhill Farm. This landfill site was used as a tar and ash disposal site until it was closed in 1978. This area has been determined as Contaminated Land and designated as a Special Site under section 78C of Part 2A of the Environmental Protection Act 1990 (Ref 10.1). Due to its distance from the Project, it has not been included as a potentially contaminative land use in Section 3.

Section 4: Morley to Ockbrook

- 10.5.73 The land use of Section 4 is characterised as agricultural; however, the northern half of this section has a history of mineral extraction (coal mining) which is highlighted by the number of opencasts, outcrops and shafts/adits identified in the northern half of Section 4 on **Figure 10.5 Coal Mining Features in Volume 2**. A total of three sources were identified in relation to mineral extraction in Section 4.

- 10.5.74 One other potentially contaminative land use was identified in Section 4 and was detailed as a waste activity (construction and demolition waste).
- 10.5.75 No active or recent landfill sites were recorded within 250 m of the draft Order Limits. No historical landfills were recorded within the draft Order Limits of Section 4 or within 250 m of the draft Order Limits of Section 4.

Section 5: Ockbrook to Aston-on-Trent

- 10.5.76 The land use of Section 5 is characterised as agricultural and has no history of coal mining mineral extraction.
- 10.5.77 Four types of potentially contaminative land uses were identified in Section 5, including:
- one source related to potentially infilled land;
 - one source related to railway land;
 - one source related to a licensed discharge of sewage; and
 - one source related to waste activity (landfill).
- 10.5.78 No active or recent landfill sites were recorded within 250 m of the draft Order Limits.
- 10.5.79 Four historical landfill sites were recorded within the draft Order Limits of Section 5 and were all related to Elvaston Quarry. One landfill has been considered as a potentially contaminative land use due to it being located beneath two proposed pylons (pylons 141 and 142) of the Project.
- 10.5.80 One historical landfill site was located within 250 m of the draft Order Limits.

Section 6: Aston-on-Trent to Willington Substation

- 10.5.81 The land use of Section 6 is characterised as agricultural and has no history of coal mining mineral extraction. A key feature of note within Section 6 is the Willington Power Station which is present at the end of Section 6.
- 10.5.82 Five types of potentially contaminative land uses were identified in Section 6, including:
- one source related to railway land;
 - one source related to potentially infilled land;
 - one source related to a power station;
 - two sources related to a mineral extraction; and
 - one source related to waste activity (landfill).
- 10.5.83 No active or recent landfill sites were recorded within 250 m of the draft Order Limits.
- 10.5.84 There was one historical landfill recorded within the draft Order Limits of Section 6. Six historical landfill sites are located within 250 m of the draft Order Limits. None of the identified historical landfill sites were considered as a potential source of contamination to the Project due to their distance and location.

Topography

- 10.5.85 The topography at the proposed new Chesterfield Substation is generally level in the region of 108 m Above Ordnance Datum (m AOD). The topography to the south and west falls gently towards the A617 and 'Calow Brook' located approximately 450 m south of the substation with an approximate elevation of 90 m AOD.
- 10.5.86 The topography of Sections 1 to 3 is gently undulating except in localised areas near watercourses and at road or railway cuttings and embankments. The elevation of the route sections is between approximately 56 m AOD and 185 m AOD. The highest elevation area on the proposed route alignment is near to the village of Hardstoft located in Section 1.
- 10.5.87 The elevation of Sections 4 ranges from approximately 136 m AOD to 35 m AOD between the start and end of Section 4. The elevation of Sections 5 and 6 remains generally consistent with an elevation of around 70 m AOD at the start of Section 5 and 45 m AOD at the end of Section 6.
- 10.5.88 The topography at the Willington Substation is generally level in the region of 45 m AOD. The topography to the south and south east decreases in elevation towards the River Trent which is located approximately 0.9 km south of the last pylon (pylon 186).

Groundwater levels and flows

- 10.5.89 Groundwater level data has been collected from several local historical boreholes located within the 500 m hydrogeology Study Area. A data search was conducted on BGS borehole records (Ref 10.54) to gather historical information on groundwater levels. Where the groundwater level dataset is not sufficient for the area within the 500 m hydrogeology Study Area, the groundwater level from outside of the buffer has been used.

Section 1: Chesterfield to Tibshelf

- 10.5.90 Groundwater strikes were identified at one borehole record at 19 m Below Ground Level (BGL) (124.8 m AOD) with seepage from 12.50 m BGL (131.3 m AOD). Groundwater was not encountered in multiple boreholes with depths ranging from 105 m AOD and 130 m AOD. The groundwater strike was encountered within fragmented siltstone and sandstone with seepage from weathered silty mudstone.

Section 2: Tibshelf to Ripley

- 10.5.91 Groundwater strikes have been recorded in multiple borehole records throughout Section 2. The water strikes ranged from 2.75 m BGL to 23 m BGL (125.25 m AOD to 131.66 m AOD) within shale and weathered mudstone. Groundwater seepages were recorded 3.7 – 6 m BGL (95.02 m AOD to 131.66 m AOD) within shale/mudstone and silty clay.

Section 3: Ripley to Morley

- 10.5.92 Groundwater seepages have been recorded in several borehole records within Section 3 at approximately 3.5 m BGL to 15 m BGL (68.70 m AOD to 130.21 m AOD) within silty mudstone, predominately in areas of fracturing or sandy layers. Groundwater was not encountered in multiple boreholes with depths ranging from 94.68 m AOD to 123.11 m AOD.

Section 4: Morley to Ockbrook

- 10.5.93 Groundwater levels have not been recorded in any borehole records within Section 4. The geology was noted as becoming wet during drilling at two locations at 26.30 m BGL to 34 m BGL (50.03 m AOD to 53.54 m AOD) within sandstone and mudstone. Groundwater was not encountered in multiple boreholes with depths ranging from 49.56 m AOD to 75.47 m AOD.

Section 5: Ockbrook to Aston-on-Trent

- 10.5.94 Groundwater strikes have been recorded in multiple borehole records throughout Section 5 at approximately 2.7 m BGL to 10 m BGL (28.37 m AOD to 37.58 m AOD) within sands and gravels and Keuper Marl. Groundwater levels were recorded at approximately 2.29 m BGL to 9.10 m BGL (30.88 m AOD to 41.82 m AOD) within sands and gravels and Keuper Marl. Groundwater seepages were recorded at approximately 2.0 m BGL to 9.0 m BGL (29.42 m AOD to 38.73 m AOD) within sands and gravels and Keuper Marl.

Section 6: Aston-on-Trent to Willington Substation

- 10.5.95 Groundwater strikes have been recorded in multiple borehole records throughout Section 6 at approximately 0.90 m BGL to 25 m BGL (29.89 m AOD to 52.88 m AOD) within sands and gravels and alluvium. Groundwater levels were recorded at approximately 0.35 m BGL to 19.10 m BGL (35.79 m AOD to 53.78 m AOD) within sand and gravels, weathered sandy clay, and clay with gravel and sandstone fragments. Groundwater was not encountered in multiple boreholes with depths ranging from 39.40 m AOD to 43.49 m AOD.

Groundwater source protection zone and abstractions

- 10.5.96 Information on licensed groundwater SPZs and abstractions located within the 500 m hydrogeology Study Area has been obtained from Groundsure reports and the Environment Agency (abstraction licence information provided by the Environment Agency in February 2025 is presented in **Annex A10.8 of Appendix 10A Geo-Environmental Preliminary Risk Assessment**).
- 10.5.97 The relevant local authorities were contacted on 17 July 2025 to request information they held on private (unlicensed) water supplies. **Table 10.11** outlines the responses from the relevant local authorities.

Table 10.11: Local authorities' responses to data request

Local Authority	Sections Included Within District	Response Received
North East Derbyshire District Council	1 and 2	Response received on 28 July 2025
Bolsover District Council	1 and 2	Response received on 1 August 2025
Amber Valley Borough Council	2 and 3	No response at time of publication

Local Authority	Sections Included Within District	Response Received
Erewash Borough Council	3, 4 and 5	No response at time of publication
South Derbyshire District Council	5 and 6	No response at time of publication
Derby City Council	6	No response at time of publication

10.5.98 Every effort has been made to identify and obtain information on private, unlicensed groundwater abstractions. However, it remains a possibility that some local properties rely on private water supplies that either have not been recorded within the dataset received, or their locations are not known.

10.5.99 Groundwater SPZs and licensed abstractions have been mapped across the draft Order Limits and are provided in **Figure 10.9 Source Protection Zones & Groundwater Abstraction Licence Points** in **Volume 2**.

Section 1: Chesterfield to Tibshelf

10.5.100 There are no active licensed groundwater abstractions or groundwater SPZs identified within the 500 m hydrogeology Study Area.

10.5.101 From the information provided by North East Derbyshire District Council, there are no known identified private water supplies within North East Derbyshire within the 500 m hydrogeology Study Area.

10.5.102 Bolsover District Council confirmed that there are no known private water supplies to any council owned housing and none of the corporate properties have private water supplies within their district.

Section 2: Tibshelf to Ripley

10.5.103 There are no active licensed groundwater abstractions or groundwater SPZs identified within the 500 m hydrogeology Study Area.

10.5.104 From the information provided by North East Derbyshire District Council, there are no known identified private water supplies within North East Derbyshire within the 500 m hydrogeology Study Area.

10.5.105 Bolsover District Council confirmed that there are no known private water supplies to any council owned housing and none of the corporate properties have private water supplies within their district.

Section 3: Ripley to Morley

10.5.106 There are no active licensed groundwater abstractions or groundwater SPZs identified within the 500 m hydrogeology Study Area.

10.5.107 A response in relation to known private water supplies has not yet been received from the relevant local authority.

Section 4: Morley to Ockbrook

- 10.5.108 There are no active licensed groundwater abstractions or groundwater SPZs identified within the 500 m hydrogeology Study Area.
- 10.5.109 A response in relation to known private water supplies has not yet been received from the relevant local authority.

Section 5: Ockbrook to Aston-on-Trent

- 10.5.110 There are no active licensed groundwater abstractions identified within the draft Order Limits of Section 5. There is one active licensed groundwater abstraction identified within the 500 m hydrogeology Study Area; this is summarised in **Table 10.12**.
- 10.5.111 There are no groundwater SPZs identified within 500 m of the draft Order Limits.

Table 10.12: Section 5 – groundwater abstractions identified within the 500 m hydrogeology Study Area

Name	Purpose	Distance/Direction from draft Order Limits (m)	Easting	Northing	Annual Abstraction Volume (m ³)
Bellington Hill Quarry – Catchpit	Industrial, Commercial and Public Services	333 m south east	442860	331560	8,500

- 10.5.112 A response in relation to known private water supplies has not yet been received from the relevant local authority.

Section 6: Aston-on-Trent to Willington Substation

- 10.5.113 There are no active licensed groundwater abstractions identified within the draft Order Limits of Section 6. There are two active licensed groundwater abstractions identified within the 500 m hydrogeology Study Area of Section 6; these are summarised in **Table 10.13**.
- 10.5.114 There are no groundwater SPZs identified within the 500 m hydrogeology Study Area.

Table 10.13: Section 6 – groundwater abstractions identified within the 500 m hydrogeology Study Area

Name	Purpose	Distance/Direction from draft Order Limits (m)	Easting	Northing	Annual Abstraction Volume (m ³)
Swarkestone Quarry – Dewatering Area	Dewatering	387 m south	433988	328377	5,725,152

Name	Purpose	Distance/Direction from draft Order Limits (m)	Easting	Northing	Annual Abstraction Volume (m ³)
Swarkestone Quarry – Catchpit	Industrial, Commercial and Public Services	414 m south	434350	328350	1,000,000

10.5.115 A response in relation to known private water supplies has not yet been received from the relevant local authority.

Groundwater quality and vulnerability

10.5.116 Groundwater vulnerability refers to the overall risk to groundwater from a particular activity, development or pollution event. Groundwater vulnerability is described as High, Medium or Low.

10.5.117 High groundwater vulnerability areas can easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits. Low groundwater vulnerability areas provide the greatest protection from pollution. They are likely characterised by low leaching soils and/or the presence of superficial deposits of low permeability. Medium groundwater vulnerability areas have an intermediate vulnerability, between high and low vulnerability.

10.5.118 Groundwater vulnerability, groundwater body WFD status and nitrate vulnerable zone data has been obtained from Groundsure reports.

10.5.119 Groundwater vulnerability mapping across the draft Order Limits is provided in **Figure 10.10 Groundwater Vulnerability** in **Volume 2**.

10.5.120 Potential sources of existing ground contamination, where groundwater could act as a contaminant pathway, have been identified from Groundsure reports.

Section 1: Chesterfield to Tibshelf

10.5.121 Most of the area within the draft Order Limits of Section 1 is designated as having 'medium' groundwater vulnerability, with a small area of 'high' vulnerability.

10.5.122 There are no groundwater nitrate vulnerable zones within the 500 m hydrogeology Study Area.

10.5.123 Section 1 of the Project is underlain by the Derwent – Secondary Combined Water Body (GB40402G990400) and the Don and Rother Millstone grit and Coal Measures Water Body (GB40402G992300). Both water bodies have a current 2019 Cycle 3 assessment of Poor chemical status (Good quantitative status) and Poor overall status.

10.5.124 Five current or recent petrol stations and three historical petrol stations have been identified within the 500 m hydrogeology Study Area of Section 1.

10.5.125 Twelve historical landfills have been identified within 500 m of the draft Order Limits. One historical landfill site, located 313 m north west of the draft Order Limits, is a site determined as potentially contaminated land. No active or recent landfills have been identified within the 500 m hydrogeology Study Area.

10.5.126 Two historical scrap yards have been identified within the 500 m hydrogeology Study Area.

Section 2: Tibshelf to Ripley

10.5.127 Most of the area within the draft Order Limits of Section 2 is designated as having 'medium' groundwater vulnerability, with a small area of 'high' vulnerability.

10.5.128 There are no groundwater nitrate vulnerable zones within the 500 m hydrogeology Study Area.

10.5.129 Section 2 of the Project is underlain by the Derwent – Secondary Combined Water Body (GB40402G990400). This water body has a current 2019 Cycle 3 assessment of Poor chemical status (Good quantitative status) and Poor overall status.

10.5.130 Three current or recent petrol stations and three historical petrol stations have been identified within the 500 m hydrogeology Study Area.

10.5.131 Four historical landfills have been identified within the 500 m hydrogeology Study Area. No active or recent landfills have been identified within the 500 m hydrogeology Study Area.

10.5.132 No scrap yards have been identified within the 500 m hydrogeology Study Area.

Section 3: Ripley to Morley

10.5.133 The area within the draft Order Limits of Section 3 is designated as having 'medium' groundwater vulnerability (predominately to the north of the section) and 'high' groundwater vulnerability (predominately to the south of the section).

10.5.134 The Breadsall groundwater nitrate vulnerable zone (Protected Area ID: G172) is located 94 m west of the draft Order Limits.

10.5.135 Section 3 of the Project is underlain by the Derwent – Secondary Combined Water Body (GB40402G990400) and the Lower Trent Erewash Coal Measures Water Body (GB40402G303200). The Derwent – Secondary Combined Water Body has a current 2019 Cycle 3 assessment of Poor chemical status (Good quantitative status) and Poor overall status. The Lower Trent Erewash Coal Measures Water Body has a current 2019 Cycle 3 assessment of Good chemical status (Good quantitative status) and Good overall status.

10.5.136 Two current or recent petrol stations and one historical petrol station have been identified within the 500 m hydrogeology Study Area.

10.5.137 Ten historical landfills have been identified within the 500 m hydrogeology Study Area. No active or recent landfills have been identified within the 500 m hydrogeology Study Area.

10.5.138 No scrap yards have been identified within the 500 m hydrogeology Study Area.

Section 4: Morley to Ockbrook

- 10.5.139 The groundwater vulnerability designation for the area within the draft Order Limits of Section 4 includes 'high', 'medium' and 'low'.
- 10.5.140 The Breadsall groundwater nitrate vulnerable zone (Protected Area ID: G172) is located 149 m south west of the draft Order Limits.
- 10.5.141 Section 4 of the Project is underlain by the Derwent – Secondary Combined Water Body (GB40402G990400), Idle Torne Permo-Triassic (PT) Sandstone Nottinghamshire and Doncaster Water Body (GB40401G301500), Lower Trent Erewash – Secondary Combined Water Body (GB40402G990300) and the Lower Trent Erewash Coal Measures Water Body (GB40402G303200).
- 10.5.142 The Derwent – Secondary Combined Water Body has a current 2019 Cycle 3 assessment of Poor chemical status (Good quantitative status) and Poor overall status. The Idle Torne PT Sandstone Water Body has a current 2019 Cycle 3 assessment of Poor chemical status (Poor quantitative status) and Poor overall status. Both the Lower Trent water bodies (Erewash – Secondary Combined and Coal Measures) have a current 2019 Cycle 3 assessment of Good chemical status (Good quantitative status) and Good overall status.
- 10.5.143 One current or recent petrol station has been identified within the 500 m hydrogeology Study Area. There have been no historical petrol stations identified within 500 m of the draft Order Limits.
- 10.5.144 Two historical landfills have been identified within the 500 m hydrogeology Study Area. No active or recent landfills have been identified within the 500 m hydrogeology Study Area.
- 10.5.145 No scrap yards have been identified within the 500 m hydrogeology Study Area.

Section 5: Ockbrook to Aston-on-Trent

- 10.5.146 The groundwater vulnerability designation for the area within the draft Order Limits of Section 5 is predominately 'high', with some areas of 'medium' and 'low'.
- 10.5.147 There are no groundwater nitrate vulnerable zones within 500 m of the draft Order Limits.
- 10.5.148 Section 5 of the Project is underlain by the Derwent – Secondary Combined Water Body (GB40402G990400) and the Lower Trent Erewash – Secondary Combined Water Body (GB40402G990300). The Derwent – Secondary Combined Water Body has a current 2019 Cycle 3 assessment of Poor chemical status (Good quantitative status) and Poor overall status. The Lower Trent Erewash – Secondary Combined has a current 2019 Cycle 3 assessment of Good chemical status (Good quantitative status) and Good overall status.
- 10.5.149 One current or recent petrol station has been identified within the 500 m hydrogeology Study Area. There have been no historical petrol stations identified within the 500 m hydrogeology Study Area.
- 10.5.150 Fifteen historical landfills have been identified within the 500 m hydrogeology Study Area. No active or recent landfills have been identified within the 500 m hydrogeology Study Area.
- 10.5.151 Two historical scrap yards have been identified within the 500 m hydrogeology Study Area.

Section 6: Aston-on-Trent to Willington Substation

- 10.5.152 The groundwater vulnerability designation for the area within the draft Order Limits of Section 6 is predominately 'high', with some small areas of 'medium'.
- 10.5.153 The Burton groundwater nitrate vulnerable zone (Protected Area ID: G34) is located within the hydrogeology Study Area.
- 10.5.154 Section 6 of the Project is underlain by the Lower Trent Erewash – Secondary Combined Water Body (GB40402G990300). This water body has a current 2019 Cycle 3 assessment of Good chemical status (Good quantitative status) and Good overall status.
- 10.5.155 One current or recent petrol station and one historical petrol station have been identified within 500 m of the draft Order Limits.
- 10.5.156 Eleven historical landfills have been identified within 500 m of the draft Order Limits of Section 6. No active or recent landfills have been identified within 500 m of the draft Order Limits.
- 10.5.157 Two historical scrap yards have been identified within 500 m of the draft Order Limits.

Groundwater flooding

- 10.5.158 Groundwater flooding usually occurs in low-lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Shallow groundwater levels can be expected near surface watercourses which are typical receptors for groundwater flow.
- 10.5.159 Groundwater flooding is caused by the emergence of water from beneath the ground, either at point source or diffuse locations. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.
- 10.5.160 Information on groundwater flood risk has been obtained from the Groundsure reports and is summarised in **Table 10.14**.

Table 10.14: Groundwater flood risk within the 500 m hydrogeology Study Area

Section	Groundwater Flood Risk
Section 1	Predominately negligible, with some small areas of low risk
Section 2	Predominately negligible, with some small areas of low risk
Section 3	Predominately negligible, with some small areas of low risk
Section 4	Predominately negligible, with some small areas of low risk
Section 5	Predominately low, with some areas of negligible risk and localised small areas of moderate risk. The areas of moderate risk are in the region of the proposed route alignment however and are not in the vicinity of any proposed substation construction

Section	Groundwater Flood Risk
Section 6	Predominately low, with some areas of moderate and negligible risk. The areas of moderate risk are predominately located towards the west of Section 6, in the region of the Willington Substation

10.5.161 Springs OS mapping (OS layer on Bing (Ref 10.56)) has been used to identify marked springs within the 500 m hydrogeology Study Area. These are summarised in **Table 10.15**.

Table 10.15: Springs identified within the 500 m hydrogeology Study Area

Section	Grid Reference	Location
Section 1	444103, 362761	Near Ridlocks Wood, Hardstoft, approximately 334 m north east of the draft Order Limits
Section 2	438505, 352358	Pentrich Home Farm, Pentrich
Section 3	436556, 346859	High Wood, Belper, approximately 450 m west of the draft Order Limits
	436815, 345726	Booths Wood, Kilburn, approximately 80 m west of the draft Order Limits
	437995, 343538	Sandy Lane, Horsley
Section 4	443166, 338761	Closes Farm, Dale Abbey, approximately 430 m east of the draft Order Limits
	443496, 337074	Little London, Spondon, approximately 500 m north east of the draft Order Limits
Section 5	No springs identified within the Study Area	
Section 6		

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

10.5.162 The presence of GWDTE within and in the vicinity of the 500 m hydrogeology Study Area have been identified using Groundsure reports and Google Earth (Ref 10.59).

10.5.163 GWDTE identified within the Study Area are shown in **Figure 10.11 Groundwater Dependent Terrestrial Ecosystems (GWDTE)** in **Volume 2** and are summarised in **Table 10.16**.

Table 10.16: GWDTE identified within and close to the 500 m hydrogeology Study Area

Section	GWDTE Description	Location
Section 1	No GWDTE identified within the Study Area	
Section 2		
Section 3		
Section 4	Morley Brick Pits (SSSI) – consists of a series of flooded pits, originally dug for clay and which now contain acidic water colonised by a range of plants and animals several of which are becoming rare in Derbyshire	15 m south west of the draft Order Limits
	Breadsall Railway Cutting (SSSI), has a variety of wildlife habitats that are uncommon to disused railways and not found elsewhere on the edge of Derby	531 m south west of the draft Order Limits
Section 5	No GWDTE identified within the Study Area	
Section 6		

Baseline – summary of identified receptors

10.5.164 Following a review of the available baseline information, the following key sensitive geology and hydrogeology receptors have been identified:

- geology and minerals:
 - mineral resources; and
 - RIGS.
- hydrogeology:
 - Principal and Secondary A Aquifers;
 - springs;
 - groundwater abstractions; and
 - GWDTE.
- contaminated land:
 - human health (construction workers and future site users); and
 - controlled waters (surface water and groundwater).

Future Baseline

10.5.165 The future baseline relates to known or foreseeable changes to the current baseline in the future, against which the effects of the Project during construction and

operation can be assessed. Specifically, it accounts for anticipated changes including those caused by changing climatic conditions, policy, legislation and by other confirmed development projects which would be complete prior to construction of the Project.

- 10.5.166 The future baseline for geology and hydrogeology is not expected to change within the timeframe of the Project, during construction and operation, which is assumed to be approximately 80 years. It is assumed that any man-made changes (for example due to new developments) would be appropriately permitted and operated to prevent or limit adverse impacts to ground conditions or controlled waters.

10.6 Design Embedded and Good Practice Mitigation Measures

- 10.6.1 As set out in **Chapter 5 Approach to Preliminary Environmental Information Report**, mitigation measures fall into one of three categories: design embedded mitigation measures; good practice measures; and additional mitigation measures. Those measures relevant to the assessment of geology and hydrogeology effects are set out below.

Design Embedded Mitigation Measures

- 10.6.2 An optioneering study, as described in **Chapter 3 Main Alternatives Considered**, has been undertaken to identify the preferred route alignment to ensure that, where reasonably practicable, environmental effects are avoided or reduced. This includes avoiding geological SSSIs, mining shafts and adits, authorised and historical landfills, groundwater SPZs and international sites designated for nature conservation, including those which support ecosystems that rely on groundwater.
- 10.6.3 Further embedded design measures will be developed as the Project design evolves.

Good Practice Mitigation Measures

- 10.6.4 A range of standard good practice mitigation measures for the Project would be adopted throughout the duration of the construction phase. **Appendix 4A Draft Outline Code of Construction Practice in Volume 3** presents the likely good practice mitigation measures relevant to geology and hydrogeology. These include but are not limited to:
- GH01: Geo-environmental and geotechnical intrusive and non-intrusive ground investigations and assessment would be undertaken in accordance with current (at the time of the works) best practice including BS 5930 (Ref 10.29), BS 10175 (Ref 10.28), Eurocode 7 (Ref 10.30) and LCRM (Ref 10.26) which would inform, if required, a site remediation strategy, slope stability assessments, foundation design, and piling risk assessments where appropriate. This would be undertaken as part of the detailed pre-construction survey and design for implementation during construction.
 - GH02: Construction methods such as appropriate piling techniques (if required) to minimise the risk of mixing of aquifer bodies through the creation of new pathways would be utilised. Foundation Works Risk Assessments would be undertaken in accordance with the CL:AIRE guidance Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination (Ref 10.42) to understand potential impacts on controlled waters (where it has not been possible

to avoid through design). Where required, this would include suitable mitigation measures to minimise potential effects.

- GH03: Use of appropriate occupational health and safety measures, e.g. Personal Protective Equipment (PPE), and statutory health and safety compliance (e.g. compliance with the Confined Spaces Regulations 1997 (Ref 10.12) in relation to ground gas from working in confined spaces/trenches) to minimise the risks associated with anticipated/unexpected contamination. This would be based on risk assessments informed by site specific information.
- GH04: Use and storage of chemicals would be undertaken in accordance with the Defra and Environment Agency Guidance: Pollution Prevention for Business (Ref 10.65).
- GH05: The control of earthworks or materials movement (including any reuse of materials) would be undertaken under appropriate Environmental Permits, exemptions or Contaminated Land: Applications in Real Environments The Definition of Waste: The development industry Code of Practice (CL:AIRE DoWCoP) (Ref 10.66).
- GH06: Any temporary dewatering activities or abstraction from watercourses during construction would be undertaken in accordance with relevant Environment Agency guidance, and if required, an Abstraction Licence and Environmental Permit (for the discharge) and would be limited to the depth and time required to facilitate construction activities.
- GH07: Establishment of a protocol, including measures to prevent mobilisation, in the event of any unexpected contamination being discovered during the construction phase.
- GH08: Engagement and confirmation with the local authority and the Mining Remediation Authority, if appropriate, prior to construction to ensure minimal mineral sterilisation.
- GH09: An Emergency Response Plan would be developed for the construction phase which would outline procedures to be implemented in case of unplanned events such as accidental spillages or leaks.

10.6.5 Given the nature of the Project in regard to electricity transmission, the Project will be operated remotely with site visits limited to annual inspections, routine maintenance and repairs and refurbishments. Good practice measures relevant to the specific site based tasks will be implemented throughout operation of the Project, in particular the implementation of appropriate occupational health and safety measures, e.g. PPE, and statutory health and safety compliance. This would be based on task specific risk assessments and method statements prepared ahead of the undertaking of site based operational tasks.

10.7 Preliminary Assessment of Effects

Likely Significant Effects

10.7.1 This section sets out the likely significant effects on geology and hydrogeology arising from the construction and operation of the Project. A description of each of these stages is set out in **Chapter 4 Description of the Project**.

10.7.2 The review of likely significant effects assumes that the design embedded the good practice mitigation measures described in section 10.6 and outlined within **Appendix 4A Draft Outline Code of Construction Practice in Volume 3**, before assessing the effects. This is in accordance with IEMA guide to: Materials and Waste in Environmental Impact Assessment. Guidance for a proportionate approach (Ref 10.36). All assessments presented are preliminary based on information known to date. The assessment will be refined for the ES to reflect the design development.

Construction phase

10.7.3 The potential effects that could result from the construction of the Project are:

- geology and minerals:
 - sterilisation of minerals within the draft Order Limits; and
 - loss or damage to RIGS.
- hydrogeology:
 - changes to groundwater flows and levels; and
 - changes to groundwater quality.
- contaminated land:
 - disturbance and mobilisation of existing contamination.

Operational phase

10.7.4 The potential effects that could result from the operation of the Project are:

- hydrogeology:
 - changes to groundwater flows and levels.

Preliminary construction effects

Construction: geology and minerals – sterilisation of minerals within the draft Order Limits

10.7.5 The draft Order Limits for the Project cross areas safeguarded as surface coal and sand and gravel resources within the Minerals Local Plan (Ref 10.16) and pre-submission draft Minerals Local Plan (Ref 10.17). An Existing Permitted Area associated with sand and gravel resources is present within the draft Order Limits of Section 5. Although not within the draft Order Limits, an Existing Permitted Area is located approximately 90 m east of the draft Order Limits of Section 6.

10.7.6 Areas of coal resources are covered by a separate system of consultation operated by the Mining Remediation Authority. Surface coal measures are either no longer considered for safeguarding due to the general presumption against the extraction of coal set out in the NPPF (deemed contrary to the current lack of significant UK domestic market for coal and the government's priorities for mitigating the impacts of climate change to meet its net zero target by 2050) or any extraction planning proposals would be challenging to get approved considering any proposals must be proven to be environmentally acceptable and will have a net zero impact on climate change.

- 10.7.7 Another factor to consider is that of the Sections across the Project that are located within MSAs for surface coal, a significant proportion of their draft Order Limits have been historically opencast mined for their coal resources. As such, the remaining surface coal resources available, and thus minerals at risk of sterilisation, have been further reduced.
- 10.7.8 Further engagement with the MPAs and Mining Remediation Authority is required as part of the development of the Project to confirm that the surface coal resources identified within the Minerals Local Plan and pre-submission draft Minerals Local Plan can be disregarded in relation to mineral sterilisation.
- 10.7.9 There is potential for the sterilisation of sand and gravel resources in areas designated as Existing Permitted Areas at and nearby to the draft Order Limits, Allocated Areas nearby to the Project and areas within the draft Order Limits that have been designated as MSAs for sand and gravel.
- 10.7.10 At this stage, the sensitivity for the sterilisation of sand and gravel resources is categorised as very high (due to the presence of an Existing Permitted Area within the draft Order Limits) to medium (due to areas of the draft Order Limits being in MSAs for sand and gravel). However, due to the small footprints of the overhead line pylon foundations and temporary nature of the haul roads and construction compounds the magnitude of change of the Project to mineral sterilisation is likely to be negligible. The overall significance of effect in relation to the sterilisation of minerals within the draft Order Limits is therefore considered minor (**not significant**).

Construction: geology and minerals – loss or damage to RIGS

- 10.7.11 Three RIGS have been identified within the Study Area. Two RIGS (Coxbench Quarries and Dunnshill) are shown not to be within the footprint of any proposed pylons, haul roads or temporary construction compounds. The footprint of pylon 163 is shown to be located within the Sinfin Moor RIGS which extends across a section of Section 6 to the west of the A514/A50 junction.
- 10.7.12 In accordance with **Table 10.16**, the sensitivity of RIGS is categorised as medium. At this stage the magnitude of change presented by the Project to Coxbench Quarries and Dunnshill is likely to be no change, and the magnitude of change to the area of Sinfin Moor in the vicinity of pylon 163 is likely to be small. The overall significance of effect in relation to the loss or damage to RIGS within the draft Order Limits is therefore considered neutral (**not significant**) for Coxbench Quarries and Dunnshill and minor (**not significant**) for Sinfin Moor.

Construction: hydrogeology – changes to groundwater flows and levels

- 10.7.13 As set out in **Table 10.9**, the draft Order Limits crosses geological units that potentially support groundwater resources, including Principal aquifers, Secondary A, Secondary B aquifers and Secondary (undifferentiated). In addition, three groundwater abstractions, seven marked springs and two GWDTE and potential surface water bodies have been identified within 500 m of the draft Order Limits, of which two springs are identified within the draft Order Limits itself and the Morley Pits GWDTE is identified 15 m from the draft Order Limits. There is potential for the Project construction activities, such as excavation dewatering, to result in temporary and localised changes to groundwater levels and flows. Likely significant effects could occur where changes to flows and levels intersect with sensitive receptors such as groundwater abstractions, springs, surface water baseflows and GWDTE.

- 10.7.14 Any dewatering activities during construction would be undertaken in accordance with Environment Agency Guidance: Temporary dewatering from excavations to surface water: RPS 261 (Ref 10.67). All instances of dewatering would be assessed to identify the requirement for an Abstraction Licence and Environmental Permit (for the discharge) and would be limited to the depth and time required to facilitate the construction activities (mitigation measure GH06). Significant effects are unlikely to occur when all the following criteria are met:
- drawdown from dewatering is less than 1.5 m below rest water level;
 - dewatering lasts for 100 days or less; and
 - there are no groundwater sensitive receptors within 500 m of the dewatering.
- 10.7.15 As well as dewatering, ground disturbance during the construction phase also has the potential to result in changes to groundwater flow regimes either through the introduction of new flow paths through piling of foundations and installation of new permeable structures and backfill materials, or the barrier effect from new impermeable structures and backfill materials. There is also the potential to create new connections between groundwater bodies.
- 10.7.16 The pre-construction activities associated with mine working remediation have the potential to result in changes to groundwater flow regimes. Groundwater currently flowing through mine workings may be impeded as a result of voids being filled as part of the stabilisation of underground mine workings.
- 10.7.17 The scale and nature of the planned works are such that no significant barriers to flow are envisaged. The same is true for the creation of new flow pathways during the construction of piled foundations within the new pylon bases, open cut and trenchless crossings. **Appendix 4A Draft Outline Code of Construction Practice** includes a commitment to undertake Foundation Works Risk Assessments (mitigation measure GH02) once the proposed foundation solutions are known. This would provide an assessment of the risk of the creation of new flow pathways and identify appropriate control measures required during construction.
- 10.7.18 At this stage, the sensitivity of changes to groundwater flows and levels during construction is categorised as high due to the presence of several groundwater receptors within the 500 m buffer. However, due to the scale and nature of the planned works and temporary nature of the dewatering works, the magnitude of the Project to changes to groundwater flows and levels during construction is likely to be small.
- 10.7.19 The overall significance of effect in relation to changes to groundwater flows and levels during construction is therefore considered moderate (**significant**).

Construction: hydrogeology – changes to groundwater quality

- 10.7.20 The creation of preferential flow pathways during the construction of the piled foundations within the new pylon bases, open cut and trenchless crossings may result in changes to the quality of groundwater through the mobilisation of existing contamination, pollution to any receiving water bodies through the discharge of untreated groundwater collected from dewatering, increased turbidity resulting from excavations and spillages of vehicle fluids. Likely significant effects could occur where changes to groundwater quality intersect with sensitive receptors such as groundwater abstractions, surface water baseflows, springs and GWDTE. **Appendix 4A Draft Outline Code of Construction Practice** includes a commitment to

undertake Foundation Works Risk Assessments (mitigation measure GH02) once the proposed foundation solutions are known. This would provide an assessment of the risk of the creation of new flow pathways and any appropriate mitigation measures required to control the risk of contaminants entering the groundwater body. The storage and use of chemicals are to be undertaken in accordance with the Environment Agency and Government Pollution Prevention for Business guidance (Ref 10.65) (mitigation measure GH04).

10.7.21 At this stage, the sensitivity to groundwater quality during construction is categorised as medium to high due to the presence of Principal and Secondary A aquifers. The magnitude of the Project to changes in groundwater quality is likely to be medium due to the presence of potentially contaminative land uses.

10.7.22 The overall significance of effect in relation to changes in groundwater quality during construction is therefore considered major to moderate (**significant**).

Construction: contamination – disturbance and mobilisation of existing contamination

10.7.23 There is the potential for existing contamination to be encountered within the draft Order Limits during construction of the Project. Ground disturbance and handling of potentially contaminated soils during earthwork operations including soil stripping, the excavation of foundations and the placement of backfilling materials may result in sensitive receptors (such as human health and controlled waters) being exposed. At this stage it is anticipated that there is a limited requirement for earthworks resulting in the potential for reuse of material on site or generation of surplus soils. Should there be a requirement for the reuse of materials it will be done in adherence to the requirements of a Materials Management Plan prepared in accordance with industry guidance: CL:AIRE DoWCoP (Ref 10.66), Appropriate controls to manage the storage and handling of construction materials, excavated soils and wastes are detailed in **Appendix 4A Draft Outline Code of Construction Practice in Volume 3**.

10.7.24 At this stage, the sensitivity for contaminated land in relation to construction disturbance and mobilisation of existing contamination is conservatively categorised as high (due to identified receptors being construction workers and controlled waters). Based on the nature of the identified potentially contaminative land uses and using a worst-case scenario for potential contamination that could be encountered and mobilised during construction, a magnitude of medium to small can be assigned.

10.7.25 At this stage the overall significance of effects in relation to the disturbance and mobilisation of existing contamination has been conservatively assessed as major to moderate (**significant**).

10.7.26 Further review and intrusive investigation within the draft Order Limits, at Project features (pylons, haul roads and construction compounds) and areas surrounding the draft Order Limits are required to identify and confirm the presence of potential contamination sources as well as potential receptors and pathways.

Preliminary operational effects

Operation: hydrogeology – changes to groundwater flows and levels

10.7.27 The Project has the potential to cause disruption of shallow groundwater flow pathways within aquifer units due to the presence of permanent below ground infrastructure, such as pylon base foundations. Based on the small overall

dimensions of any foundations and cable ducts, both are likely to be insignificant compared to the groundwater body as a whole. In areas of large foundations such as the proposed new Chesterfield Substation groundwater flow may be impeded due to large impermeable surfaces and engineered drainage which may impact the rates of water infiltration to groundwater. Dewatering activities would not be required during the operational phase of the Project; operational effects associated with dewatering are therefore not anticipated.

- 10.7.28 At this stage, the sensitivity to groundwater flows and changes during operation is categorised as high to medium due to the presence of Principal and Secondary A aquifers. The magnitude of the Project to changes to groundwater flows and levels during operation is likely to be negligible (in areas of pylon base foundations and cable ducts) and medium (in areas of larger foundations, e.g. the proposed new Chesterfield Substation).
- 10.7.29 The overall significance of effect in relation to changes in groundwater flows and levels during operation is therefore considered minor to negligible (**not significant**) in areas of pylon foundation and cable ducts and major to moderate (**significant**) in areas of larger foundations.

10.8 Potential Additional Mitigation Measures

- 10.8.1 Additional mitigation comprises measures over and above any embedded and standard mitigation measures, for which the EIA has identified a requirement to further reduce significant environmental effects.
- 10.8.2 Additional mitigation measures are outlined below. The likely effect of these additional mitigation measures is presented in **Table 10.17**. The requirement for additional mitigation measures will remain under review during the refinement of the Project design and the completion of further assessment and development of the ES.

Construction

Construction: hydrogeology – changes to groundwater flows and levels

- 10.8.3 If deemed a requirement based on further assessment, additional mitigation during construction may potentially include the production of a Groundwater Management and Monitoring Plan (GWMMP) and Dewatering Management Plan (DWP) by the Main Works Contractor.
- 10.8.4 If required, the GWMMP would generally include:
- the roles and responsibilities of key parties in relation to the plan;
 - a description of the site setting and summary of the hydrogeological conceptual model;
 - the proposed monitoring network, monitoring frequency and physical/chemical parameters to be measured;
 - the methods to be used for monitoring and appropriate standards;
 - requirements for data management including quality assurance/quality control;
 - site-specific groundwater management requirements;

- the methods used to assess data collected during construction against baseline monitoring data;
- a contingency action plan that outlines the steps to manage risks to groundwater (or other receptors) in the event of impacts arising/potentially arising; and
- reporting procedures (routine and incidents).

10.8.5 If required, the DWP will include:

- the location of and proposed construction activities that will require groundwater control and management;
- the results of a water features survey within a radius of search appropriate to the hydrogeological setting and anticipated dewatering rates;
- the conceptual hydrogeological model for the site, from which the dewatering requirements have been developed;
- the potential groundwater hazards (e.g. known contamination);
- the hydrogeological impact assessment;
- the proposed groundwater control structures (e.g. sheet piling, pumping wells);
- the site-specific additional mitigation measures (e.g. water treatment) required to reduce the potential effects arising either directly or indirectly on identified receptors;
- the main discharge points, abstraction and discharge rates;
- the inspection, monitoring, and maintenance plan;
- the licences, permits or consents relevant to the proposed works;
- the roles and responsibilities of relevant parties;
- the proposed monitoring (linking back to the GWMMMP); and
- other relevant information.

Construction: hydrogeology – changes to groundwater quality

10.8.6 Additional mitigation during construction may include the production of a GWMMMP and DWP by the Main Works Contractor, as outlined above.

Construction: contamination – disturbance and mobilisation of existing contamination

10.8.7 Further to the intrusive ground investigation which is included as embedded mitigation, additional supplementary phases of ground investigation and detailed assessment may be required. Additional ground investigation and detailed assessment may be required to further delineate potential contamination sources if identified during the initial phases of investigation. Additional assessment may lead to the requirement for the implementation of remediation measures and/or potential amendments to the design and construction methodology. The remediation measures, if required, would be detailed within a Remediation Strategy.

Operation

Operation: hydrogeology – changes to groundwater flows and levels

- 10.8.8 During design development drainage blankets and bypass flows will be engineered into the foundations for the substation and pylons at specific locations where there is the potential for significant effects.

10.9 Monitoring

- 10.9.1 Prior to construction, groundwater level monitoring would be undertaken in areas where dewatering is anticipated during the construction phase to establish baseline conditions.
- 10.9.2 If the Project passes through any areas of potentially contaminated land where contaminants have potential to be mobilised as part of the construction phase, groundwater quality monitoring would be undertaken prior to construction to establish baseline conditions.
- 10.9.3 Where required, groundwater quality monitoring will be undertaken throughout the construction phase to monitor the effects on groundwater quality and flows.
- 10.9.4 Should intrusive ground investigation and geo-environmental risk assessment identify areas requiring remediation, verification would be completed as part of the remediation works. If required, a period of groundwater monitoring would be completed following completion of the remediation works.

10.10 Residual Effects

- 10.10.1 The preliminary assessment takes into consideration both design embedded mitigation measures and good practice measures. The residual effects take into consideration the additional mitigation measures that may be implemented for geology and hydrogeology. As the Project design evolves additional mitigation measures may be developed, leading to further assessment of the residual effects.

10.11 Summary

- 10.11.1 **Table 10.17** summarises the preliminary assessment of effects, potential additional mitigation measures and residual effects.

Table 10.17: Summary of residual effects for geology and hydrogeology

Description of the Effect	Sensitive Receptor	Significance of Effect with Design Embedded and Good Practice Mitigation	Additional Mitigation Measure	Residual Effect
Construction Phase: Geology and Minerals				
Sterilisation of minerals within the draft Order Limits	Sand and gravel resources	Minor (not significant)	None at this stage	Minor (not significant)
Loss or damage to RIGS	RIGS – Coxbench Quarries and Dunnshill	Neutral (not significant)	None at this stage	Neutral (not significant)
Loss or damage to RIGS	RIGS – Sinfin Moor	Minor (not significant)	None at this stage	Minor (not significant)
Construction Phase: Hydrogeology				
Changes to groundwater flows and levels	Principal and Secondary A aquifers	Moderate (significant)	Implementation of GWMMP and DWP.	Minor (not significant)
	Secondary B Aquifers	Minor (not significant)	None at this stage	Minor (not significant)
	GWTDE	Moderate (significant)	Implementation of GWMMP and DWP.	Moderate (significant)
	Groundwater abstractions	Minor (not significant)	None at this stage	Minor (not significant)
	Springs	Minor (not significant)	None at this stage	Minor (not significant)
Changes to groundwater quality	Principal and Secondary A aquifers	Major to moderate (significant)	Implementation of GWMMP and DWP.	Minor (not significant)
	Secondary B Aquifers	Minor (not significant)	None at this stage	Minor (not significant)

Description of the Effect	Sensitive Receptor	Significance of Effect with Design Embedded and Good Practice Mitigation	Additional Mitigation Measure	Residual Effect
	GWTDE	Moderate (significant)	Implementation of GWMMP and DWP.	Moderate (significant)
	Groundwater abstractions	Minor (not significant)	None at this stage	Minor (not significant)
	Springs	Minor (not significant)	None at this stage	Minor (not significant)
Construction Phase: Contamination				
Disturbance and mobilisation of existing contamination	Human health and controlled waters	Major to moderate (significant)	Dependent on findings of ground investigation included as embedded mitigation, additional phases of ground investigation and detailed assessment may be required, leading to potential requirement for remediation and/or design change.	Minor (not significant)
Operational Phase: Hydrogeology				
Changes to groundwater flows and levels in areas of pylon foundations and cable ducts	Principal and Secondary A aquifers	Minor to negligible (not significant)	None at this stage	Minor to negligible (not significant)
Changes to groundwater flows and levels in areas of larger foundations	Principal and Secondary A aquifers	Major to moderate (significant)	Engineering of foundations will include drainage blankets and bypass flows, where appropriate.	Minor (not significant)

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