WHITESTONE SOLAR FARM

Volume 6: Environmental Statement

6.9 Chapter 9: Ground Conditions and Land Quality

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Prepared by:

ERM

Prepared for:

Whitestone Net Zero Ltd

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Glossary

Term	Meaning
Agricultural Land Classification (ALC)	A system of classification of agricultural resource value of soils in England devised by Natural England, from Grade 1 (best quality) to Grade 5 (poorest quality), and based on criteria including soil characteristics (depth, structure, texture, chemistry, stoniness) as well as climate and site aspects.
Aquifer	"Underground layers of water-bearing, permeable rock from which groundwater can be extracted" (British Geological Survey).
Best and Most Versatile (BMV)	Best and Most Versatile is agricultural land with an Agricultural land Classification of Grade 1, Grade 2 or Grade 3a (National Planning Policy Framework).
Cable Corridors	Corridors within which the high voltage cables would be constructed.
Conceptual Site Model	"A representation of the characteristics of a site which shows the possible relationships between contaminants, pathways and receptors" (Land Contamination Risk Management).
Draft Environmental Statement	The Draft Environmental Statement which presented the preliminary environmental information relating to the Proposed Development. The Draft ES was prepared to present information for statutory consultation in accordance with current EIA regulations.
Environmental Statement (ES)	The Environmental Statement which presents the environmental information relating to the Proposed Development. The ES has been prepared to present information for formal consultation in accordance with current EIA regulations.
Made Ground	Land where the pre-existing ground surface is raised or replaced by artificial or man-made deposits.

Term	Meaning
Mineral Safeguarding Area	"An area designated by a Mineral Planning Authority which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development" (Planning Practice Guidance).
Principal Aquifer	"Rocks that provide significant quantities of water and can support water supply and/or baseflow to rivers, lakes and wetlands on a strategic scale. They typically have a high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage" (Environment Agency).
Order Limits	Maximum extent of the Proposed Development comprising the Site and Cable Corridors.
Secondary Aquifer	Rocks which "can provide modest amounts of water, but the nature of the rock or the aquifer's structure limits their use. They support water supplies at a local rather than strategic scale (such as for private supplies) and remain important for rivers, wetlands and lakes. They have a wide range of water permeability and storage" (Environment Agency). Secondary Aquifers may be further classified as 'A', 'B' or 'Undifferentiated' based on their permeability and ability to support local water supplies and/or base flow to rivers.
Source Protection Zone	Defined around large and potable groundwater abstractions sites with the purpose to "provide additional protection to safeguard drinking water quality through constraining the proximity of an activity what may impact upon a drinking water abstraction" (Environment Agency).
Study Area	The spatial extent within which environmental receptors may experience likely significant effects from the Proposed Development.
The Applicant	Whitestone Net Zero Ltd.
The Application	The Application submitted to the Secretary of State for a Development Consent Order.
The Proposed Development	The proposed Whitestone Solar Farm.
The Site	The land planned to be used for solar PV array and associated infrastructure, BESS, substation, and landscaping and habitat enhancement. The Site is split into W1, W2, and W3.
Whitestone 1 (W1)	The northern parcels of the Whitestone Solar Farm.
Whitestone 2 (W2)	The middle parcels of the Whitestone Solar Farm.
Whitestone 3 (W3)	The southern parcels of the Whitestone Solar Farm.

Acronyms

Acronym	Meaning
AIL	Abnormal Indivisible Load

Acronym	Meaning
ALC	Agricultural Land Classification
BESS	Battery Energy Storage System
BGS	British Geological Survey
BMV	Best and Most Versatile
BNG	Biodiversity Net Gain
CDC	City of Doncaster Council
CEMP	Construction Environmental Management Plan
CLR	Contaminated Land Report
CMRA	Coal Mining Risk Assessment
COSHH	Control of Substances Hazardous to Health
CSM	Conceptual Site Model
DCC	Derbyshire County Council
DCO	Development Consent Order
DEFRA	Department for Environmental, Food and Rural Affairs
DEMP	Decommissioning Environmental Management Plan
EA	Environment Agency
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EMMP	Excavated Materials Management Plan
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HVC	High Voltage Cable
IEMA	Institute of Environmental Management and Assessment
ISEP	Institute of Sustainability and Environmental Professionals
LCRM	Land Contamination Risk Management
LFA	Lead Flood Authority
LPA	Local Planning Authority
LSE	Likely Significant Effect
MRA	Mining Remediation Authority
MSA	Mineral Safeguarding Area
NEDDC	North East Derbyshire District Council
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
oBSMP	Outline Battery Safety Management Plan
oCEMP	Outline Construction Environmental Management Plan

Acronym	Meaning
oDEMP	Outline Decommissioning Environmental Management Plan
oEMMP	Outline Excavated Materials Management Plan
OEMP	Operational Environmental Management Plan
oOEMP	Outline Operational Environmental Management Plan
oSMP	Outline Soil Management Plan
PPE	Personal Protective Equipment
PPG	Planning Practice Guidance
PRA	Preliminary Risk Assessment
PV	Photovoltaic
RIGS	Regionally Important Geological Site
RMBC	Rotherham Metropolitan Borough Council
SMP	Soil Management Plan
SPR	Source-Pathway-Receptor
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SYMAS	South Yorkshire Mining Advisory Service
UKSO	United Kingdom Soil Observatory
UXO	Unexploded Ordnance
WFD	Water Framework Directive
W1	Whitestone 1
W2	Whitestone 2
W3	Whitestone 3
ZoI	Zone of Influence

Units

Units	Meaning
ha	Hectares
km	Kilometres
kV	Kilovolt
m	Metres
MW	Megawatt

9 GROUND CONDITIONS AND LAND QUALITY

9.1 Introduction

9.1.1 This Chapter of the Environmental Statement (ES) has been prepared on behalf of Whitestone Net Zero Ltd ('the Applicant') to evaluate the potential effects of the construction, operation and maintenance, and decommissioning of the Whitestone Solar Farm (the Proposed Development) in relation to Ground Conditions and Land Quality. The Proposed Development is described in **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]**.

Order Limits

9.1.2 The extent of the Order Limits are described in **ES Volume 1, Chapter 3: The Site and Surrounding Area [EN0110020/APP/6.3]** and shown in **ES Volume 3, Figure 3.1: Order Limits [EN0110020/APP/6.19]**. The Proposed Development is described in **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]** and shown spatially on the **Works Plans [EN0110020/APP/2.3]**.

The Proposed Development

9.1.3 The Proposed Development involves the construction, operation and maintenance, and decommissioning of more than 100 megawatt (MW) of solar photovoltaic (PV) array, Battery Energy Storage System (BESS), onsite substations and supporting infrastructure, and grid connection infrastructure. The grid connection infrastructure would connect the Proposed Development to the National Grid at the new 400 kilovolt (kV) National Grid substation proposed on land immediately east of Long Lane, Brinsworth, S60 4JJ (Long Lane 400kV Substation). National Grid have applied to Rotherham Metropolitan Borough Council (RMBC) for the development of this new substation which is intended by National Grid to be operational in time for the Proposed Development to connect in 2029. This substation is therefore not included in the Proposed Development and will be subject to a separate planning application taken forward by National Grid.

9.1.4 As the Proposed Development would have a generating capacity in excess of 100MW, it is considered to be a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008.

9.1.5 The Proposed Development would be located within the Order Limits. The Order Limits encompass the total area of the project comprising the Site and Cable Corridors. The Site is specifically the land that is planned to be used for solar PV array and associated infrastructure, BESS, substation, landscaping and habitat enhancement. The Site is split into Whitestone 1 (W1), Whitestone 2 (W2), and Whitestone 3 (W3).

9.1.6 Highway Works are sections of the highway network that will contain localised improvements, such as improvements to road edge where it is deteriorated, or

temporary highway and traffic works required to safely accommodate the Abnormal Indivisible Load (AIL) deliveries. These areas will support the movement of construction vehicles on narrower sections of the local highway network within parts of the construction vehicle routes to the Site (as described in **ES Volume 2, Chapter 13: Traffic and Transport [EN0110020/APP/6.13]**).

9.1.7 This Chapter of the ES includes the following sections:

- Legislation, Policy, and Guidance;
- Consultation;
- Assessment Methodology;
- Baseline;
- Embedded Mitigation;
- Assessment of Effects;
- Additional Mitigation and Residual Effects; and
- Cumulative Effects.

9.1.8 This Chapter is supported by the following figures in **ES Volume 3, Figures [EN0110020/APP/6.19]**;

- **Figure 3.2: Site Referencing**;
- **Figure 9.1: Study Area**;
- **Figure 9.2: ALC Survey Results**;
- **Figure 9.3: Coal Mining High Risk Development Areas**;
- **Figure 9.4: Mineral Resource**;
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- **Figure 9.10.2: Bedrock Geology**;
- **Figure 9.10.3: Mine Entries**; and
- **Figure 9.10.4: Borehole Locations**.

9.1.9 This Chapter is supported by the following appendices in **ES Volume 3, Appendices [EN0110020/APP/6.20]**:

- **Appendix 9.1: Legislation, Policy and Guidance**;
- **Appendix 9.2: Landmark Envirocheck® Report: Whitestone 1**;
- **Appendix 9.3: Landmark Envirocheck® Report: Whitestone 2**;
- **Appendix 9.4: Landmark Envirocheck® Report: Whitestone 3**;
- **Appendix 9.5: Landmark Envirocheck® Report for Cable Corridors**;
- **Appendix 9.6: Agricultural Land Classification Report**;
- **Appendix 9.7: Phase 1 Contaminated Land Report: Whitestone 1**;
- **Appendix 9.8: Phase 1 Contaminated Land Report: Whitestone 2**;
- **Appendix 9.9: Phase 1 Contaminated Land Report: Whitestone 3**;
- **Appendix 9.10: Phase 1 Coal Mining Risk Assessment: Whitestone 1**;

- **Appendix 9.11: Phase 1 Coal Mining Risk Assessment: Whitestone 2**; and
- **Appendix 9.12: Phase 1 Coal Mining Risk Assessment: Whitestone 3**.

9.2 Legislation, Policy and Guidance

9.2.1 The legislation, policy, and guidance relevant to ground conditions and land quality in the context of the Proposed Development is summarised below and detailed in **ES Volume 3, Appendix 9.1: Legislation, Policy and Guidance [EN0110020/APP/6.20]**.

Legislation

9.2.2 Legislation that has been considered includes:

- The Environmental Protection Act 1990[1];
- The Contaminated Land (England) (Amendment) Regulations (2012)[2];
- Water Resources Act 1991 (as amended by the Water Act 2003)[3];
- Groundwater (England and Wales) Regulations 2009[4];
- Environmental Permitting (England and Wales) Regulations (2016) (as amended)[5];
- Control of Pollution Act (1974)[6]; and
- Environmental Improvement Plan (2025)[7].

National Policy

9.2.3 National policy that has been considered includes:

- Overarching National Policy Statement (NPS) for Energy (EN-1), (2025)[8] ;
- NPS for Renewable Energy Infrastructure (EN-3), (2025)[9];
- NPS for Electricity Networks Infrastructure (EN-5) (2025),[10]; and
- National Planning Policy Framework (NPPF) (2024)[11].

Local Policy

9.2.4 Local policy that has been considered includes:

- Rotherham Metropolitan Borough Council Local Plan Core Strategy 2014[12];
- Rotherham Metropolitan Borough Council Sites and Policies Plan 2018[13];
- Rotherham Local Plan Supplementary Planning Document No. 11 Natural Environment 2021[14];
- Doncaster Local Plan 2021[15] including Technical and Developer Requirements Supplementary Planning Document (adopted 2023);
- North East Derbyshire District Council Development Plan 2021[16]; and
- Derby and Derbyshire Minerals Local Plan 2000[17].

Guidance

9.2.5 Supporting guidance that has been considered includes:

- NPPF Planning Practice Guidance (PPG) documents[18], specifically:
  - Land affected by contamination (2019);
  - Land stability (2019);
  - Minerals (2014);
  - Natural environment (2025); and
  - Water supply, wastewater and water quality (2019).
- Environment Agency, Groundwater Protection in England (2026) and the sub-section 'Land Contamination Risk Management' (LCRM), updated 2025[19];
- Natural England 'Agricultural land Classification of England and Wales: Revised Criteria for Grading the Quality of Agricultural Land (ALC011)', 1988[20];
- Natural England 'Likelihood of Best and Most Versatile Agricultural Land', 2017[21];
- Yorkshire and Lincolnshire Pollution Advisory Group 'Development on Land Affected by Contamination, Technical Guidance for Developers, Landowners and Consultants', updated July 2023[22]; and
- Institute of Environmental Management & Assessment (IEMA), 'A New perspective on Land and Soil in Environmental Impact Assessment', 2022[23].
- Natural England 'Agricultural land Classification of England and Wales: Revised Criteria for Grading the Quality of Agricultural Land (ALC011)', 1988[24];
- Natural England 'Likelihood of Best and Most Versatile Agricultural Land', 2017[25];
- Yorkshire and Lincolnshire Pollution Advisory Group 'Development on Land Affected by Contamination, Technical Guidance for Developers, Landowners and Consultants', updated July 2023[26]; and
- IEMA, 'A New Perspective on Land and Soil in Environmental Impact Assessment', 2022[27].

9.3 Consultation

9.3.1 This section provides a summary of the Consultation undertaken to date in relation to the Proposed Development.

EIA Scoping

9.3.2 A Scoping Opinion was sought from the Planning Inspectorate to determine the content of the assessment, as well as the approach and methods to be used. The outcomes of this exercise were documented in the Scoping Report (**ES Volume 3, Appendix 2.1: EIA Scoping Report [EN0110020/APP/6.20]**), which was submitted to the Planning Inspectorate on 23 April 2025. The Scoping Report captures the findings of the scoping exercise and outlines the technical guidance,

standards, best practices, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Proposed Development on Ground Conditions and Land Quality.

9.3.3 A Scoping Opinion was received from the Planning Inspectorate on 3 June 2025 (**ES Volume 3, Appendix 2.2: EIA Scoping Opinion [EN0110020/APP/6.20]**).

9.3.4 **Table 9.1** summarises how this Chapter of the ES addresses key points from the Environmental Impact Assessment (EIA) Scoping Opinion comments related to Ground Conditions and Land Quality.

Table 9.1: Scoping Opinion Comments and How They Are Addressed in This ES

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
The Planning Inspectorate	**ID 3.4.1: Construction of Cables on Possible Best and Most Versatile (BMV) Land – Construction** *"The ES should include an assessment of this matter or evidence demonstrating agreement with the relevant consultation bodies and the absence of LSE. The applicant should undertake ALC surveys for the whole site, including the cable corridor, to support the ES or provide justification for an alternative methodology. The ES should contain a clear tabulation of the areas of land in each BMV classification to be temporarily or permanently lost as a result of the PD, with reference to accompanying map(s) depicting the grades. Specific justification for the use of the land by grade should be provided. Consideration should be given to the use of BMV land in the applicant's discussion of alternatives."*	Desk-based review of Agricultural Land Classification (ALC) classification of land within the Cable Corridors has been undertaken. No ALC classification surveys have been undertaken for the land within the Cable Corridors. ALC surveys have been undertaken within the Site (W1, W2 and W3). The potential impacts of the proposed cable laying on agricultural land are considered as Significant, regardless of their ALC, because: i) the trenching works required for the laying of the cables would be very short in duration, localised and linear with individual trench sections open only for a limited duration as construction activities progress incrementally along the Cable Corridor. The area of land subject to active disturbance at any one time would be small; ii) the land would be reinstated following installation and returned to agricultural use, using a method specifically designed to retain its general soil characteristics without loss of soil function; and	Proposed construction methodology is described in Section 9.4.20. Embedded mitigation, including the oSMP, is discussed in Section 9.6. BMV classification data for W1, W2 and W3, based on site surveys and sampling, and for the Cable Corridors, based on a desk-based review, is provided in Section 9.5, including tabulated areas. Discussion of potential alternatives is provided in **ES Volume 1, Chapter 4: Alternatives and Design Iterations [EN0110020/APP/6.4]**.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
		iii) installation and restoration works would be undertaken in line with a Soil Management Plan (SMP) and / or Excavated Materials Management Plan (EMMP). An oSMP and outline Excavated Materials Management Plan (oEMMP) are included in the **outline Construction Environmental Management Plan (oCEMP) [EN0110020/APP/5.9]** submitted with Application. For the purposes of the EIA, a reasonable worst-case scenario has been assumed whereby cable installation passes through agricultural land of the highest potential sensitivity, including Best and Most Versatile (BMV) land. Even on this basis, effects on agricultural land and soil resources are assessed as temporary, reversible and **Not Significant**, due to the limited spatial extent of the works, their short duration, and the committed mitigation and reinstatement measures in the outline Soil Management Plan (oSMP). Further, the EIA does not rely on the specific ALC grading of the Cable Corridors	

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
		because the nature of the works and mitigation proposed would not result in permanent loss of soil function or agricultural capability and as such, further differentiation by ALC would not alter the outcome of the assessment nor identify any materially different mitigation requirements. The Applicant considers this to be proportionate and consistent with established practice for underground connection cables for solar infrastructure where soil resources are reinstated and returned to agricultural use. Recent NSIP precedent includes West Burton Development Cosent Order (DCO) where ALC surveys were not undertaken for underground Cable Corridors, on the basis that impacts were temporary and subject to soil management controls and Sunnica Energy Farm DCO in which the Secretary of State agreed with the approach of not proposing further ALC surveys for Cable Corridors, given the limited and reversible nature of the works and controls secured through the **Draft DCO [EN0110020/APP/3.1]**.	

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
The Planning Inspectorate	**ID 3.4.2: Construction and Operation within Mineral Safeguarding Areas (MSAs) – Construction** *"The ES should include an assessment of these matters, or information demonstrating the agreement with the relevant consultation bodies, including Mineral Planning Authority and the absence of a LSE. The ES should include a figure identifying the extent of any MSAs in relation to the PD."*	Consultation has been undertaken with the City of Doncaster Council (CDC), RMBC Council and the Mineral Planning Officer. The Proposed Development overlaps a limestone MSA which is currently exploited, and the Proposed Development must avoid sterilising the resource. An assessment has been made to demonstrate how impacts to MSAs have been minimised.	**ES Volume 3, Figure 9.4: Mineral Resources [EN0110020/APP/6.19]** shows the locations of MSAs in the Study Area. A summary of additional consultation is provided in **Table 9.3** of this Chapter. The assessment of MSAs is included in Section 9.7 of this Chapter.
The Planning Inspectorate	**ID 3.4.3: Unstable Ground Conditions – Construction** • *"The site and cable corridor options lie in areas of high-risk due to geotechnical instability and a Phase 1 geotechnical study has not yet been carried out. The information pertaining to the risk associated with ground conditions is currently unknown at this stage and it is not clear what measures would be set out in the oCEMP and oEMMP to ensure no LSE."* • *"The ES should demonstrate the baseline to determine the potential risks of unstable*	Ground conditions, including the potential for unstable ground, is described in detail in the Phase 1 Contaminated Land Reports (CLRs) (**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**) and Phase 1 Coal Mining Risks Assessments (CMRAs), (**ES Volume 3, Appendix 9.7 – 9.12: Phase 1 Coal Mining Risk Assessment [EN0110020/APP/6.20]**). The CMRAs include a preliminary risk assessment (PRA) in relation to land instability, on the Proposed Development and on other receptors as a result of the Proposed	Summary provided in Section 9.5. Design and embedded mitigation measures (see Section 9.6), in relation to land stability, are included in the EMMP which is part of the **oCEMP [EN0110020/APP/5.9]**, submitted with the Application. Phase 1 CLRs (**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**) and CMRAs (**ES Volume 3, Appendix 9.7 – 9.12: Phase 1 Coal Mining Risk Assessment [EN0110020/APP/6.20]**) have been

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
	ground. The ES should demonstrate how this has informed design and any appropriate mitigation measures; any agreement with relevant consultees should be evidenced and mitigation appropriately secured through the draft DCO. This should include assessment of potential impacts from ground instability as a result of the Proposed Development on other environmentally sensitive receptors and associated waterways."	Development. This principally relates to risk from land affected by historic coal mining from the surface or shallow underground, from mine entries, from steep slopes and from small areas of landfills intersected by Cable Corridors. No permanent buildings are to be constructed on such land, although solar arrays and cables would be installed on them. Coal mining and other land stability risks will be further addressed as part of the post consent detailed design development by targeted ground investigation undertaken prior to construction in areas where risk of unstable ground has been identified to inform design. A 20-metre Zone of Influence (ZoI) around known mine entries has been used to avoid ground stability issues with installed infrastructure, and targeted ground investigations under the oversight of the Mining Remediation Authority (MRA) are required if construction within the zone is required. No likely significant effects (LSE) are anticipated as Proposed Development design will incorporate mitigation measures to address land stability risks.	included as appendices to this ES, submitted as part of the Application.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
The Planning Inspectorate	**ID 3.4.4: Contaminated Land – Construction** *"The Inspectorate notes that the Proposed Development lies in an area of historic coal mining, the risk and extent of ground contamination is unknown at this stage and no mitigation measures are described. Accordingly, the ES should include an assessment of this matter, or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a LSE."*	PRAs in relation to land contamination have been undertaken in the Phase 1 CLRs. The reports identify potential source-pathway-receptor pollutant linkages in the context of the Proposed Development. The potential for land contamination identified in this PRA has been incorporated into the assessment of effects.	A summary of the baseline data is provided in Section 9.5 of this Chapter. Design and embedded mitigation measures in relation to ground conditions / land stability are provided in Section 9.6 of this Chapter. An assessment of the effects, including from land contamination, is provided in Section 9.7 of this Chapter. Phase 1 CLRs (**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**) and CMRAs (**ES Volume 3, Appendix 9.7 – 9.12: Phase 1 Coal Mining Risk Assessment [EN0110020/APP/6.20]**) have been included as appendices to this ES, submitted as part of the Application.
The Planning Inspectorate	**ID 3.4.5: Physical Damage to Soils – Construction and Decommissioning** *"The Scoping Report states that impacts to soil structure and*	Mitigation in relation to soil management will be implemented via compliance with a SMP and / or EMMP during the construction and decommissioning phases. The SMP	Mitigation measures in relation to soil management are described in Section 9.6 of this Chapter. The oEMMP is included in the **oCEMP [EN0110020/APP/5.9]** which

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
	compaction during construction can be managed via an oCEMP and oEMMP to mitigate potential effects. The Planning Inspectorate notes that the oEMMP will be developed to ensure the handling, storage and disposal of materials and the oCEMP will mitigate residual impacts during construction on material handling. In the absence of information such as identified mitigation measures, the Planning Inspectorate is not in a position to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters, or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a LSE."	and EMMP will form part of the Construction Environmental Management Plan (CEMP) and Decommissioning Environmental Management Plan (DEMP), which will be submitted to the Local Planning Authority (LPA) for review and approval prior to commencement of construction / decommissioning. Outline versions of the SMP, EMMP, CEMP and DEMP are submitted with the Application, which will describe the proposed mitigation measures. No LSE anticipated with the proposed embedded mitigation in place. Therefore, aspect remains scoped out of the assessment.	has been submitted with the Application.
The Planning Inspectorate	**ID 3.4.6: Study Area** *"The ES should justify the application of professional judgement in determining this Study Area [of 100 m] and explain how this aligns with the Zone of Influence."*	The Study Area for the assessment of ground conditions and land quality has been increased to a 250m buffer around the Order Limits. This is deemed appropriate based on the proposed shallow nature of ground disturbance (predominantly <5m); effects from (or on) the Proposed Development are not anticipated beyond this distance. The Phase 1 CLRs also consider potential sources	The Study Area is defined in Section 9.4 of this Chapter. Potential sources and receptors are identified in the Phase 1 CLRs, available in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
		and receptors of contamination within 250m.	
The Planning Inspectorate	**ID 3.4.7: Impacts to Geology Including Sensitive Geological Sites** *"The ES should provide an assessment of impacts to geology during construction, operation and decommissioning, including an assessment on sensitive geological sites, or the information required to demonstrate the absence of a LSE."*	There are no sensitive geological sites, i.e. geological Sites of Special Scientific Interest (SSSIs) or Regionally Important Geological Sites (RIGS) identified within the Study Area. Therefore, aspect remains scoped out of the assessment.	This information is demonstrated within Section 9.5 of this Chapter.
The Planning Inspectorate	**ID 3.4.8: Contaminated Land - Operation and Decommissioning** *"The ES should include an assessment where there is potential for likely significant effects to occur across all phases of the Proposed Development unless evidence is provided in the ES demonstrating agreement with the relevant consultation bodies and the absence of a LSE."*	Risks from land contamination have been assessed for all phases of the Proposed Development. Risks from contamination will be managed via implementation of the CEMP (during construction), an Operational Environmental Management Plan (OEMP) (during operation) and the DEMP (during decommissioning). Outlines versions of the CEMP, OEMP and DEMP, submitted alongside this ES.	Potential sources of land contamination are identified in Section 9.5 and are presented in **ES Volume 3, Appendix: 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**. Section 9.6 of this Chapter outlines the relevant aspects of the **oCEMP [EN0110020/APP/5.9]**, **outline Operational Environmental Management Plan (oOEMP) [EN0110020/APP/5.10]** and **outline Decommissioning Environmental Management Plan (oDEMP) [EN0110020/APP/5.11]**. An assessment of effects in relation to land contamination is provided in Section 9.7.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
Environment Agency	**Aquifer Classification** The Scoping Report does not address the necessary scoping related to the assessment of aquifer classification. The EA emphasises that the geological setting must be thoroughly evaluated during the Phase 1 desk study to effectively assess risks to groundwater resources.	A detailed description of geological and hydrogeological setting, including aquifer classification, is provided in the Phase 1 CLRs. Risks to groundwater resources, considering the receptor value assigned in line with relevant guidance, are assessed in this ES.	Details of aquifer classification are provided in Section 9.5. An assessment of effects in relation to groundwater resources is provided in Section 9.7. Phase 1 CLRs, available in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.
Environment Agency	**Groundwater Springs** There does not appear to be any consideration of groundwater springs within the scoping report. It is understood they are possible, especially in the region of Brampton Common. Springs are vulnerable to contamination without adequate pollution prevention controls and therefore could be polluted as a result of not being fully considered. Locations and impacts on groundwater springs should be considered in detail in subsequent reports, the Phase 1 environmental desk study.	The presence of licenced groundwater is described within the Phase 1 CLRs, along with the presence of any groundwater Source Protection Zones (SPZs) within the Study Area. A small section of the Cable Corridor at South Anston is located within an SPZ3, the details of which are outlined further in Section 9.5. Mitigation in relation to pollution prevention and groundwater protection will be secured via the oCEMP, which is included with the Application and secured via Requirement 4 of the **Draft DCO [EN0110020/APP/3.1]**. **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]** includes a	This information is demonstrated within Section 9.5 of this Chapter. Mitigation measures are described in Section 9.6 of this Chapter. Phase 1 CLRs, available in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
		Water Framework Directive (WFD) Screening Assessment to identify the potential for the Proposed Development to have an adverse effect on WFD designated watercourses and waterbodies which includes groundwater springs.	
Environment Agency	**Landfill Sites** The overview of permitted sites and historical landfills presented is currently insufficient. We have records of other landfills near the Site which are not discussed. Interactions with nearby industrial sites and waste sites may not be adequately assessed resulting in water pollution occurring. Ensure a detailed review and assessment of active and historical landfills is included in the Phase 1 environmental desk study.	A detailed assessment of the presence of current and historic landfills, as well as other sites of contamination risk, within the Study Area, is included as part of **ES Volume 3, Appendix 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.	Details of current and historic landfills is provided in Section 9.5 of this Chapter, in **ES Volume 3, Appendix 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**, and the assessment of effects in relation to landfill sites is provided in Section 9.7.
Environment Agency	**Management of Unexpected Contamination** The proposed procedure for unexpected contamination in the summary of oCEMP is insufficient. The oCEMP when drafted should ensure this issue is fully covered in order to mitigate risks. Soil removal as proposed may require a permit or exemption under the	Details of the relevant procedures, permits and exemptions required are provided in the **oCEMP [EN0110020/APP/5.9]** submitted with the Application.	Embedded Mitigation is described in Section 9.6, including an overview of the proposed content of the **oCEMP [EN0110020/APP/5.9]**.

Consultee	Issue Raised	How This is Addressed	Where This is Addressed in the ES
	Environmental Permitting regulations, and this must be obtained prior to works.		

Issues Scoped Out of Assessment

9.3.5 In the initial scoping exercise some potential effects were proposed to be scoped out of assessment in this ES. However, following Statutory Consultation (see Section 9.3.7), these were agreed to be scoped back in and all potential effects on Ground Conditions and Land Quality from the Proposed Development are considered in the ES. The assessment is presented in Section 9.7 and in a preliminary form in **ES Volume 3, Appendix 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.

9.3.6 The purpose of the Phase 1 CLRs, as appended, is to provide a repository for the baseline data and a much more detailed baseline description than appears in Section 9.5. They were compiled following submission of the Draft ES and prior to the design freeze. As such, they consider some areas that are no longer in Order Limits, for Cable Corridors especially, including many potential source areas. The qualitative PRA and conceptual site models (CSM) within them were for this preliminary stage only and have not been updated to the final design. Whilst the PRA and CSM have helped guide the Assessment of Effects in this Chapter, nothing was scoped out and all potential Effects have been considered anew in Section 9.7.

Statutory Consultation

9.3.7 A Statutory Consultation period was held between 16 September and 28 October 2025 in line with Section 47 of the Planning Act 2008. Feedback was sought from the local community and a range of consultee bodies based on the preliminary information and assessments presented in the Draft Environmental Statement (Draft ES).

9.3.8 **Table 9.2** presents feedback from statutory consultees given at Statutory Consultation, and how this is addressed in this ES.

Table 9.2 Statutory Consultation Feedback from the Statutory Consultation Period

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
Natural England	**ALC Surveys** Natural England states that reconnaissance surveys alone are insufficient and that detailed ALC surveys will be required to inform appropriate soil handling techniques within the SMP. They advise that Department for Environment, Food and Rural Affairs' (DEFRA) Construction Code of Practice and BSSS soil management guidance should be followed. They also request that Post-1988 ADAS ALC data be incorporated, particularly where it overlaps the Cable Corridors east of Todwick and east of Wickersley.	ALC surveys have been undertaken across the entirety of W1, W2 and W3. Post-1988 ADAS ALC data in the W1 area was also included in the assessment. The potential impacts of the proposed cable laying on agricultural land are considered as Significant, regardless of their ALC, because: i) the trenching works required for the laying of the cables would be very short in duration, localised and linear with individual trench sections open only for a limited duration as construction activities progress incrementally along the Cable Corridor. The area of land subject to active disturbance at any one time would be small; ii) the land would be reinstated following installation and returned to agricultural use, using a method specifically designed to retain its	Proposed construction methodology is described in Section 9.4.20. Mitigation, including the oSMP, is discussed in Section 9.6. BMV classification data for W1, W2 and W3, based on Site surveys and sampling, and for the Cable Corridors, based on a desk-based review, is provided in Section 9.5, including tabulated areas. Discussion of potential alternatives is provided in **ES Volume 1, Chapter 4: Alternatives and Design Evolution [EN0110020/APP/6.4]**.

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		general soil characteristics without loss of soil function; and iii) installation and restoration works would be undertaken under a Soil Management Plan (SMP) and / or EMMP. An oSMP and oEMMP is included in this with the Application. For the purposes of the EIA, a reasonable worst-case scenario has been assumed whereby cable installation passes through agricultural land of the highest potential sensitivity, including BMV land. Even on this basis, effects on agricultural land and soil resources are assessed as temporary, reversible and Not Significant, due to the limited spatial extent of the works, their short duration, and the committed mitigation and reinstatement measures in the SMP. Further, the EIA does not rely on the specific ALC grading of the Cable Corridors because the nature of the works and mitigation proposed	

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		would not result in permanent loss of soil function or agricultural capability and as such, further differentiation by ALC would not alter the outcome of the assessment nor identify any materially different mitigation requirements. The Applicant considers this to be proportionate and consistent with established practice for underground connection cables for solar infrastructure where soil resources are reinstated and returned to agricultural use. Recent NSIP precedent includes West Burton DCO where ALC surveys were not undertaken for underground Cable Corridors, on the basis that impacts were temporary and subject to soil management controls and Sunnica Energy Farm DCO in which the Secretary of State agreed with the approach of not proposing further ALC surveys for the Cable Corridors, given the limited and reversible nature of the works	

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		and controls secured through the **Draft DCO [EN0110020/APP/3.1]**.	
Natural England	ALC Surveys Natural England considers that, in the absence of site-specific ALC data, a detailed ALC/soil survey is required to inform development proposals, with a semi-detailed survey acceptable only where non-BMV soils are expected. They request clarification of inaccuracies and unsupported statements, and request clear evidence to underpin claims of long-term soil health benefits. They advise that operational impacts over a 60-year lifespan should not be described as "short term", reiterate that soils must only be handled in dry, friable conditions, and request temporary and permanent land-take breakdowns by project component. They require that all disturbed land, including the Cable Corridors, is supported by soil resource information.	The majority of the Site is underlain by non-BMV soils, with small areas of BMV dotted across the Site, predominantly in southern W1, Central W2 and south of Woodall in W3. These areas are not covered by permanent infrastructure, apart from 0.4ha in W1, by a substation compound. The Cable Corridors were not included in the scope of the surveys due to the reasons outlined in the comment row above.	Proposed construction methodology is described in Section 9.4.20. Mitigation, including the oSMP, is discussed in Section 9.6. BMV classification data for W1, W2 and W3, based on Site surveys and sampling, and for the Cable Corridors, based on a desk-based review, is provided in Section 9.5, including tabulated areas. Discussion of potential alternatives is provided in **ES Volume 1, Chapter 4: Alternatives and Design Evolution [EN0110020/APP/6.4]**.
Environment Agency	The Environment Agency (EA) advises that the Draft ES does not yet fully reflect the	Risks to groundwater as a receptor to land contamination have been assessed in more	Section 9.5 reflects a fully updated baseline from the Draft ES, and Section 9.7 an updated

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
	groundwater risks associated with the development, noting inconsistencies and omissions in the information presented.	detail in this Chapter of the ES, and extensively in the Phase 1 Contaminated Land Reports that include PRAs. Risks to groundwater as a water environment receptor in its own right as well as updated hydrogeological regime description, WFD status, groundwater bodies, abstractions, springs, SPZs and hydraulic connectivity, and assessing quantitative and qualitative effects on groundwater resources and dependent receptors are covered in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**.	assessment of effects. The aspects of risks to groundwater are detailed in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20].**
Environment Agency	Baseline Conditions The Environment Agency notes that the baseline in Section 9.6 is based on limited information and that the section itself confirms further data will be provided later, indicating that the current baseline does not represent a complete assessment.	Baseline conditions have been fully defined in this Chapter of the ES with updates included from the Phase 1 Contaminated Land Reports (**ES Volume 3, Appendix 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20])**.	Section 9.5 reflects a fully updated baseline from the baseline initially presented in the Draft ES. The aspects detailed in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20].**

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
Environment Agency	Shallow Groundwater Characterisation The Environment Agency highlights incorrect characterisation of shallow groundwater sensitivity, noting that bedrock Principal Aquifer conditions occur in parts of the Site and should be assessed as high sensitivity. They advise that mischaracterisation may lead to underestimation of significance. They request that bedrock aquifers be fully reflected in assessment tables, including operational and maintenance impacts. Groundwater level monitoring is recommended for all intrusive investigations.	Risks to groundwater have been assessed in more detail in this Chapter of the ES, and extensively in the Phase 1 Contaminated Land Reports (**ES Volume 3, 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**) that include PRAs. The Cadeby formation, which is characterised as a Principal Aquifer and intersects with Cable Route L, connecting W3 to W2, is considered in this assessment as having high sensitivity.	Section 9.6 reflects a fully updated baseline from the Draft ES, and 9.7 an updated assessment of effects. The aspects of risks to groundwater are detailed in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20].**
Environment Agency	Criteria Inconsistency The Environment Agency states that several effects have been assessed before key supporting information is available, leading to inconsistent application of sensitivity and magnitude criteria. They state that until site investigations have been carried out, including in and around landfills, the potential magnitude of impact cannot be determined, even when embedded mitigation	The Phase 1 CLRs (**ES Volume 3, Appendix 9.7-9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**) and CMRA (**ES Volume 3, Appendix 9.10-9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**) have informed a detailed reassessment of the magnitude of effects in this Chapter of the ES. Phase 2 ground	Section 9.7 for Assessment of Effects and 9.8 for Additional Mitigation.

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
	is considered. They note mismatches in Table 9.8 between narrative and tabulated magnitude ratings and highlight that groundwater sensitivity is omitted from some assessments (sections 9.8.15 to 9.8.17). Only the sensitivity of human receptors (low) is mentioned in 9.8.17, not groundwater (medium to high). They require reassessment once Phase 1 CLR and CMRA data are available, particularly for landfill-related risks.	investigations are currently considered as additional mitigation and would be undertaken in all areas of the Proposed Development which intersect with known historic and registered landfills sites.	
Environment Agency	Firewater The Environment Agency states that risks associated with fires and firewater during operation have not been considered and that adequacy of embedded mitigation cannot be confirmed until oBSMP and BESS drainage designs are reviewed. They request explicit assessment of fire and firewater impacts in subsequent reporting. Ensure fires and firewater are considered in relation to ground conditions and land quality in subsequent reports.	Fires at BESS facilities can cause significant generation of firewater that can be polluted and risk negative effects on soil and controlled waters. An **outline Battery Safety Management Plan (oBSMP) [EN0110020/APP/5.15]** has been submitted alongside the ES and will be secured via Requirement 8 of the **Draft DCO [EN0110020/APP/3.1]**. Firewater contamination and pollution prevention, including prevention of pollution to soils and underlying groundwater, is considered in **ES Volume 2, Chapter 10: Water Resources**	Firewater contamination and pollution prevention is considered in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**. Unforeseen and accidental effects are considered in **ES Volume 2, Chapter 16: Other Environmental Topics [EN0110020/APP/6.16]**.

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		and Flood Risk [EN0110020/APP/6.10]. Unforeseen and accidental effects are considered in ES Volume 2, Chapter 16: Other Environmental Topics [EN0110020/APP/6.16]	
Environment Agency	Unexpected Contamination The Environment Agency notes that procedures for identifying and managing unexpected contamination are not included within the ES lists or Commitments Register. They advise that explicit procedures must be secured in the oCEMP and oDEMP, covering both construction and decommissioning, as unexpected contamination may arise from on- or off-site sources. They note that while there is discussion of management of contaminated materials, there is no specific mention of a procedure for identifying and managing areas of suspected previously unknown contamination which may be encountered during works.	The **oCEMP [EN0110020/APP/5.9]** and **oDEMP [EN0110020/APP/5.11]** submitted with the Application and secured via Requirements 4 and 16 respectively in the **Draft DCO [EN0110020/APP/3.1]**, contain explicit procedures for encountering unexpected contamination. The Phase 1 CLR's detail all potential sources of onsite and offsite contamination within the Study Area where there is potential for the migration of contaminants to occur. Certain areas have higher potential of contaminated land, for example, Cable Corridors intersect narrow historical and registered landfills in four locations and Phase 2 intrusive investigations will be required in these areas prior to final engineering design.	**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** and **ES Volume 3, Appendix 9.10 – 9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**. The **oCEMP [EN0110020/APP/5.9]** and **oDEMP [EN0110020/APP/5.11]** submitted with the Application contain explicit procedures for encountering unexpected contamination. Additional Mitigation is included in Section 9.8.

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		The Commitments Register will be updated to include the unexpected contamination procedure and the requirement for Phase 2 intrusive works prior to construction in certain areas.	
Environment Agency	Technical Corrections The Environment Agency identifies several technical and editorial corrections: an outdated reference in Section 9.5.7, the need for dewatering to comply with EA guidance (Section 9.8.22), the requirement for full assessment of controlled waters risks at design stage (Sections 9.8.28 to 9.8.31), and inconsistencies between significance matrices presented in Tables 9.6 and 10.6.	References have been updated for the ES. It is now acknowledged that any dewatering activities would be undertaken in compliance with EA guidance. Full assessment of risks to controlled waters is included in the Phase 1 Contaminated Land Reports, summarised in Section 9.7. The risks to controlled waters and specifically groundwater as an abstracted resource is also considered in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10].** Matrices of significance are consistent across all chapters of the ES.	**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** and **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**.
RMBC	Landfills and Coal Mining Risk RMBC and South Yorkshire Mining Advisory Service (SYMAS) identify risks associated with historic coal	Cable Corridor Options included within the Draft ES previously included crossing the landfills as referenced, but these options have not been brought forward	Section 9.6 reflects a fully updated baseline from the Draft ES, and 9.7 an updated assessment of effects. **ES Volume 3, Appendix 9.7 – 9.9:**

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
	mining, mine entries and landfill sites within development areas. RMBC objects to cable routing through Maltby Landfill due to active landfill gas and leachate infrastructure and expresses strong concern about proximity to Kiveton Park Landfill, requiring detailed risk assessments and intrusive investigations. Insufficient detail is noted regarding BESS locations and foundations, and the council requests comprehensive GI and risk assessments to ensure the scheme does not pose risks to human health or the environment.	and the Cable Corridors in the ES avoid these large landfills. Cable Corridors do still intersect very small areas of registered and historic landfills in four locations and Phase 2 intrusive investigations would be required in these areas prior to final engineering design. No permanent infrastructure, including those requiring deep foundations, are located on landfills or land affected by coal mining. Coal mining and other land stability risks will be further addressed as part of the post consent detailed design development by targeted ground investigation undertaken prior to construction in areas where risk of unstable ground has been identified to inform design. A 20-metre ZoI around known mine entries has been used to avoid ground stability issues with installed infrastructure, and targeted ground investigations under the oversight of the MRA are	**Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** and **ES Volume 3, Appendix 9.10 – 9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**. Additional Mitigation is included in Section 9.8

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
		required if construction within the zone is required.	
Canal and River Trust	oCEMP and oEMMP The Canal and River Trust states that CEMPs and Excavated Materials Management Plans must be of sufficient standard to ensure full mitigation of risks to their receptors, and that future CEMPs must clearly identify and address these risks.	The Phase 1 CLR's detail all potential sources of on-Site and off-Site contamination within the Study Area where there is potential for the migration of contaminants to occur. These have informed the **oCEMP [EN0110020/APP/5.9]** which is submitted with the Application and includes the oSMP and oEMMP, the oCEMP is secured via Requirement 4 of the **Draft DCO [EN0110020/APP/3.1]**.	**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** and **ES Volume 3, Appendix 9.10 – 9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**. The **oCEMP [EN0110020/APP/5.9]** is submitted with the Application. Additional Mitigation is included in Section 9.8
The Coal Authority	**Mine Entries** The consultee welcomes that the Draft ES recognises recorded coal mining features and confirms that a Phase 1 CMRA will be included. They highlight that while solar panels are generally exempt, areas containing mine entries should be kept clear and fenced for safety, with infrastructure also avoided within influencing distance wherever possible. If avoidance is not feasible, strong justification and robust engineering solutions are required. They request that	Mine entries are described in the Phase 1 Contaminated Land Reports and Phase 1 Coal Mining Risks Assessments. The CMRAs include a PRA in relation to land instability, on the Proposed Development and on other receptors as a result of the Proposed Development. This principally relates to risk from land affected by historic coal mining from the surface or shallow underground and from mine entries.	Phase 1 Contaminated Land Reports and Phase 1 Coal Mining Risks Assessments (see **ES Volume 3, Appendix 9.7 – 9.12) and ES Volume 3, Appendix 9.10 – 9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**. Additional Mitigation is included in Section 9.8.

Consultee	Consultee Feedback	How This is Addressed	Where This is Addressed in The ES
	future submissions include clear plans showing the layout of all solar farm infrastructure in relation to mine entries and their zones of influence.	No permanent buildings are to be constructed on such land, although solar arrays and cables would be installed except within 20m of mine entries. The 20m ZoI around known mine entries has been used to avoid ground stability issues and, if construction within the zone is required, targeted ground investigations under the oversight of the MRA will be undertaken. Coal mining and other land stability risks will be further addressed as part of the ongoing detailed design development by targeted ground investigation undertaken prior to construction in areas where risk of unstable ground has been identified to inform design.	

Other Consultation

9.3.9 Details of consultation to date undertaken outside of the scoping exercise and Statutory Consultation are presented in **Table 9.3**.

Table 9.3: Summary of Other Consultation

Consultee	Date	Summary of Discussion	Where Addressed in the ES
City of Doncaster Council	12 June 2025	The CDC's Policy Officer (Minerals) noted that the W1 area of the Proposed Development: i) Is located in a shallow coal safeguarding area; ii) Overlaps a shallow coal / crushed rock (limestone) buffer near Clifton; and iii) Intersects the crushed rock (limestone) safeguarding areas along the M18 motorway. The Officer stated that, given the NPPF direction with regards to coal, it is not considered necessary to have regard to Local Plan Policy 61B. However, consideration must be given to the crushed rock (limestone) area. In line with Local Plan Policy 61B and NPPF paragraph 200 (Agent of Change), the development must demonstrate that it will not sterilise the safeguarded limestone resource or place unreasonable restrictions on the continued operation or future expansion of the quarry. This includes assessing whether the quarry can continue to function as intended and ensuring that the development does not introduce sensitive uses that could lead to operational conflicts.	**ES Volume 3, Figure 9.4: Mineral Resources [EN0110020/APP/6.19]** shows the locations of MSAs in the Study Area and existing baseline conditions are included in Section 9.5. The layout of the Proposed Development in the ES does not significantly overlap or sterilise mineral resources within the W1 area closest to Doncaster. Cable Route L overlaps the limestone MSA. An assessment of effects in relation to minerals is provided in Section 9.7.

Consultee	Date	Summary of Discussion	Where Addressed in the ES
Environment Agency	7 May 2026	A meeting was held to discuss the comments provided by the EA regarding the Phase 1 Contaminated Land Reports (**ES Volume 3, Appendix 9.7 – 9.9 [EN0110020/APP/6.20]**). Further information was provided on the approach to the assessment within this Chapter, proposed mitigation (including avoidance of potential sources of contamination within the design of the Proposed Development), and future ground investigation works that may be required if complete avoidance isn't possible.	Topics that were discussed in the meeting are detailed in Sections 9.4, 9.6, 9.7, and 9.8 of this Chapter.

Targeted Consultation

9.3.10 A Targeted Consultation period was held between 4 March and 3 April 2026 on proposed changes to the Order Limits. This included notifying relevant prescribed consultees. Feedback from this Targeted Consultation and the Applicant's response is included the **Consultation Report [EN0110020/APP/5.1]**.

9.3.11 A second Targeted Consultation was held for any individuals that had been identified as land interests after the Statutory Consultation.

9.3.12 No comments were provided by statutory consultees through the Targeted Consultation period in relation to Ground Conditions and Land Quality.

9.4 Assessment Methodology and Significance Criteria

9.4.1 This section sets out the scope and methodology for the assessment of the impacts of the Proposed Development on ground conditions and land quality from the construction, operation (including maintenance) and decommissioning phases.

The Study Area

9.4.2 For the purpose of the ground conditions and land quality assessment, the Study Area comprises a 250m buffer around the Order Limits, as shown in **ES Volume 3, Figure 9.1: Study Area [EN0110020/APP/6.19]**. This is considered appropriate based on the proposed shallow nature of ground disturbance (predominantly <5m). Effects from (or on) the Proposed Development are not anticipated beyond this distance.

9.4.3 The Phase 1 CLRs (**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**) consider potential sources and receptors of contamination within 250m. This approach facilitates the identification of both

on-site and off-site sources of potential contamination, as well as other factors that may influence land quality and ground conditions at or as a result of the Proposed Development.

Baseline Survey Methodology

9.4.4 To assess the agricultural quality of soils within the Site, intrusive ALC surveys have been undertaken, in line with Natural England guidance[20].

9.4.5 The ALC system grades land based on the extent to which physical factors, such as soil quality, climate, topography, and drainage, limit its agricultural productivity and cropping flexibility. These grades range from Grade 1 (excellent quality) to Grade 5 (very poor quality), with Grades 1, 2, and 3a collectively referred to as the BMV land.

9.4.6 ALC surveys were undertaken at a sampling rate of 1 per every 2 hectares across the entirety of W1, W2 and W3 (**ES Volume 3, Appendix 9.6: ALC Report [EN0110020/APP/6.20]**). This is with the exception of areas of planned permanent infrastructure, including BESS and substation locations. Due to the permanent effect on the soil in these locations, a higher resolution sampling grid of 1 location per 1 hectare was chosen in order to establish a more detailed ALC classification. The ALC survey included areas now just outside of the Order Limits of the solar arrays, and has a total of 803 samples obtained across 1,284ha, meaning that the whole Site average is a sample per 1.59ha. Of those, 178 samples taken are now outside the Order Limits but mostly within the Study Area. These have also contributed to the understanding of the ALC distribution.

9.4.7 ALC surveys have not been undertaken for the Cable Corridors due to the embedded mitigation measures within the oSMP (part of the **oCEMP [EN0110020/APP/5.9]**) which result in a low magnitude, temporary, fully reversible and **Not Significant** effect on soil function from the proposed cable laying approach. Desk-based information is used for the assessment of agricultural soils in the Cable Corridors.

Baseline Data Sources

Ground Conditions and Land Quality

9.4.8 The process of assessing contamination risk to ground conditions and land quality has been undertaken in line with EA guidance, LCRM[28].

9.4.9 A standalone Phase 1 Contaminated Land Report has been completed in three parts (for W1, W2 and W3, see **ES Volume 3, Appendix 9.7 - 9.9: Contaminated Land Reports [EN0110020/APP/6.20]**) and submitted alongside this ES, consistent with the 'Stage 1 Tier 1' risk assessments under LCRM guidance and includes:

i) Review of publicly available environmental site setting information, including in relation to soils, geology (including mineral sites and land stability), hydrogeology and hydrology;

ii) Collation and review of site-specific data, including a general search of the area using an environmental database (Landmark Envirocheck® Report) which includes up-to-date datasets (on-site and within 250m of the Proposed Development) on the following key areas:

a) Historic land use (historical mapping and aerial imagery);
b) Industrial land use and permits for industrial processes;
c) Sensitive land use and designated sites (ecology, hydrology, hydrogeology etc.);
d) Recorded pollution incidents; and
e) Licensed landfill and waste management facilities.

iii) Review of available previous borehole records and ground investigation reports for the Site and Cable Corridors to obtain site-specific data on the anticipated ground conditions;

iv) Identification of potential contaminative sources, the presence and nature of potential pathways and receptors (including human receptors, ecological receptors and natural resources, such as groundwater, surface watercourses and designated sites) to develop a CSM;

v) Identification of potential ground conditions that may have an effect or be affected by the Proposed Development and include these within the CSM;

vi) Site walkovers of key potential contaminative source areas and areas with potential ground conditions, undertaken by contaminated land specialists during the course of several intrusive ALC surveys and including historical landfills, other infilled land, areas with mine entries and areas with historical industrial activity; and

vii) Evaluation of the risk via a PRA to identified receptors using the 'source-pathway-receptor' methodology. Land contamination may be a hazard, but it does not constitute a risk unless all three elements, and therefore a 'pollutant linkage', are present. In assessing the potential for contamination to cause a Significant effect, the extent and nature of the potential source or sources of contamination must be assessed, any pathways present must be identified, and sensitive receptors or resources identified and appraised. This approach takes into account the sensitivity and vulnerability of the receptor, the likelihood of occurrence and the magnitude of the potential impact when evaluating potential risk.

9.4.10 Definitions of resource value and impact magnitude vary depending on the resource (i.e. land or groundwater) and are outlined in the following sections.

9.4.11 The risk evaluation also uses professional judgement to take into consideration the application of statutory standards and guidance, such as:

- LCRM, Environment Agency, 2020[28];
- CLR11 - Model Procedures for the Management of Land Contamination, Environment Agency 2004 (withdrawn)[29];
- GPLC2 – FAQs, technical information, detailed advice and references, Environment Agency 2010[30];
- Contaminated Land Assessment Exposure tool guidance, Environment Agency, 2014[31];
- Human Health Toxicological Assessment of Contaminants in Soil, Environment Agency, January 2009[32];
- BS EN1997 (EC7), Geotechnical Design, European Standard, 2004[33];
- BS 8004:2015+A1:2020, Code of Practice for Foundations, March 2020[34];

- Using Soil Guideline Values, Environment Agency, March 2009[35]; and
- Groundwater Pollution Prevention Principles (GP3), Environment Agency, March 2017 (withdrawn).

9.4.12 Data sources that were reviewed to establish the baseline presented in Section 9.5 (Baseline Conditions) included:

- British Geological Survey (BGS) Solid and Drift Geology, 1:50,000 England and Wales[36];
- BGS GeoIndex Onshore interactive map viewer[37];
- Defra's 'Magic' Map and Historical Landfills Sites database[38];
- The Mining Remediation Authority's (formerly the Coal Authority) interactive map viewer[39];
- Rotherham Local Plan Interactive Policies Map[40];
- Doncaster Local Plan Policies Map[41];
- Natural England's Agricultural Land Classification (ALC) Map[42];
- Zetica UXO Risk Map[43];
- UK Soil Observatory (UKSO) 'Soilscapes' Interactive Map[44];
- EA Catchment Data Explorer[45];
- Three Landmark Envirocheck® Reports for W1, W2 and W3 (see **ES Volume 3, Appendix 9.2 – 9.4 Landmark Envirocheck Reports [EN0110020/APP/6.20]**);
- Landmark Envirocheck® Reports for the Cable Corridors (see **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report for Cable Corridors [EN0110020/APP/6.20]**); and
- Defra's 'Magic' Map and Historical Landfills Sites database[46];
- The Mining Remediation Authority's (formerly the Coal Authority) interactive map viewer[47];
- Agricultural Land Classification Soil Resource Assessment, Whitestone Solar Farm, Land Drainage Consultancy Ltd. (see **ES Volume 3, Appendix 9.6: Agricultural Land Classification Report [EN0110020/APP/6.20]**).

Coal Mining

9.4.13 The process of assessing risk to ground conditions and land quality from historic coal mining activities has been undertaken **ES Volume 3, Appendix 9.10-9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]** and include:

i) Review of publicly-available environmental information, including in relation to geology, sensitive land uses, hydrogeology and hydrology;

ii) Review of MRA for identified High Risk Areas within the Site and Cable Corridors (licensed from the Mining Remediation Authority) which includes current datasets (within 250m of the Order Limits) on the following key areas:

a. Past, present and future underground coal mining;

b. Mine entries;

c. Coal mining geology;
d. Past, present and future opencast coal mining;
e. Coal mining subsidence;
f. Mine gas;
g. Hazards related to coal mining;
h. Mine water treatment schemes;
i. Coal Authority managed tips; and
j. Mine abandonment plans (if deemed necessary following previous review).

Methodology for the Assessment of Effects

9.4.14 An assessment of the potential impacts of the Proposed Development on existing ground conditions and land quality has been undertaken, including the potential for the Proposed Development to result in land contamination. The methodology specific to the ground conditions and land quality assessment is outlined in the following sections and incorporates both the Institute of Sustainability and Environmental Professionals (ISEP) (formerly IEMA) guidance on impact assessment in relation to land and soils[27] and the EA's LCRM guidance on the approach to qualitative assessment of risk from potentially contaminated land[28].

Sensitivity of Receptors

9.4.15 The sensitivity (value) of potential receptors can be described qualitatively according to the categories presented in **Table 9.4**.

Table 9.4: Receptor Sensitivity

Sensitivity	Receptor
High	• Human health: onsite residential developments, onsite construction workers; • Controlled waters (groundwater): Source Protection Zone or highly productive aquifer (i.e. Principal Aquifer); • Controlled waters (surface water): all surface water bodies (springs, drains, ponds, wetlands, streams and rivers); and • Soil resource: Presence of BMV land (Grades 1, 2 or 3a), surface mineral reserves, soils supporting nationally important environmental designated sites, high carbon sequestration soils (e.g. peat), or soils acting as important catchment pathways for water flow and / or flood management.
Medium	• Human health: onsite commercial developments, off-site residential developments; • Controlled waters (groundwater): Moderately productive aquifer (i.e. Secondary Aquifer); and • Soil resource: Presence of land of moderate quality (Grade 3b), sites supporting locally important environmental designated sites, moderate carbon sequestration soils (e.g. mineral soils), or soils acting as minor catchment pathways for water flow and/ or flood management.

Low	• Human health: transient or limited access, off-site commercial development; • Controlled waters (groundwater): Low productivity aquifer or rocks essentially with no groundwater (i.e. Unproductive Strata); and • Soil resource: Presence of land of poor quality (Grade 4) or urban soils, or soils acting as a pathway for local water flow and/ or flood management.

Magnitude of Impact

9.4.16 The magnitude of impact considers the timing, scale, size, and duration of the impact. The magnitude assigned will also use professional judgement to take into consideration the application of statutory standards and non-statutory standards or guidelines. The magnitude of impact on the receptors is presented in **Table 9.5**.

Table 9.5: Magnitude of Impact

Magnitude of Impact	Description of impacts	Example
High	• Results in loss of attribute and/or likely to cause exceedance of statutory objectives and/or breach of legislation; and • High degree of disruption to cultivation patterns and with high risk of change in land use.	• Contamination of a highly productive aquifer (Principal Aquifer) or any surface water; • Loss or isolation of a strategic mineral resource; • Permanent or irreversible loss of soil functions over an area of >20ha, or loss or isolation of strategic mineral resource; and • Impact of the health of a large number of human receptors, including off-site.
Medium	• Results in impact on integrity of attribute/or loss of part of attribute, and/or possibly cause exceedance of statutory objectives and/or breach of legislation; and • Moderate degree of disruption to cultivation patterns with moderate risk of change in land use.	• Loss or isolation of a regional/local mineral resource; • Contamination of a moderately productive aquifer (Secondary A Aquifer); • Reduction in the value of a feature, permanent or irreversible loss of soil functions over an area of 5 – 20ha, or loss or isolation of regional/local mineral resource; and • Impact on the health of on-site human receptors (i.e. the workforce).
Low	• Results in minor impacts on receptor; and	• Measurable change in receptor, but of limited size/proportion;

	• Minimal degree of disruption to cultivation patterns and low risk of change in land use.	• Contamination of a minor aquifer (Secondary B / Undifferentiated Aquifer); and • Reduction in the value of a feature, permanent or irreversible loss of soil functions over an area of <5ha, or a temporary, reversible loss.
Negligible	• No loss or alteration of characteristics, features or elements, no observable impact in either direction; and • Minimal or no disruption to cultivation patterns and very low risk of change in land use.	• No significant loss in quality of receptor.

Defining the Significance of Effects

9.4.17 The significance of an effect is determined by evaluating the sensitivity of the receptor against the potential magnitude of the impact. **Table 9.6** presents the matrix showing the significance of effects. Effects shaded green are considered 'Significant' in EIA terms.

Table 9.6: Significance of Effects

	Magnitude of Impact			
Sensitivity of Receptor	**Negligible**	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible	Negligible	Negligible
Low	Negligible	Minor	Minor	Moderate
Medium	Negligible	Minor	Moderate	Major
High	Negligible	Moderate	Major	Major

9.4.18 Where a range of significance levels is identified, the final determination for each effect is based on expert judgement, taking into account the reasonable worst case, as defined in Section 9.4.

Likelihood of Occurrence

9.4.19 The significance of effects is determined as if the impact has actually happened. However, in the context of geology and ground conditions it is also important to consider the likelihood of the impact occurring when assessing the overall significance of effects. The likelihood of occurrence is defined as follows:

- **High**: Occurrence of an impact is very likely in the short-term and is almost certain to occur in the long term, or a complete pathway is known to already exist;

- **Medium**: An impact may occur, either due to an unplanned event or the presence of a complete pathway, and it is probable that it will do so over the long term;
- **Low**: An impact may occur, either due to an unplanned event or the presence of a complete pathway, and it is possible that it will do so over the long term but there is no certainty that it will do so; and
- **Unlikely**: The potential for an impact to occur may be present, but the circumstances under which an adverse effect would materialise, even in the long-term, are improbable.

Basis of the Assessment

9.4.20 **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]** presents a summary of the design information for the Proposed Development which has been used to inform this assessment. Ground conditions and land quality, including soil resources and hydrogeology, would be exposed to potential impacts within the temporary construction (e.g. of below-ground cables, within construction compounds) and permanent surface infrastructure (e.g. solar arrays, BESS, substations) footprints of the Proposed Development.

9.4.21 In the context of ground conditions and land quality, construction phase activities have most potential for significant effects. The aspects of the construction phase of the Proposed Development which have potential effects on ground conditions and land quality, including soil resources, hydrogeology and contamination include:

- Early works, construction laydown and site preparation and access (soil stripping, site levelling and soil and groundwater remediation, if required);
- Excavation of foundations, including piling, for surface infrastructure and buildings (that may include dewatering of excavations) and subsequent construction of permanent above-ground structures;
- Excavations for below-ground cable installation (that may include dewatering of excavations), or cable installation by horizontal directional drilling (HDD);
- Piling for solar panels in the arrays, involving driving metal rods into the earth;
- Management of waste and surplus soil; and
- Fuel and other materials storage and use.

9.4.22 Therefore, the potential effects during construction that are considered in this Chapter include:

- Permanent loss of soils (in the locations of the BESS compound, substations and associated hardstanding);
- Soil compaction and changes to current drainage and water infiltration to ground due to construction activities;
- Potential effects on the quality of groundwater, including potential impacts to abstractions, resulting from disturbance and / or removal of the ground and groundwater which could potentially remove, relocate or mobilise potential contaminants from historical pollution; mobilisation of contamination into groundwater during construction (and decommissioning);

- Potential effects on groundwater resources as a result of dewatering of trenches and excavations (also see **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**);
- Potential effects on groundwater quality as a result of physical intrusion into aquifers, e.g. during drilling and installation of foundations;
- Exposure of construction workers to potentially contaminated soil and dust during soil removal, transportation and placement activities as a result of encountering historical contamination, including disturbance and / or removal of the ground and groundwater which could potentially remove, relocate or mobilise potential contaminants during construction (and decommissioning);
- Potential mobilisation of materials and substances with polluting potential (e.g. concrete, fuel, oils and soils) into ground or Controlled Waters as a result of accidental leaks or spills from the storage and use of such substances (e.g. in plant and equipment);
- Potential effects on land stability due to construction on land associated with historic coal mining in areas of former surface and shallow mines, and around former underground mine entries;
- Potential sterilisation of mineral resources due to construction on land designated as a MSA; and
- Potential effects from construction on land where historic landfilling has occurred.

9.4.23 During operation and maintenance of the Proposed Development, potential effects relating to ground conditions and land quality, include:

- Effects on soil resource agricultural classification, hydrogeology and contamination are limited to occasional maintenance activities that may require groundworks and the occurrence of accidental spills.
- Ongoing potential sterilisation of mineral resources due to construction on land designated as a MSA;
- The potential effects of high voltage cable (HVC) heat on adjacent soils and groundwater; and
- Potential effects on land stability over the operating period on land associated with historic coal mining in areas of former surface and shallow mines.

9.4.24 Decommissioning is likely to involve the dismantling and recycling of the PV arrays with associated vehicle movements. Components of the Proposed Development such as mitigation planting, Site accesses, and ducts for cabling buried beneath plough-depth would be left in place subject to landowner agreement. These activities would be managed through appropriate environmental management plans and industry best practices and are not expected to result in any adverse environmental impacts. The effects of decommissioning are usually similar to, or of a lesser magnitude than, construction effects on ground conditions and land quality. The specific method of decommissioning the Proposed Development at the end of its operational life is uncertain at present as the engineering approaches to decommissioning will evolve over the operational life of the Proposed Development. Assumptions will therefore be made where appropriate.

9.4.25 The ground conditions and land quality assessment should be considered alongside the following chapters of this ES which address other intra-related effects, including on:

- Surface water receptors, assessed in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**;
- Ecology, for example in groundwater-dependent terrestrial ecosystems (GWDTEs), assessed in **ES Volume 2, Chapter 6: Biodiversity and Nature Conservation [EN0110020/APP/6.6]**;
- Waste, assessed in **ES Volume 2, Chapter 16: Other Environmental Topics [EN0110020/APP/6.16]**; and
- Loss of agricultural land, assessed in **ES Volume 2, Chapter 15: Socio-Economics, Tourism and Recreation and Land Use [EN0110020/APP/6.15]**.

9.4.26 The design parameters are described in **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]** and are also described below. All design parameters are subject to refinement during post consent detailed design, that may need to be informed by targeted Phase 2 site intrusive works in certain circumstances (see Section 9.8). The design parameters described below are all those relevant in terms of expected ground disturbance and those with the potential for permanent changes the ground conditions.

9.4.27 The area of permanent ground disturbance (i.e. the total footprint for all proposed permanent structures onsite (power converter stations, substations, BESS and ancillary buildings) is anticipated to be approximately 42,000m^2 (**ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5], Tables 5.1, 5.4** and **5.5)**. This is based on the worst-case assumption that the entire footprint of the permanent structures would be disturbed. It is assumed that the topsoil stripped during construction would be stored if of high value or re-used elsewhere, either as part of the Proposed Development (e.g. landscaping, biodiversity net gain (BNG) initiatives) and/or offsite, subject to compliance with relevant legislation and guidance.

9.4.28 The area of temporary (surface) ground disturbance (i.e. the footprints of the temporary construction compounds, laydown areas, temporary access roads and Cable Corridors) is assessed as a reasonable worst-case scenario whereby the whole area of potential disturbance is assumed to be temporarily disturbed in the locations of construction compounds, laydown areas and temporary access roads, and the full working width (typically up to 40m) within the Cable Corridors. In reality, the area subject to disturbance is likely to be less, typically around 10m width.

9.4.29 For the solar PV infrastructure, the anchoring of the solar arrays will require the securing of mounting structures through piling (up to 3m below ground level (bgl)) or on a concrete ballast on potentially unstable or contaminated ground or to avoid archaeological features. Power conversion stations, BESS and substation foundations may require piling, anticipated to be up to a maximum of approximately 3, 4 and 15m BGL respectively. Open-cut trenches for cable installation are assumed to be a maximum of approximately 3m below finished ground level.

9.4.30 Where open-cut is not feasible (e.g. beneath main water courses, motorways), trenchless cable crossings will be installed (e.g. by HDD or similar method). The depth of trenchless cable installation methods beneath drains and minor

watercourses will be at least 1.5m below the bed of each watercourse, and avoiding disturbance within 10m of the bank top. Design and installation methods will be agreed with the Local Authorities during the detailed design stage.

9.4.31 During construction and operation (including maintenance) of the Proposed Development it is assumed that the hazardous substances will be stored with suitable containment measures in place and handled according to standard operating procedures. The hazardous substances may comprise of:

- Fuel (diesel) and ancillary fluids (e.g. oils);
- Potentially contaminated excavation arisings; and
- General waste.

9.4.32 The nature of sporadic maintenance works involving ground disturbance during the operational (including maintenance) phase is anticipated to be consistent with construction activities outlined above but on a smaller scale (lower magnitude).

9.4.33 Decommissioning is likely to operate within the parameters identified for construction (i.e., any activities are likely to occur within construction working areas and to require no greater amount or duration of activity than that assessed for construction).

Assumptions, Exclusions and Limitations

9.4.34 The following assumptions, exclusions and limitations apply to the ES in relation to ground conditions and land quality:

- With the exception of the ALC surveys, no other intrusive ground investigations have been undertaken to date. The information used to determine the significance of potential effects in relation to ground conditions and land quality is therefore based primarily upon a review of the available desk-based information. Additional Site-specific surveys and investigations, including ground investigations, will be undertaken to inform the detailed design in the post-consent phase, see Section 9.8;
- The assessment assumes that the publicly available information and environmental databases from which the baseline has been determined are accurate and up to date; and
- The assessment assumes that there will be no significant change in baseline conditions between the time of the surveys / assessment and the construction phase of the Proposed Development.

9.5 Baseline

Existing Baseline Conditions

Overview

9.5.1 The existing baseline is described below for each of the three Site areas (W1, W2 and W3) and the Cable Corridors, as defined in **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]** and shown on **ES Volume 3, Figure 3.1: Order Limits** and **ES Volume 3, Figure 3.2: Site Referencing [EN0110020/APP/6.19]**

9.5.2 The following baseline data applies to all areas:

- There are no designated sites of geological importance (such as RIGS, geological SSSIs or global geoparks) located within the Study Area; and
- ALC surveys undertaken at the Site (excluding the Cable Corridors) between February 2025 and January 2026, comprising a desk-top study, field survey, soil sampling and laboratory testing, did not split data by area. Based on the findings of the ALC surveys, the majority of the soils (79%) were classified as Subgrade 3b or 4 (non-BMV), as shown in **Table 9.7**, and on **ES Volume 3, Figure 9.2: ALC Survey Results [EN0110020/APP/6.19]**. The technical report on the ALC surveys is provided in **ES Volume 3, Appendix 9.6: Agricultural Land Classification Soil Report [EN0110020/APP/6.20]**.

Table 9.7: ALC Survey Results

ALC Grades	Total Area (Ha)	% of Total Site Area
Grade 1	10.85	0.94
Grade 2	81.24	7.06
Subgrade 3a	128.39	11.16
Subgrade 3b	907.16	78.86
Grade 4	3.64	0.32
Urban	7.65	0.67
Non-Agricultural	1.5	0.13
Not surveyed	9.83	0.85
Total	**1,150.26**	**100.0**

9.5.3 Of the area surveyed, 19% comprises BMV land (i.e. ALC grades 1, 2 and 3a). ALC areas are shown in **ES Volume 3, Figure 9.2: ALC Survey Results [EN0110020/APP/6.19]**. The substation located in W1 overlaps with approximately 0.4ha of Grade 3a agricultural land. All other permanent infrastructure is not to be located on any areas of BMV land. Areas identified as BMV land will only be used for solar PV modules or for landscape mitigation.

9.5.4 The areas surveyed for ALC is characterised by widespread landscapes of subgrade 3b quality (non-BMV) with BMV land distributed in scattered patterns. Notably, there are only a small number of fields (less than ten) that are occupied entirely or in majority by BMV, for example in central W2. This distribution means that, for the vast majority of the area surveyed, it is difficult to reasonably farm the better quality land separately to its full potential, being somewhat limited by the remainder of the field itself. Area-specific ALC data for W1, W2 and W3, is described in the following sections.

Baseline Conditions in W1

Current Land Use

9.5.5 W1 is located in South Yorkshire, approximately 1.3km to the west of Conisbrough (centred on National Grid Reference (NGR) SK503962). W1 covers

an area of approximately 327ha comprising agricultural fields and three existing agricultural / commercial properties located in the north, east, and central areas of W1. The four agricultural properties within the W1 area are Conisbrough Lodge Farm, Hill Top Farm and Conisbrough Parks Farm.

9.5.6 A more detailed description of the land within W1 is provided in **ES Volume 1, Chapter 3: The Site and Surrounding Area [EN0110020/APP/6.3]** and is illustrated in **ES Volume 3, Figure 3.2: Site Referencing [EN0110020/APP/6.19]**.

9.5.7 Based on a review of available information, the following current potentially contaminative land uses within W1 include:

On-site (Within the Order Limits)

- Made Ground placed to create building platforms during previous developments; and
- Potential sources of contamination associated with the current use of the Site for agricultural purposes (e.g. pesticides, accidental spillage of fuel from farm machinery);

Off-site (Within 250m Buffer of the Order Limits)

- Made Ground on adjacent properties and potential sources of contamination from current use of adjacent properties for agricultural purposes; and
- Other industrial land uses / landfills within 250m of the Site.

9.5.8 Locations of key potential sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report W1 [EN0110020/APP/6.20]**. The locations and nature of potential sources of contamination have been assessed further in **ES Volume 3, Appendix 9.7: Phase 1 Contaminated Land Report W1 [EN0110020/APP/6.20]**.

Historic Land Use

9.5.9 The majority of the land within W1 has historically been undeveloped, agricultural land since the first available historical maps (included within **ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report W1 [EN0110020/APP/6.20]**) dated 1854 .

9.5.10 Based on historical mapping, historic potentially contaminative land uses within W1 include:

On-site (Within the Order Limits)

- Agricultural structures and properties including Conisbrough Lodge Farm, Hill Top Farm and Conisbrough Parks Farm (1854-present day);
- Historic railway line from north to south located in the eastern area of W1 (1930-1983);
- Three mine shafts located in the centre, northern, and northeastern areas of W1 (1903-1966);
- Two recorded BGS Mineral Sites, Conisbrough Parks Brick Field and Clifton Common Shaft (associated with a mine entry) in the western central area and northern area of W1 respectively;
- At least two air shafts located in the western and central areas (1893-2024); and

- Four areas of potentially infilled land (non-water) are located in the western area of W1, and two are located in the northeastern area (1994).

Off-site (Within 250m Buffer of the Order Limits)

- Historical landfill site off Common Lane, Conisbrough approximately 50m north of W1 (reported as including inert, industrial, commercial and special wastes. Input dates from 1983 to1994). Inferred as infilling of a railway cutting on former railway line in this location (1930 – 1983 mapping);
- A sewage works ~200m northeast of W1 (1983-2024);
- Frisby Reservoir located ~200m south (1893-present);
- Areas located ~250m to the west labelled 'Sandstone Quarry' (1854-1893);
- Unnamed former quarry ~180m southwest (1903-1930); and
- Unnamed reservoir ~100m east (1930-1966).

9.5.11 Where approximate distances are provided, these are from the Order Limits.

9.5.12 Locations of key potential historical sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20]**. Mining-related potential sources are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

Unexploded Ordnance (UXO)

9.5.13 Online Zetica UXO mapping[43] indicates that W1 is in an area classified as 'low' risk from UXO. However, one decoy site is identified in the centre of W1, north of Conisbrough Lodge Farm.

Soils

9.5.14 According to UKSO 'Soilscapes' data[44], W1 is described as having predominantly "*slowly permeable seasonally wet acid loamy and clayey soils (Soilscape 17)*", with some areas of "*freely draining slightly acid loamy soils (Soilscape 6)*" in the west and "*freely draining lime-rich loamy soils (Soilscape 5)*" in the northwest and east.

9.5.15 The ALC surveys undertaken indicate that the soil grade in W1 is predominantly ALC subgrade 3b (non-BMV), with small areas in the north and south of Grade 2 and slightly larger areas of Subgrade 3a (BMV) in the northwest, centre and south.

9.5.16 The majority of W1, corresponding with ALC Subgrade 3b, is classified as Soil Type 5: Dale/Bardsey. This soil type is described as slowly permeable seasonally waterlogged soils with variable silt content. The Bardsey Association is derived from interbedded mudstones with fine loamy textures, while the Dale Association is developed from clay and shale deposits with stoneless clayey textures.

9.5.17 The sections of W1 corresponding with ALC Subgrade 3a in the centre around Park Lane, and in the west (ALC Subgrade 3b), is classified as Soil Type 2: Rivington 1 transitioning into Dale/Bardsey. This soil type represents a transitionary area between the lighter soil type 1 and previously described soil type 5. The topsoil is described as very dark greyish brown in colour with a fine sandy clay loam texture, while the subsoil is fine sandy clay loam to medium sandy loam with rare few mottles.

9.5.18 In the very northwestern section of W1, in areas classified predominantly as ALC Grade 2, the soil type is described as Soil Type 1: Rivington Soil Association and Soil Type 4: Aberford transitioning into Dale/Bardsey. Soil Type 1 is broadly reflective of underlying sandstone formation with very dark brown topsoil with sandy clay loam, medium clay loam or medium sandy loam textures. The subsoil is described as reddish brown in colour with medium sandy loam, loamy medium sand, or medium sand texture and absent of visible mottles. Soil Type 4 serves as a transition layer between the permeable Aberford association and the heavier textured Dale and Bardsey Associations. The topsoils are characterized by dark greyish brown medium to heavy clay textures, overlying mottled and gleyed, slowly permeable sandy clay loam and heavy clay loam subsoil immediately below the topsoil.

9.5.19 ALC grades are shown in **ES Volume 3, Figure 9.2: ALC Survey Results [EN0110020/APP/6.19]** and on the plans in **ES Volume 3, Appendix 9.6: Agricultural Land Classification Soil Resource Assessment [EN0110020/APP/6.20]**.

Geology

9.5.20 The BGS 'GeoIndex' online map viewer[37] indicates the following geological sequence underlying W1:

- Localised superficial deposits of glaciofluvial Sand and Gravel in the northwest of W1. No superficial deposits are mapped beneath the majority of W1;
- Sandstone, Mudstone and Siltstone of the Pennine Upper Coal Measures Formation bedrock beneath the majority of W1, and
- Dolostone with subordinate mudstone, dolomitic siltstone and sandstone of the Permian Cadeby Formation (also known as Magnesian Limestone) with the basal outcrop extending 8ha over the northern boundary of W1.

9.5.21 Plans showing the geology underlying W1 are provided in in **ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20]**.

9.5.22 Six BGS boreholes are recorded within the Order Limits, with many additional nearby boreholes associated with historic coal exploration.

9.5.23 **ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20]** indicates that there is very low to no hazard associated with ground stability across the extents of W1.

Coal Mining

9.5.24 According to the MRA online mapping[39], W1 is located in a Coal Mining Reporting Area.

9.5.25 Two High Risk Development Areas are identified in the northeast of W1 containing three mine entries associated with probable shallow coal mine workings and are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

9.5.26 **ES Volume 3, Appendix 9.10: Phase 1 Coal Mining Risk Assessment – W1 [EN0110020/APP/6.20]** has assessed risk associated with historic coal mining within W1 and the Study Area. Key findings are mine entries and their associated risk of mine gas and ground stability, past surface coal mining and risk concerning

infilled land, and several records of subsidence causing building and land damage, associated with historic underground mining.

9.5.27 The CMRA indicates that 12 claims of coal mining subsidence have been recorded within area of W1, with four of these substantiated with compensation or repair work completed. No subsidence claims have been made in the last 20 years, although this does not necessarily mean that ground stability issues associated with historic coal mining have ceased.

Mineral Resources

9.5.28 The Doncaster Local Plan Policies Map[41] shows designated Mineral Safeguarding Areas to protect sand, gravel, limestone, and shallow coal resources from being lost to development. Magnesian Limestone and sand and gravel are safeguarded in areas along and to the north of the Site, in a small area south of Conisbrough. The safeguarded area of Cadeby Formation (Magnesian Limestone MSA) intersects with W1 over approximately 8 hectares along outcrop of the thin basal deposits, while the sand and gravel safeguarded area intersects for approximately 3 hectares. Nearly all of the area of W1 which overlaps with these MSAs is currently planned as mitigation land. A MSA for shallow coal is present across the entirety of W1.

9.5.29 The Cadeby Formation dolostone (Magnesian Limestone) is worked locally with Holme Hall Quarry located approximately 2.5km east of W1.

9.5.30 The location and extent of MSAs within W1 are shown in **ES Volume 3, Figure 9.4: Mineral Resources [EN0110020/APP/6.19]**.

Groundwater Classification

9.5.31 As shown on plans provided in the Envirocheck® Report (**ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20])**, the geological units identified at W1 have the following Environment Agency aquifer classifications:

- Superficial Aquifer (glaciofluvial Sands and Gravels) over 3ha – Secondary A Aquifer;
- Bedrock Aquifer (Pennine Middle Coal Measures) over or underlying all of W1 - Secondary A Aquifer; and
- Bedrock Aquifer (Cadeby Formation) over 8ha – Principal Aquifer.

9.5.32 Groundwater vulnerability across W1 is predominantly classified as ‘High’, with a small area in the north classified as ‘Medium-High’. Plans showing the groundwater vulnerability in area W1 are provided in in the Envirocheck® Report (**ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20])**.

9.5.33 There is no soluble rock risk identified for W1.

9.5.34 There are no groundwater Source Protection Zones located within W1.

9.5.35 According to the EA Catchment Data Explorer[45], the majority of W1 is located within the “Don & Rother Millstone Grit & Coal Measures Water Body”. In 2019, this water body was classified as having ‘poor’ overall status, attributed to historic mining and quarrying as well as natural mineralisation. The far east of W1 is located within the “Idle Torne - Magnesian Limestone Water Body" which also was

classified in 2019 as having 'poor' overall status. This is attribute to agricultural nutrient management (e.g. nitrates).

Groundwater Abstractions

9.5.36 According to the Landmark Envirocheck® Report (see **ES Volume 3, Appendix 9.2: Landmark Envirocheck® Report: W1 [EN0110020/APP/6.20]**), there are no groundwater abstractions located within W1.

9.5.37 Within the Study Area, one licenced groundwater abstraction is located at Firsby Hall Farm, approximately 100m southwest of W1 registered for general farming and domestic use. Licenced groundwater abstractions are shown in **ES Volume 3, Figure 9.5: SPZ and Groundwater Abstractions [EN0110020/APP/6.19]**.

9.5.38 There are no borehole records available with groundwater depth data, so this remains uncertain in the W1 area, although shallow groundwater is expected in valley areas and near surface water bodies.

Baseline Conditions in W2

Current Land Use

9.5.39 W2 is located entirely within the administrative area of RMBC (centred on NGR SK477874) and covers approximately 651ha, primarily consisting of agricultural land. The M1 motorway bisects W2, running north to south through its centre. W2 is bordered by the settlements of Wickersley to the north, North Anston to the southeast, Aughton to the southwest and Thurcroft and Dinnington to the east. A wind farm, comprising six turbines, is present within W2.

9.5.40 A more detailed description of the land within W2 is provided in **ES Volume 1, Chapter 3: The Site and Surrounding Area [EN0110020/APP/6.3]** and is illustrated in **ES Volume 3, Figure 3.2: Site Referencing [EN0110020/APP/6.19]**.

9.5.41 Based on a review of available information, the following current potentially contaminative land uses within W2 include:

On-site (Within the Order Limits)

- Made Ground placed to create building platforms during previous developments, such as the M18 and M1 motorways and wind farm; and
- Potential sources of contamination associated with the current use of the Site for agricultural purposes (e.g. pesticides, accidental spillage of fuel from farm machinery).

Off-site (Within 250m Buffer of the Order Limits)

- Made Ground on adjacent properties and potential sources of contamination from current use of adjacent properties for agricultural purposes;
- The M1 and M18 motorways located immediately south of the north-western part of W2 and immediately east of the northern part of W2 respectively;
- Railway line located to the east of W2; and
- Other industrial land uses / landfills within 250m of the Site, including a sewage works and transformer station.

9.5.42 Locations of key potential sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**. The locations and nature of potential sources of contamination is further assessed in **ES Volume 3, Appendix 9.8: Contaminated Land Report W2 [EN0110020/APP/6.20].**

Historic Land Use

9.5.43 The majority of the area within W2 has historically been undeveloped, agricultural land with field boundaries and drainage ditches present, along with tracks, roads, footpaths and some agricultural properties since the first available historical maps dated 1854 (see **ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**).

9.5.44 Historical potentially contaminative land uses within W2 include:

On-site (Within the Order Limits)

- A former railway located along the Proposed Order Limit in the eastern area of W2 (1931 - 2000) along a strip of Mitigation Grassland. Listed in the Landmark Envirocheck Reports® as “Railway Cutting” Historic Landfill, ten to 15m wide along approximately 200m of border. Input dates from 1964 to 1974 with deposited waste including commercial and household waste; and
- Approximately 5ha of land in northwest W2 that has been subject to surface coal mining, including outcrops of coal seams identified in MRA records, where backfilling and land-levelling may have incorporated waste other that local mineral waste.

Off-site (Within 250m Buffer of the Order Limits)

- Bole Hill BGS Recorded Landfill, north of northwest W2, (1965 - unknown). First input date recorded as 1965 with deposited waste including inert, commercial and household waste.
- Former Brick Works located approximately 250m north of the eastern section of W2, immediately south of Common Road and southeast of Todwick Road (1854 - 1924);
- Six former quarries located:
  - Southwest of the eastern section of W2, south of the village of Hardwick and north of A57 (1854 - 1924);
  - South of the western section of the W2, south of Guilthwaite (1855 - 1924);
  - North of the western section of the W2, northeast of the village of Treeton (1924 - 1924);
  - ~Southwest of the northwestern section of W2, immediately southwest of the roundabout where the M1 meets A630 (1854 - 1924);
  - South of the central area of W2 to the north of the village of Hardwick (1855 - 1903); and
  - Two quarries south of the central area of W2 (1855 - 1924).
- A depot (unknown use) located to the south of the western section of W2, A618, Whiston (1981 - present); and
- Two former sewage works located:

- West of the northern section of W2, Second Lane, Wickersley (1930 - 2006); and
- South of the northwestern section of W2, adjacent to the River Rother (1924 - 1977).

9.5.45 Where approximate distances are provided, these are from the Order Limits.

9.5.46 Locations of key potential historical sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report W2 [EN0110020/APP/6.20]**.

UXO

9.5.47 Online Zetica UXO mapping[43] indicates that W2 is in an area classified as 'low' risk from UXO. However, a military installation is identified adjacent to W2 at Ulley Beeches and a decoy site was present adjacent to W2 east of the M1/M18.

Soils

9.5.48 According to UKSO 'Soilscapes' data[44], W2 is described as having predominantly *"slowly permeable seasonally wet acid loamy and clayey soils (Soilscape 17)"* in the north and east and *"freely draining slightly acid loamy soils (Soilscape 6)"* in the west and north. The western-most section of W2 has *"loamy and clayey floodplain soils with naturally high groundwater (Soilscape 20)"*.

9.5.49 The ALC surveys undertaken indicate that the soil grade in W2 predominantly ALC subgrade 3b (non-BMV). Areas of Grade 2 and Subgrade 3a soils (BMV) are present south and east of the village of Ulley, north of the A57, in the eastern parcels west of Treeton and also in the northern parcels south of Bramley Lings. A localised area of Grade 1 soil (BMV) is present to the south of Carr Lane. ALC grades are shown in **ES Volume 3, Figure 9.2: ALC Survey Results [EN0110020/APP/6.19]** and on the plans in **ES Volume 3, Appendix 9.6: Agricultural Land Classification Soil Resource Assessment [EN0110020/APP/6.20]**.

9.5.50 The majority of the soil type across W2 is Soil Type 5: Dale/Bardsey as described in Section 9.5.16. These areas correspond with the ALC Subgrade 3b classification across most of W2. Areas in the north, west, central and southeast of W2 where higher grades of ALC classification are found (Subgrade 3a and Grade 2), the soil types identified are predominantly Soil Type 1: Rivington 1 Association and Soil Type 2: Rivington 1 transitioning into Dale/Bardsey. Both of these soil types are described in more detail in Section 9.5.17.

Geology

9.5.51 The BGS 'GeoIndex' online map viewer[37] indicates the following geological sequence underlying W2:

- Superficial deposits of Clay, Silt, Sand and Gravel (Alluvium and Head) in the northwest and Glacial Till in the southeast;
- Bedrock comprising Sandstone, Mudstone and Siltstone of the Pennine Middle and Upper Coal Measures Formation; and
- Made Ground recorded in the western part of W2 and beneath sections of W2 coinciding with areas of potential historical surface coal workings.

9.5.52 Several BGS boreholes are recorded within W2, including logs showing sequences of clay, gravel deposits overlying interbedded sandstone and siltstone.

9.5.53 The Envirocheck® Report (**ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**) indicates that there is very low to moderate hazard associated with ground stability across the extents of W2. There is moderate hazard for compressible ground stability in the northwest of W2, in areas with past surface coal mining. Areas in the northwest and south of W2 have also been identified as having moderate risk for the potential of landslide ground stability hazards. This is due to the steeper slopes of the terrain, particularly the east side of Bole Hill in the northwest. In the south, this area is designated as mitigation land and will have no construction or groundworks, however in the northwest at Bole Hill, a roadway and a Cable Corridor is to be constructed between array areas.

9.5.54 Plans showing the geology underlying W2 are provided in in the Envirocheck® Report (**ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**).

Coal Mining

9.5.55 According to the MRA online mapping[39], W2 is located in a Coal Mining Reporting Area.

9.5.56 A High-Risk Development Area is identified to the east of Treeton, recorded as an area of past and current surface mining. High Risk Development Areas in relation to coal mining are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

9.5.57 **ES Volume 3, Appendix 9.11: Phase 1 Coal Mining Risk Assessment - W2 [EN0110020/APP/6.20]** has assessed risk associated with historic coal mining within W2. The main finding is the historical surface coal mining from an unlicensed opencast site and the potential risk concerning infilled land and records of subsidence associated with historic underground mining. The Brecks and Shafton coal outcrops are both mapped at the surface and mirror the location of the opencast site as well as the BGS records for infilled land. This suggests that these outcrops were likely worked for surface coal and subsequently infilled with mine spoil or other unknown material.

9.5.58 There have been no records of subsidence related to coal mining or mine gas within the extents of W2 and the adjacent Study Area.

Mineral Resources

9.5.59 The entire RMBC district is part of an MSA for shallow coal, fireclay and brick clay, which includes all of W2. No other MSAs are present.

9.5.60 The location and extent of MSAs within W2 are shown in **ES Volume 3, Figure 9.4: Mineral Resource [EN0110020/APP/6.19]**.

Groundwater Classification

9.5.61 As shown on plans provided in the Envirocheck® Report (**ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**), the geological units identified at W2 have the following Environment Agency aquifer classifications:

- Superficial Aquifer (Alluvium) – Secondary A Aquifer;
- Superficial Aquifer (Head and Glacial Till) – Secondary Undifferentiated Aquifers; and
- Bedrock Aquifer (Pennine Middle and Upper Coal Measures) - Secondary A Aquifers.

9.5.62 Groundwater vulnerability across W2 is predominantly classified as 'High', with a small area in the northwest and southeast classified as 'medium' and 'Medium-High'. Plans showing the groundwater vulnerability in area W2 are provided in in the Envirocheck® Report (**ES Volume 3, Appendix 9.3 Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**).

9.5.63 There are no groundwater Source Protection Zones located within W2.

9.5.64 According to the EA Catchment Data Explorer[45], the entirety of W2 is located within the "Don & Rother Millstone Grit & Coal Measures Water Body". In 2019, this water body was classified as having 'poor' overall status. This is attributed to historic mining activity, quarrying, and natural mineralisation affecting groundwater chemical quality.

Groundwater Abstractions

9.5.65 According to the Landmark Envirocheck® Report (see **ES Volume 3, Appendix 9.3: Landmark Envirocheck® Report: W2 [EN0110020/APP/6.20]**), there are two groundwater abstractions recorded within the Study Area around W2, as follows:

- Straight Mile Fishery in Todwick, adjacent to W2 and southwest of Common Road, and used for general use, water level maintenance, and as domestic private water supply; and
- Side Farm, Thurcroft, approximately 200m northeast of W2, to the north of the B6060 and used for aquaculture- make-up or top-up water.

9.5.66 One borehole (SK48NE262) adjacent to the eastern central boundary recorded a groundwater strike at 44.5m BGL within the Middle Coal Measures. Otherwise, depth to groundwater in the W2 area remains uncertain due to limited borehole data, although shallow groundwater is expected in valley areas and near surface water bodies.

9.5.67 Licenced groundwater abstractions are shown in **ES Volume 3, Figure 9.5: SPZ and Groundwater Abstractions [EN0110020/APP/6.19]**.

Baseline Conditions in W3

Current Land Use

9.5.68 W3 is situated within the administrative area of RMBC (centred on NGR SK481807) and covers approximately 172ha of predominantly agricultural land. The southern extent of the Order Limits slightly crosses into the area of North East Derbyshire District Council (NEDDC) within Derbyshire County Council (DCC). The M1 motorway bisects the southern portion of W3. Kiveton Park and the village of Wales are located approximately 500m to the north of W3. Northern W3 sits adjacent to Hard Lane to the east, while southern W3 is located within 50m of Harthill Reservoir to the east. To the south and west of W3 are the A618 and the Derbyshire County boundary respectively. Nearby residential receptors

are primarily located in the villages of Woodall, Harthill, Kiveton Park and Wales, with an additional cluster of properties situated along the A618 to the southwest.

9.5.69 A more detailed description of the land within W3 is provided in **ES Volume 1, Chapter 3: The Site and Surrounding Area [EN0110020/APP/6.3]** and is illustrated in **ES Volume 3, Figure 3.2: Site Referencing [EN0110020/APP/6.19]**.

9.5.70 Based on a review of available information, the following current potentially contaminative land uses within W3 include:

On-site (Within the Order Limits)

- Made Ground placed to create building platforms during previous developments, such as the M1 motorway; and
- Potential sources of contamination associated with the current use of the Site for agricultural purposes (e.g. pesticides, accidental spillage of fuel from farm machinery).

Off-site (within 250m Buffer of the Order Limits)

- Made Ground on adjacent properties and potential sources of contamination from current use of adjacent properties for agricultural purposes;
- The M1 motorway located immediately adjacent to W3, including Woodhall service station, with large fuelling operations both east and west of the motorway; and
- Other industrial land uses / landfills within 250m of the Site, including a sewage works;

9.5.71 Locations of key potential sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20]**. The locations and nature of potential sources of contamination are assessed further in **ES Volume 3, Appendix 9.9: Phase 1 Contaminated Land Report W3 [EN0110020/APP/6.20]**.

Historic Land Use

9.5.72 The majority of W3 has historically been undeveloped, agricultural land with field boundaries and drainage ditches present, along with tracks, roads, footpaths and some agricultural properties since the first available historical maps dated 1854 (see **ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20]**).

9.5.73 Historical potentially contaminative land uses within W3 include:

On-site (Within the Order Limits)

- Approximately 17ha of land in southeast and northern W3 that has been subject to historical surface coal mining, including outcrops of coal seams identified in MRA records, where backfilling and land-levelling with coal spoil may have incorporated other waste;
- Eight colliery shafts in the northwest corner of W3 (1854) and one in the far south;
- Bougy Hill quarry in the centre of W3 (1854 – 1931); and
- “Clay pit” in the eastern corner of W3 (1854 – 1899).

Off-site (Within 250m Buffer of the Order Limits)

- Unnamed quarry approximately 100m northeast (1894 – 1924);
- Two sewage works located approximately 50m north (1924 – 2000), and 20m west (1924 – 1967), and ~20m east, (1978 – present);
- A mine entry approximately 50m west of W3; and
- High Moor Colliery approximately 250m west (1882 – 1990).

9.5.74 Where approximate distances are provided, these are from the Order Limits.

9.5.75 Locations of key potential historical sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report W3 [EN0110020/APP/6.20]**. Mining-related potential sources are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

UXO

9.5.76 Online Zetica UXO mapping[43] indicates that W3 is in an area classified as 'low' risk from UXO.

Soils

9.5.77 According to UKSO 'Soilscapes' data[44], W3 is described as comprising *"slowly permeable seasonally wet acid loamy and clayey soils (Soilscape 17)"*.

9.5.78 The ALC surveys undertaken indicate that the soil grade in is predominantly ALC subgrade 3b (non-BMV). An area of Grades 1 and 2 and Subgrade 3a is present in the eastern section of W3, west of Harthill Reservoir and south of Woodall Lane, as well as small areas of Subgrade 3a in the west. ALC grades are shown in **ES Volume 3, Figure 9.2: ALC Survey Results [EN0110020/APP/6.19]** and on the plans in **ES Volume 3, Appendix 9.6: Agricultural Land Classification Soil Resource Assessment [EN0110020/APP/6.20]**.

9.5.79 The predominant soil type across W3 is Soil Type 5: Dale/Bardsey, as detailed in Section 9.5.16. This soil type corresponds with the areas classified as ALC Subgrade 3b. In the southern section of W3, south of Woodall, there is a large area of Soil Type 1: Rivington 1 Association, corresponding to identified areas of ALC Grades 1, 2 and 3a. Similarly, a small area just south of this, corresponding to ALC Subgrade 3a is identified as Soil Type 2: Rivington 1 transitioning into Dale/Bardsey.

Geology

9.5.80 The BGS 'GeoIndex' online map viewer[37] indicates the following geology underlying different parts of W3:

- Superficial deposits of Clay, Silt, Sand and Gravel (Head) across most of W3, with localised Alluvium (also comprising Clay, Silt, Sand and Gravel) in the east;
- Bedrock comprising Sandstone, Mudstone and Siltstone of the Pennine Middle Coal Measures Formation;
- Dolostone with subordinate mudstone, dolomitic siltstone and sandstone of the Permian Cadeby Formation (also known as Magnesian Limestone) with the

basal outcrop present along 2.1km of a Cable Corridor in the far south-east of W3; and

- Approximately 17ha of Made Ground of mixed mudstone/sandstone fragments with occasional coal primarily in the southeastern and northern sections of W3.

9.5.81 Several BGS boreholes within W3 record interbedded mudstone, siltstone and sandstone with multiple coal seams, including the Main Bright, Two Foot, Chavery, and other seams. Many additional boreholes in the area relate to historic coal mining or shallow investigations for the M1 motorway.

9.5.82 The Envirocheck® Report (**ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20]**) indicates that there is very low to no hazard associated with ground stability across the extents of W3.

9.5.83 Plans showing the geology underlying W3 are provided in in the Envirocheck® Report (**ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20]**).

Coal Mining

9.5.84 According to the MRA online mapping[39], W3 is located in a Coal Mining Reporting Area.

9.5.85 High Risk Development Areas have been identified within W3 and the Study Area around W3 associated with 17 mine entries associated with past surface mining and probable shallow coal mine workings.

9.5.86 High Risk Development Areas in relation to coal mining are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

9.5.87 **ES Volume 3, Appendix 9.12: Phase 1 Coal Mining Risk Assessment – W3 [EN0110020/APP/6.20]** has assessed the risk associated with historic coal mining within W3 and the Study Area. Key findings are the numerous mine entries and their associated risk of ground stability, past surface coal mining and risk concerning infilled land, records of subsidence associated with historic underground mining (although not recorded within the limits of the W3), and incidents of mine gas also recorded within the Study Area buffer around W3 (25 – 250m southwest).

9.5.88 One claim of coal mining subsidence was recorded within the Study Area buffer around W3 (50m south), however there are no current Stop Notices delaying the start of remedial works or repairs to this property. Although no coal mining subsidence has been recorded directly within W3, this does not necessarily mean that ground stability issues associated with historic coal mining cannot / will not occur.

Mineral Resources

9.5.89 The entire RMBC district is part of an MSA for shallow coal, fireclay and brick clay Mineral Safeguarding Area, which includes all of W3 which is located with the RMBC district.

9.5.90 A Cable Corridor in the far south-east of W3 crosses over 2.1km of the basal outcrop of the Cadeby Formation (also known as Magnesian Limestone) MSA.

9.5.91 The location and extent of MSAs in W3 are shown in **ES Volume 3, Figure 9.4: Mineral Resource [EN0110020/APP/6.19]**.

Groundwater Classification

9.5.92 As shown on plans provided in the Envirocheck® Report (**ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20])**, the geological units identified at W3 have the following Environment Agency aquifer classifications:

- Superficial Aquifer (Head and Alluvium) – Secondary Undifferentiated Aquifers; and
- Bedrock Aquifer (Pennine Middle Coal Measures) - Secondary A Aquifer.

9.5.93 Groundwater vulnerability across W3 is predominantly classified as 'High', with a localised areas in the northeast classified as 'Medium-High'. Plans showing the groundwater vulnerability in area W1 are provided in in the Envirocheck® Report (**ES Volume 3, Appendix 9.4 Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20])**.

9.5.94 There are no groundwater Source Protection Zones located within W3.

9.5.95 According to the EA Catchment Data Explorer[45], the entirety of W3 is located within the "Don & Rother Millstone Grit & Coal Measures Water Body". In 2019, this water body was classified as having 'poor' overall status attributed to historic mining, quarrying, and natural mineralisation.

Groundwater Abstractions

9.5.96 **ES Volume 3, Appendix 9.4: Landmark Envirocheck® Report: W3 [EN0110020/APP/6.20]** shows there are no groundwater abstractions located within W3.

9.5.97 Within the Study Area, one groundwater abstraction is recorded at Oaklands Farm, 190m east of W3, used for *"general agriculture, primarily spray irrigation storage"*.

9.5.98 Licenced groundwater abstractions are shown in **ES Volume 3, Figure 9.5: SPZ and Groundwater Abstractions [EN0110020/APP/6.19]**.

Baseline Conditions in Cable Corridors

Current Land Use

9.5.99 There are 18 Cable Corridors included within the Order Limits, interconnecting the three solar PV infrastructure areas (W1, W2 and W3) and connecting to the grid at the new Long Lane Substation as described in **ES Volume 1, Chapter 3: The Site and Surrounding Area [EN0110020/APP/6.3]**. The Cable Corridors cover an area predominantly comprising agricultural fields and also cross a number of roads, watercourses, a railway, past mining areas and small areas of woodland. To clearly define the Cable Corridors, W2, and W3 have been further divided into sub parcels, which are connected by Cable Corridors as described below. These sub parcels are shown in **ES Volume 3, Figure 3.3: Detailed Site Referencing [EN0110020/APP/6.19]**. The Cable Corridors comprise:

- Cable Route A to connect the east and west of W1, either side of the disused railway;
- Cable Route B to connect W1 to W2;
- Cable Route C to connect W2A to W2C;

- Cable Routes D1 and D2 to connect W2 to the point of connection at Long Lane 400kV Substation;
- Cable Route E to encompass all cabling works in and around Long Lane 400kV Substation;
- Cable Route F to connect W2B and W2C;
- Cable Routes G1 and G2 to interconnect W2B;
- Cable Route H to connect W2C to W2D;
- Cable Routes I1 and I2 to connect W2D and W2E;
- Cable Route J to connect W2F to Cable Routes K1 and K2;
- Cable Routes K1 and K2 to connect Cable Route J to W2G;
- Cable Route L to connect W2 and W3;
- Cable Route M to connect W3A to W3C; and
- Cable Route N to connect W3B to W3C.

9.5.100 Based on a review of available information, the following current potentially contaminative land uses and deleterious ground conditions within the Cable Corridors include:

On-site (Within the Order Limits)

- Made Ground placed to create building platforms during previous site development, such as roads and motorways;
- Potential sources of contamination associated with the current use of the Site for agricultural purposes (e.g. pesticides, accidental spillage of fuel from farm machinery); and
- Currently operated railway line crossing Cable Route N (Sheffield-Lincoln line) and historic rail infrastructure intersecting with Cable Route B.

Off-site (Within 250m Buffer of the Order Limits)

- Made Ground on adjacent properties and potential sources of contamination from current use of adjacent properties for agricultural purposes;
- Lidget Lane Household Waste Recycling Centre, adjacent to the west of Cable Corridor B; and
- Other industrial land uses / landfills within 250m of the Cable Corridor areas, including quarries, industrial estates and sewage works.

9.5.101 Locations of key potential sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report Cable Corridors [EN0110020/APP/6.20]**. The locations and nature of potential sources of contamination are further assessed in **ES Volume 3, Appendix 9.9: Phase 1 Contaminated Land Report W3 [EN0110020/APP/6.20]**.

Historic Land Use

9.5.102 The majority of the land within the Cable Corridor areas have been undeveloped agricultural land since the first available historical maps (included within the Envirocheck® report) dated 1854 (see **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: Cable Corridors [EN0110020/APP/6.20]**).

9.5.103 Based on historical mapping, historic potentially contaminative land uses within the Cable Corridor area include:

On-site (Within the Order Limits)

- Civil infrastructure including the Manchester, Sheffield and Lincolnshire railway and Chesterfield Canal, located in Cable Route L (1854 – present);
- Registered and Historic landfill, Hellaby Landfill; an infilled railway line between W1 and W2 where Cable Route B crosses at two locations north and south of Common Lane northeast of Bramley, where the infilled railway line at each crossing is between 10 to 40m wide; and,
- Approximately 5.5ha of land in Cable Route D1 that has been subject to surface coal mining, including outcrops of coal seams identified in MRA records, where backfilling and land-levelling may have incorporated waste other that coal spoil.

Off-site (Within 250m Buffer of the Order Limits)

- Bantry Road Registered Landfill, located adjacent west of Cable Route B (1949-unknown); Approximately 7ha, the landfill waste is specified as deposited waste included inert, industrial, commercial and household waste, and liquid sludge. The landfill is reported as closed and appears as sports fields. First input date is recorded as 1949, and last input date is unknown;
- Hellaby Park Farm, Registered Landfill, located in in Cable Route B, (1967 – present). Licence lapsed 1988. Large max input rate with deposited waste recorded as construction/demolition waste, inert waste and excavation waste (soil/subsoil);
- Lidget Lane Registered Landfill, located adjacent to Cable Route B, likely associated with the current location of the Lidget Lane Household Waste Recycling Centre, at the split of two former railway lines (1974 – 2006) and the Hellaby Landfill that is within the Cable Route Corridor;
- Former sewage works approximately 200m west of CRB (1931 – 1982), and 200m north of CRD-1 (1924 – 1981);
- A former tip (disused) approximately 50m west of CRB (1982-1989);
- Former quarries approximately 250m south of CRB (1903-1930), approximately 100m and 200m north of CRG-1 (1854-1981 and 1904-1924, respectively);
- Former railways located immediately adjacent to CRB (1930-2000); and
- Clay pit approximately 50m south of CRK-2 (1903 – 1924);

9.5.104 Where approximate distances are provided, these are from the Order Limits.

9.5.105 Locations of key potential historical sources of contamination (landfills) are shown in **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Reports for Cable Corridors [EN0110020/APP/6.20]** as well as in the **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**.

UXO

9.5.106 Online Zetica UXO mapping[43] indicates that the Cable Corridors are in an area classified as 'Low' risk from UXO. However, decoy sites were identified close to

the Cable Route B, as well as a strategic target at the current Kiveton Park Industrial Estate, close to Cable Route L.

Soils

9.5.107 According to UKSO 'Soilscapes' data[44], the Cable Corridor areas are predominantly classified as Soilscape 17, with localised areas of Soilscapes 5, 6 and 20 (definitions provided in previous sections).

9.5.108 No ALC surveys have been undertaken in the Cable Corridors. However, based on Natural England's agricultural land classification mapping[48], the anticipated classification is predominantly Grade 3 ('good to moderate', note that the Natural England map does not distinguish between Subgrades 3a and 3b), with localised areas of Grade 2 ('good') soils, generally consistent with the findings of the Site-specific ALC surveys for areas W1, W2 and W3.

Geology

9.5.109 The BGS 'GeoIndex' online map viewer[37] indicates the following geological sequence underlying the Cable Corridors:

- Superficial deposits of Clay, Silt, Sand and Gravel (Head and Alluvium) in central and western areas and Glacial Till towards the south. In northern and eastern areas no superficial deposits are mapped; and
- Bedrock comprising Dolostone of the Cadeby Formation in the east and northeast, with Sandstone, Mudstone and Siltstone of the Pennine Middle and Upper Coal Measures Formations elsewhere.

9.5.110 Plans showing the geology underlying the Cable Corridor area are provided in **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: Cable Corridors [EN0110020/APP/6.20]**.

9.5.111 **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: Cable Corridors [EN0110020/APP/6.20]** shows the majority of the Cable Corridors have low to no hazard for ground stability. The exception to this include sections of Cable Route D1 in northern W2, where there is moderate potential for compressible ground stability hazards in areas coinciding with mapped areas of past shallow coal mining, and in the far northwest of W2 near Bole Hill where Cable Route G1 Corridor crosses steep land rated with a risk of landslide.

Coal Mining

9.5.112 According to the MRA online mapping[39], the entirety of the Cable Corridor area is located in a Coal Mining Reporting Area.

9.5.113 High Risk Development Areas have been identified in the northern and central parts of the area, intersecting the M18 and M1 motorways, associated with probable shallow coal mine workings.

9.5.114 **ES Volume 3, Appendix 9.11: Phase 1 Coal Mining Risk Assessment – W2 [EN0110020/APP/6.20]** assessed the risk associated with historic coal mining within Cable Route D1 north of the M1 and south of Whiston, identified as Development High Risk Areas. The key finding is past surface coal mining from unlicensed opencast sites and the potential risk concerning infilled land and records of subsidence associated with historic underground mining. The Brecks and Shafton outcrops are both present at the surface around W2 and mirror the

location of the opencast site as well as the BGS records for infilled land. This suggests that these outcrops were likely worked for surface coal and subsequently infilled with mine spoil or other unknown material.

9.5.115 **ES Volume 3, Appendix 9.10: Phase 1 Coal Mining Risk Assessment – W1 [EN0110020/APP/6.20]** assessed the risk associated with historic coal mining within Cable Route B connecting W1 and W2, adjacent to the M1 north of Hellaby. It indicates that one claim of coal mining subsidence was recorded within the Cable Route, which occurred in 2005. The claim was settled by a combination of repairs and compensation. There are no current Stop Notices delaying the start of remedial works or repairs to this property. Although no further coal mining subsidence has been recorded within the Cable Route since this event, this does not necessarily mean that ground stability issues associated with historic coal mining cannot / will not occur.

9.5.116 High Risk Development Areas in relation to coal mining are shown in **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**.

Mineral Resources

9.5.117 The entire RMBC district is part of an MSA for shallow coal, fireclay and brick clay, including all of the Cable Corridor areas which are located within RMBC district. Additionally, parts of Cable Route L connecting W2 and W3 fall within an MSA for limestone. The very western edge of W2, near Junction 33 of the M1 motorway slightly overlaps an MSA for sand and gravel where Cable Route D1 will connect to the new 400 kilovolt National Grid substation proposed on land immediately east of Long Lane, Brinsworth, S60 4JJ (Long Lane 400kV Substation) (not part of the Proposed Development). The far northwest corner of the Long Lane 400kV Substation site is overlapped by around 1.5ha of MSA.

9.5.118 The Doncaster Local Plan Policies Map[15] identifies MSAs shallow coal resources in Cable Route B, up to the RMBC district boundary.

9.5.119 The location and extent of MSAs in the Cable Corridor area are shown in **ES Volume 3, Figure 9.4**: **Mineral Resource [EN0110020/APP/6.19].**

Groundwater Classification

9.5.120 As shown on plans provided in **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report: Cable Corridors [EN0110020/APP/6.20]**, the geological units identified beneath the Cable Corridors have the following Environment Agency aquifer classifications:

- Superficial Aquifer (Alluvium) - Secondary A Aquifer;
- Superficial Aquifer (Head and (some) Alluvium) – Secondary Undifferentiated Aquifers;
- Bedrock Aquifer (Cadeby Formation) – Principal Aquifer; and
- Bedrock Aquifer (Pennine Middle and Upper Coal Measures) - Secondary A Aquifers.

9.5.121 Groundwater vulnerability across the Cable Corridor area is predominantly classified as ‘High’ with localised areas of ‘Medium’ and ‘Medium-High’. Plans showing the groundwater vulnerability in area W1 are provided in **ES Volume 3,**

Appendix 9.5 Landmark Envirocheck® Report: Cable Corridors [EN0110020/APP/6.20].

9.5.122 A groundwater Source Protection Zone (SPZ) 3 (Total Catchment) intersects the southern part of the Cable Corridors area, as shown in **ES Volume 3, Figure 9.5: SPZ and Groundwater Abstractions [EN0110020/APP/6.19]**.

9.5.123 According to the EA Catchment Data Explorer[45], the Cable Corridor areas are located within the "Idle Torne - Magnesian Limestone Water Body" and "Don & Rother Millstone Grit & Coal Measures Water Body". In 2019, both these water bodies were classified as having 'poor' overall status.

Groundwater Abstractions

9.5.124 According to the Landmark Envirocheck® Report (see **ES Volume 3, Appendix 9.2 – 9.5: Landmark Envirocheck® Report: W1, W2, W3 and Cable Corridors**), there are no groundwater abstractions located within the Cable Corridors, and none within the Study Area (except those already identified as within 250m of W1 / W2 / W3).

Future Baseline Conditions

9.5.125 Future baseline conditions with respect to ground conditions and land quality within the Study Area over the 60-year operational life of the Proposed Development are not anticipated to materially change in the context of the assessment. However, the following is noted:

- The arable land and pasture that extends across most of the Study Area would be expected to continue to be used for similar range of agricultural activities. Climate change and market forces may modify the crops selected and farming methods deployed;
- The mineral resources that extend across virtually all of the Study Area may in the future be exploited. This is considered highly unlikely for coal but is possible for limestone resources close to the existing quarries and for the small areas where sand and gravel resources occur;
- Agricultural land in the vicinity of the Study Area is being developed for residential housing, agricultural developments, infrastructure and some commercial and industrial development. It is considered likely that proportions of the Study Area, likely small, would be developed for similar uses in the future baseline;
- Former coal mining land in the Study Area, including collieries and locations around former shafts are less likely to be developed, although potentially contaminated land on the identified brownfield sites are preferred locations for commercial and industrial development, and are considered more likely; and
- Where such potential developments do occur within the Study Area, there would be a loss of soil under these footprints, although land quality may improve if contaminated land is improved in the process.

9.5.126 If the Proposed Development is not progressed, the baseline conditions with respect to land, soil and groundwater would be expected to remain broadly unchanged. The primary source of future change with respect to the baseline are changes in land use and climate change.

9.5.127 With regard to climate change, it is anticipated that with the general trend of global warming that there is potential for more frequent and prolonged periods of extreme weather including longer and more frequent periods of rainfall. This has the potential to increase leaching of contaminants from soil.

9.5.128 Prolonged dry spells or increased rainfall, along with increased temperatures may impact soil with a high-volume change potential, which could result in settlement/heave of foundations and earthworks, in particular when located within the influence of trees and vegetation.

9.5.129 Climate change is already leading to soil degradation and water pollution. Extreme rainfall events, which are becoming more frequent, are reducing farmland's ability to regulate pollution leading to increased runoff of nutrients and pesticides into water bodies, harming aquatic ecosystems and reducing soil health. Erosion and run-off also risks mobilising contaminants from potentially contaminated land on the identified brownfield sites and former coal mining land.

9.5.130 The extent to which climate change impacts ALC, land quality and ground conditions depends on national policy development and local implementation and therefore is hard to predict and likely to be variable across the Study Area.

9.5.131 Changes in land use could influence the baseline parameters upon which this assessment has been based by introducing new potential sources of contamination through industrial development, or new receptors during the duration of the Proposed Development such as proximity of residential receptors through further expansion of existing residential centres or modification of existing pathways potentially increasing risk of mobilisation of contaminants.

9.5.132 These factors are taken into consideration, where practicable, in the assessment of effects.

Receptors and Pathways

9.5.133 Potential soil and geological receptors are detailed below. Although not strictly land quality receptors, the potential effects of contamination that may be present at the Proposed Development on human health, ecology and property are also considered. Where receptors and / or pathways are not applicable to all phases of the Proposed Development, the relevant phases are noted below.

Receptors

Soils

- BMV agricultural land (ALC Grade 1 – 3a), which is estimated to cover approximately 19% of the Site. Although no Site-specific ALC surveys have been carried out on the Cable Corridors Area, based on a desk-based review (see Section 9.5.108) it is reasonable to assume the same proportion of the area would be BMV land; and
- Non-BMV agricultural soils (ALC Subrade 3b and higher) and non-agricultural soils, which are estimated to cover around 79% the Site.

Geology

- MSAs (in relation to coal, limestone and sand and gravel), which have been identified within the Proposed Development;

- Shallow coal (with areas where fireclay and brick clay are interbedded with coal seams) extends across almost all of the Site and Cable Corridors but are unlikely to be developed given the UK's Net Zero Strategy, and so the coal MSAs are considered to be of negligible sensitivity;
- Cadeby Formation (Magnesian Limestone) MSAs occur along the northern boundary of W1 (less than 8ha), and along 2.1km of Cable Route L connecting W2 and W3. In both instances, the MSA overlap is on eastern edges of the main outcrop, where only thin basal portions of the Cadeby Formation are present. Consequently, they are considered, in the reasonable worst case, as less sensitive compared to the much thicker outcrops quarried to the east; and
- Two small, isolated Sand and Gravel MSAs occur within the Order Limits. These are very small areas in W1 (less than 3ha) on mitigation land, and in the Long Lane 400kV Substation area northwest of W2 (overlap of less than 1.5ha) where cables may be laid from Cable Corridors, and these are considered as low sensitivity. The locations and extent of MSAs is shown in **ES Volume 3, Figure 9.4: Mineral Resource [EN0110020/APP/6.19]**.

Groundwater

- Superficial aquifers: (Secondary A and Secondary Undifferentiated Aquifers);
- Bedrock aquifers (Principal and Secondary A Aquifers); and
- Groundwater abstractions, such as the holders of abstraction licences at properties within the Study Area.

Surface Water

- Surface water bodies including streams and lakes/ponds located on and near the Proposed Development and the aquatic habitats they support.

Human Health

- Onsite temporary construction workers (in the construction and decommissioning phases, as well as maintenance works during operational phase which involve ground disturbance) will be present, undertaking works during which exposure to contaminated soil or groundwater, if present, is possible (i.e. ground disturbance works). Given the temporary nature of this work, the primary consideration relating to these receptors is likely to be harmful effects caused by short term exposure to contaminants at higher concentrations (acute effects);
- Future Site workers (operational phase) – most likely to be an adult, male worker in the context of a commercial land use (i.e. operation of the Proposed Development). The primary consideration relating to these workers is likely to be harmful effects caused by long term exposure to low contaminant concentrations (chronic effects); and
- Offsite human receptors on neighbouring properties – exposure of users of neighbouring properties (including residential properties) to ground contamination, if present, may occur, e.g. where there is the potential for dust to be generated and blown offsite.

Pathways

9.5.134 The potential pathways through which the identified land quality receptors within the Study Area (including human health and property) could plausibly be exposed to the identified contaminant sources, if present, are detailed below.

Soil and Geology

- Potential for the spreading of contaminated soil during construction and decommissioning phases (as well as maintenance works during operational phase which involve ground disturbance), including via dust migration or surface runoff, on to areas of topsoil; and
- Potential for the Proposed Development to physically or chemically impact safeguarded mineral resources (i.e. causing inaccessibility or impacting the quality of mineral resources by contamination).

Human Health

- Ingestion of contaminants in soil during construction and decommissioning phases (as well as maintenance works during operational phase which involve ground disturbance);
- Direct contact with contaminants in soil during construction and decommissioning phases (as well as maintenance works during operational phase which involve ground disturbance);
- Inhalation of particles (e.g. asbestos fibres) in dust generated from contaminated soil during construction and decommissioning phases (as well as maintenance works during operational phase which involve ground disturbance);
- Inhalation of vapours derived from volatile contaminants in soil and/or shallow groundwater;
- Inhalation or explosive risk of ground gases derived from landfills, mine gas, Made Ground, organic material in natural deposits (e.g. alluvium); and
- Acute risks to maintenance and construction workers by accidental ingestion, inhalation or direct contact with contaminants in soil and / or shallow groundwater during construction and decommissioning phases (as well as maintenance works during operational phase which involve ground disturbance).

Groundwater

- Leaching of contaminants from shallow soil into shallow groundwater (e.g. by percolation of rainwater);
- Vertical migration of contaminants in shallow groundwater to deeper groundwater (i.e. bedrock aquifer), notably via preferential pathways such as piles; and
- Lateral migration of contaminants within groundwater, including to surface water (e.g. via baseflow or as springs). Surface water receptors are assessed in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**.

9.6 Embedded Mitigation

9.6.1 The following specific environmental embedded mitigation measures relevant to ground conditions and land quality have been identified and have been considered as part of the assessment. A Commitments Register has been

included with this ES (see **ES Volume 3, Appendix 2.3: Commitments Register [EN0110020/APP/6.20]**).

Construction

9.6.2 The Applicant has committed to implementing a CEMP during construction activities for the Proposed Development, which will be submitted to the LPAs for review and approval prior to commencement of construction. An **oCEMP [EN0110020/APP/5.9]** is submitted with the Application and secured via Requirement 4 of the **Draft DCO [EN0110020/APP/3.1]**, while being implemented and managed by the contractor undertaking the works. The oCEMP provides measures to avoid, minimise, or mitigate environmental impacts. This includes procedures to address erosion and contaminated land, as well as emergency protocols for managing accidental spillages and leaks, or if contaminated land or deleterious ground conditions are encountered during ground works. The contractor will audit and monitor all construction phases to ensure compliance with the commitments outlined in the oCEMP, while implementing procedures specific to the Proposed Development as detailed in the CEMP.

9.6.3 Embedded mitigation measures incorporated into the **oCEMP [EN0110020/APP/5.9]** include:

- All works will be undertaken in accordance with the relevant Construction (Design and Management) Regulations 2015;
- Appropriate procedures to address the risk of soil and groundwater contamination and deleterious ground conditions during ground disturbance works will be identified and implemented. This includes **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**;
- Handling of potentially polluting substances (e.g. fuels, soils, drilling fluids), including excavated soils and wastes, in line with technical guidance and best working practices. All fuel and Control of Substances Hazardous to Health (COSHH) substances will be stored and handled in accordance with the relevant Environment Agency PPG notes[49] , e.g. storage and refuelling in designated areas with secondary containment, routine inspections and maintenance of machinery and infrastructure and spill response planning and training;
- Management of clean topsoil and subsoil by the implementation of a Soil Management Plan (SMP), developed in line with the DEFRA 2009 *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298,* including retuning temporary working areas to their pre-existing condition, as far as reasonably practicable;
- Implementation of dust suppression measures as necessary to prevent the mobilisation and off-site migration of dust particles, for example damping down using water sprays, covering of stockpiles and wheel-washing;
- Design of the Site drainage to adequately manage surface water discharges, including water quality monitoring, containment and treatment, as required. The Lead Flood Authority (LFA) and the appropriate utility company will be consulted on the potential requirement for an oil interceptor and sediment trap for the BESS and the substation areas at the point where site surface water runoff enters any sewerage network;

- Piling activities will be undertaken in accordance with industry best practice. If building piles are in areas identified with potentially contaminated land, ground investigation findings will inform foundation works risk assessments which will determine the most appropriate piling techniques and foundation design to effectively mitigate potential risks;
- Trenchless crossings for cable installation will be undertaken in accordance with industry best practice and carefully managed to prevent the inadvertent release of drilling fluids into aquifers or the surrounding surface environment, including land and water bodies;
- In areas of steeper terrain in western W2, geotechnical investigations will be undertaken prior to construction in order to inform the design of a roadway and cable installation method;
- Identification and appropriate procedures to address the risks of soil and groundwater contamination during dewatering, if required, including management of water from excavations via the Site drainage / treatment system;
- A UXO risk assessment will be conducted prior to construction, and if required, a safety plan will be developed to ensure UXO risk is identified and addressed before construction begins, where required;
- Construction workers will be required to use appropriate Personal Protective Equipment (PPE) and adhere to all relevant Health & Safety protocols, plans, and procedures;
- Management of clean topsoil and subsoil by the implementation of a SMP, developed in line with the DEFRA 2009 *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298,* including retuning temporary working areas to their pre-existing condition, as far as reasonably practicable;
- Implementation of dust suppression measures as necessary to prevent the mobilisation and off-site migration of dust particles, for example damping down using water sprays, covering of stockpiles and wheel-washing; and
- Design of the Site drainage to adequately manage surface water discharges, including water quality monitoring, containment and treatment, as required. The Lead Flood Authority (LFA) and the appropriate utility company will be consulted on the potential requirement for an oil interceptor and sediment trap for the BESS and the substation areas at the point where site surface water runoff enters any sewerage network.

9.6.4 Site personnel will be required to read and understand the CEMP. On-site provisions are likely to include equipment such as booms, bunding, and absorbent materials to contain and manage serious spills or leaks.

9.6.5 A SMP will be included as a supplementary plan within the CEMP to manage potential impacts on soil and agricultural land during construction, in operations and throughout the decommissioning phase. An oSMP is provided as part of the **oCEMP [EN0110020/APP/5.9]** documentation.

9.6.6 Ensuring adherence to a robust SMP will be essential in minimising adverse effects on soil and maintaining agricultural land quality. These preliminary best practice measures are likely to include:

- Identifying those areas within our Site which may be more susceptible to damage, for example, the temporary access tracks, construction compounds and steeper slopes;
- Presenting guidelines as to when soil handling should be avoided (for example when it is wet or after periods of heavy rainfall or high winds) and further guidelines as to when soils are suitable for being handled or manoeuvred;
- Providing soil management guidelines including relating to topsoil stripping, construction and storage of topsoil and subsoil in stockpiles and stockpile management;
- Providing guidelines to maintain the physical properties of the soil; and
- Independent auditing and monitoring of the contractor.

9.6.7 The SMP will detail best practice measures for soil management to preserve soil structure and function, with the objective of restoring land to its pre-construction condition following temporary use and again after decommissioning. Soil protection measures to be implemented during construction and decommissioning are likely to include:

- Wherever possible, areas designated for landscaping, through enhancement and BNG, should remain undisturbed and be clearly fenced off from active work zones to protect soil quality;
- Appropriate management of managing vehicle and machinery movements and soil disturbance activities, including undertaken works only when soils are in a suitably dry condition, restriction of traffic to designated construction routes (see **ES Volume 3, Figures 13.2 to 13.6: Proposed HGV Routing [EN0110020/APP/6.19]**) use of machinery with tracks or low ground pressure tyres where possible to spread the weight and minimise soil compaction;
- Temporary placement of material into windrows if it is not possible to strip topsoil when it is below the plastic limit. Once it has dried sufficiently, it can then be lifted and placed into its final position;
- Storage of stripped soils in designated bunds, ideally located near their intended area of reuse and sited outside of floodplains. The bunds should be a maximum of 3m in height and in place for the least amount of time practicable in order to minimise damage to the soil or site. All bunds which will be in place for more than 6 months should be sown with a low maintenance grass seed mix;
- Restoration of soils in areas of temporary disturbance to the pre-existing condition, as far as reasonably practicable. Restoration activities should begin at the furthest point from each site exit to ensure that reinstated soils are not compacted by subsequent earth-moving machinery. Upon completion soil structure should be stabilised and a vigorous, well-rooted crop should be established to maximise the likelihood of successful and sustainable restoration;
- Reinstatement of soil should be monitored by a suitably qualified and competent person, such as an Ecological Clerk of Works (ECoW) or Geotechnical Engineer; and
- Permanent post-construction drainage may be required as part of land reinstatement. Any existing drainage systems damaged during the works will be repaired or replaced to ensure continued functionality. Where existing drains are cut or disrupted by construction activities, they should be diverted

into local drainage traps to minimise sediment release and maintain effective water management.

9.6.8 The construction and decommissioning phases of work would be audited against the requirements of the SMP by the contractor to ensure adherence.

9.6.9 An EMMP, part of the CEMP, will also be developed to ensure the appropriate handling, storage, re-use and disposal of excavated materials during the construction phase. This plan will help ensure that all excavated materials are managed in an environmentally responsible and compliant manner throughout the construction process. The main components of the plan are likely to include:

- The EMMP will detail how excavated materials will be managed in accordance with applicable legislation and guidance, including the Construction (Design and Management) Regulations 2015[50] and relevant environmental protection laws. This will ensure that all handling, storage, reuse of excavated materials and disposal activities are carried out in a legally compliant and environmentally responsible manner, with any waste generated managed in full compliance with applicable waste regulations;
- Detailed protocols for identifying and categorising excavated materials (e.g., contaminated vs. non-contaminated), along with clear guidelines for their safe handling, storage, and transportation;
- Waste management strategies for reducing waste generation, including the reuse and recycling of materials wherever feasible, as well as the proper disposal of any remaining waste materials (also see **ES Volume 2, Chapter 16: Other Environmental Topics [EN0110020/APP/6.16]**);
- Mitigation measures to prevent environmental contamination, such as dust control, erosion prevention, and spill response plans;
- Methods for evaluating the effectiveness of the EMMP, including routine inspections, scheduled audits, and defined reporting requirements;
- Measures to ensure the health and safety of workers and the public, including tailored training programs for those involved in or impacted by construction activities, and emergency response plans;
- Plans for restoring the Site after excavation activities are completed, including soil stabilisation and vegetation replanting; and
- Requirements for maintaining records of all activities related to the management of excavated materials, including permits, waste transfer notes, and monitoring reports.

9.6.10 An oEMMP is provided as part of the **oCEMP [EN0110020/APP/5.9]** documentation. In addition, the CEMP will be supported by other supplementary plans including:

- A Site Waste Management Plan, outlining how contractors will manage and dispose of waste materials through appropriate recycling facilities or licensed landfill sites. The selection of a suitable landfill for any off-site disposal of contaminated soil will be based on waste classification results, determined through chemical analysis or Waste Acceptance Criteria testing, as required. Where feasible, non-contaminated excavated material will be reused on-site; and
- An incident response plan for spillages and other environmental incidents. All site personnel will be required to read and understand the plan. On-site

provisions are likely to include equipment such as booms, bunding, and absorbent materials to contain and manage serious spills or leaks.

Operation and Maintenance

9.6.11 As discussed in **ES Volume 1, Chapter 4: Alternatives and Design [EN0110020/APP/6.4]** iterations the design of the Proposed Development has been developed in line with the design principles. As the design of the Proposed Development will continue to evolve the design will seek to incorporate the following:

- Where land is not used for solar PV development, BESS, or substations, prioritise the use of non-BMV land for the creation of screening and habitats where practicable; and
- Internal access tracks and Cable Corridors will aim to use existing infrastructure, such as crossings, tracks, and gaps in hedgerows, wherever practicable.

9.6.12 Potential impacts related to land contamination and groundwater will be primarily addressed through the implementation of an OEMP. An **oOEMP [EN0110020/APP/5.10]** is submitted alongside the Application and is secured via Requirement 14 of the **Draft DCO [EN0110020/APP/3.1]** which provides that the OEMP has to be carried out substantially in accordance with the oOEMP. This plan will outline key embedded mitigation measures designed to protect the land during the operational phase of the Proposed Development.

9.6.13 With respect to soils and agricultural land, embedded mitigation during the operational phase is likely to include:

- Measures to maintain land quality throughout the operational phase of the Proposed Development, which will be outlined and secured through implementation of the operational phase of the SMP. The SMP will identify areas within the Site that may be more vulnerable to damage (such as steep slopes), as well as conditions under which soil handling would be inappropriate (for example, when the soil is wet or following periods of heavy rainfall or strong winds). It will also set out best practice soil management measures aimed at preserving the physical properties of the soil, ensuring the land retains its capacity to support its intended function throughout the operational lifetime of the Proposed Development;
- Maintenance works will be subject to appropriate method statements, detailing, amongst things, use of PPE, management of (unexpected) contamination, soil management and polluting substance storage and handling; and
- Although potential impacts on soils during the operational phase are expected to be minimal, good practice will be applied to ensure that any activities, such as the maintenance and management of land beneath the solar PV modules, are carried out in a way that avoids damage and encourages regeneration of the soil resource, as far as reasonably practicable. These measures will also contribute to BNG by supporting soil health and enhancing habitat quality across the Site.

Decommissioning

9.6.14 Potential effects and embedded mitigation for decommissioning of the Proposed Development are similar in nature to those during construction. These effects would be substantially lesser in magnitude than during construction.

9.6.15 The DEMP will be prepared at the cessation of operations at the Site, in line with relevant legislation at that time. The DEMP will outline the potential environmental effects associated with decommissioning and Site closure/ restoration, and detail appropriate management and mitigation measures similar to those in the CEMP. An **oDEMP [EN0110020/APP/5.11]**. is submitted alongside the Application and secured via Requirement 16 of the **Draft DCO [EN0110020/APP/3.1]**.

9.7 Assessment of Effects

9.7.1 The assessment of potential effects in relation to ground conditions and land quality, including soil resources, minerals safeguarding areas and hydrogeology, below has been informed by the available baseline data for the Proposed Development presented in Section 9.5, taking into account implementation of the embedded mitigation measures described in Section 9.6.

9.7.2 The purpose of the following sections is to identify and assess likely significant effects for the construction, operation and maintenance, and decommissioning of the Proposed Development, using the methodology described in Section 9.4. The assessment draws on the CSMs developed as part of the Phase 1 CLRs (**ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]**) in relation to receptor sensitivity and vulnerability and the potential for complete Source – Pathway – Receptor (SPR) linkages to be present. The assessment considers all aspects of the Proposed Development; solar array, associated infrastructure, mitigation and land and Cable Corridors.

Construction

9.7.3 This assessment considers the potential effects of the following activities that may occur the construction phase, as outlined in Section 9.4.21:

- Permanent loss of soil function by topsoil stripping in areas of permanent buildings;
- Soil compaction and changes to current drainage and water infiltration to ground;
- Exposure of construction workers to ground or groundwater contamination, including from landfills, risks from dust inhalation, ingestion and dermal contact;
- Effects on soil and groundwater quality from disturbance, excavation or removal of polluted soils or groundwater, potentially mobilising or relocating contaminants, including ground gases, from potentially contaminated land such as landfills, locations of former surface coal mining, infilled land and other areas with historical land use;
- Effects on groundwater quantity or quality as a result of dewatering of trenches and excavations;

- Effects on groundwater quality as a result of physical intrusion into groundwater resource through HDD or other drilling techniques, with risks of drilling fluid breakout/loss to ground or surface water, and the installation of sub-surface structures (e.g., cables, piles, foundations) that may create new preferential pathways for contaminants or ground gases, including potential thermal effects on groundwater from buried electrical infrastructure;
- Use of plant and equipment, with risks of accidental leakage of fuels, oils, or hydraulic fluids introducing contaminants to soil or controlled waters;
- Effects resulting from construction on potentially unstable land affected by historic coal mining and mine entries, and other landfilling; and
- Sterilisation of mineral resources as a result of construction on land designated as a Minerals Safeguard Area.

9.7.4 The magnitude of impacts, accounting for embedded mitigation, is presented **Table 9.5** and summarised below.

Permanent Loss of Soil Function

9.7.5 The majority of the above ground infrastructure will be constructed on existing agricultural land. Soil function will remain unaffected in areas where solar PV arrays are installed using driven piles, as the soil will not be significantly disturbed. Similarly, no notable negative impact is expected in landscaping / green infrastructure areas. Due to the presence of PV arrays and restricted access during the operational phase, the land will become grassland suitable for grazing rather than for arable purposes for the duration of the Proposed Development. It is anticipated that removal of this land from arable use for the duration of the Proposed Development will lead to improved soil structure, carbon content and fertility, supporting improved biodiversity, as the land will be rested from intensive farming practices such as ploughing, harvesting or chemical inputs, allowing natural recovery processes to take place. Therefore, there is no permanent loss of soil function over the great majority of the Proposed Development.

9.7.6 For all Cable Corridors, the effect of cable laying on agricultural land is not considered as Significant, regardless of their ALC, because:

- Installation and restoration works will be undertaken under a SMP and / or EMMP. An oSMP and oEMMP is included in the **oCEMP [EN0110020/APP/5.9]** submitted with this with the Application;
- The trenching works required for the laying of the cables will be very short in duration; and
- The land will be reinstated following installation and returned to agricultural use, using a method specifically designed to retain its general soil characteristics without loss of soil function.

9.7.7 There is potential for permanent loss of soil function in areas of permanent development, i.e. the primary and satellite substations, BESS and ancillary buildings and areas of hardstanding. However, the area to be permanently stripped of topsoil will be less than 5ha in total (i.e. ‘low’ magnitude, see **Table 9.5**). Stripped topsoil is proposed to be re-used, such that the soil function loss is only temporary. All other access routes and laydown areas where topsoil is currently present (including agricultural areas) will be temporary and soil will be

reinstated in the same location as far as reasonably practicable on completion of construction works.

9.7.8 Based on the findings of the ALC survey and desk-based review, BMV land occupies approximately 19% of the Site. These soils are considered as 'High' sensitivity, whilst soils of other classifications (covering approximately 79% of the Site) are considered 'medium' sensitivity (see **Table 9.4**). There are no permanent developments located on BMV land apart from 0.4ha of overlap of a substation compound in W1, considered to be of Negligible magnitude.

9.7.9 Ensuring adherence to a robust SMP will be essential in minimising adverse effects on soil and maintaining agricultural land quality, as detailed in Section 9.6.5.

9.7.10 Therefore, in areas of BMV soils (19% of the Site), there is negligible magnitude of permanent loss of soil function from the Proposed Development, and so the significance of effect is assessed as **Negligible (Not Significant)**. In areas of non-BMV soils (79% of the Site), there are small areas (low magnitude) of permanent loss of soil function, and so the significance of effect is assessed as **Minor (Not Significant)**.

9.7.11 For Cable Corridors, the embedded mitigation measures within the oSMP and **oCEMP [EN0110020/APP/5.9]** will result in a temporary, fully reversible and **Negligible (Not Significant)** effect on soil function from the proposed cable laying.

9.7.12 Potential effects of loss of agricultural land is also discussed in **ES Volume 2, Chapter 15: Socio-Economics, Tourism and Recreation and Land Use [EN0110020/APP/6.15]**.

Soil Compaction and Changes to Current Drainage and Water Infiltration to Ground

9.7.13 In areas subject to vehicle and heavy plant movement (i.e. access roads and construction laydown areas), there is the potential for compaction of soil to occur, which, without mitigation, may alter rainfall infiltration rates and drainage. This will be mitigated and managed primarily through the **oCEMP [EN0110020/APP/5.9]** and associated oSMP (see Section 9.6) Where present and necessary, natural topsoil and subsoil will be stripped and stored on-site within the temporary working areas. If works are very short duration, such as during trenching for cable laying, they will be reinstated as soon as completed, otherwise topsoil and subsoil will be stored in separate stockpiles in line with DEFRA 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298. Soil handling will be undertaken during drier periods, such that it is in a friable condition, and will be compliant with relevant legislation, guidance and good practice techniques, as described in the oCEMP. Post-construction, the temporary working areas will be reinstated to pre-existing condition, as far as reasonably practicable.

9.7.14 As described above (Section 9.7.7), less than 5ha of land is proposed to be subject to permanent ground disturbance (i.e. 'low' magnitude of impact, as per **Table 9.5**). Although a greater area will be subject to temporary disturbance, temporary soil disturbance is also classified as 'low' magnitude of impact. Similarly, sensitivity of the soils is classified as 'medium' (79% of Site) to High' (19%) of Site, based on the presence and extent of BMV soils.

9.7.15 Therefore, in areas of BMV soils (19% of the Site), the potential significance of the temporary effect of soil compaction and changes to current drainage patterns is assessed as **Moderate (Significant)**. In areas of non-BMV soils (79% of the Site), the likely significance of effect on soils is assessed as **Minor (Not Significant)**. However, with the proposed embedded mitigation in place, permanent changes are anticipated to be minimal, resulting in a 'Negligible' magnitude of impact to soils. The significance of effect of compaction of soils is therefore assessed as **Negligible (Not Significant)**.

9.7.16 In addition, compaction of soils has the potential to reduce infiltration rates to shallow groundwater, and ultimately to deeper groundwater considered as '**Medium'** to '**High'** sensitivity. However, with the proposed embedded mitigation in place, changes are anticipated to be minimal, resulting in a 'negligible' magnitude of impact to groundwater. The significance of effect of changes to drainage patterns on groundwater is therefore assessed as **Negligible (Not Significant)**.

Exposure of Construction Workers to Contamination through Encountering Contaminated Soils During Ground Works

9.7.17 The act of breaking ground for construction introduces the potential of encountering unexpected contaminants. Localised potential sources of contamination have been identified, including registered and historic landfills, unknown areas of infilled land and past surface coal mining related activities, within the Order Limits and Study Area (see Section 9.5, **ES Volume 3, Appendix 9.2-9.5: Landmark Envirocheck® Reports [EN0110020/APP/6.20]** and **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**). The significance of these are further assessed in the **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** in line with the approach in LCRM[15].

9.7.18 The design of the Proposed Development has been refined such that Cable Corridors avoid the most significant potential sources of contamination (Maltby Brickworks and Kiveton Park Landfills). Remaining potential sources identified in the Phase 1 CLR's include named historic landfill sites within Cable Route B (Lidget Lane, Hellaby Landfill, Hellaby Park Farm and Bantry Road), records of small areas of potentially infilled land and land associated with historic coal mining, including mine entries and historic surface mining.

9.7.19 As part of the Coal Mining Risk Assessment (**ES Volume 3, Appendix 9.10-9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**), ground gas was considered as a potential contaminant of concern, especially related to historic coal mining activities. The risk assessment found that no areas of mine gas were found within the limits of the Proposed Development. Two incidents were recorded within 250m southwest of W3. Although not directly located within the Order Limits of the Proposed Development, the presence of mine gas within the vicinity indicates that there is the potential for further incidents to occur, with mine gas generation or displacement during construction, especially around known historic mining infrastructure.

9.7.20 The magnitude of impact when accounting for the implementation of the embedded mitigation measures as '**Medium'** (see **Table 9.5**). Accounting for the sensitivity of the identified human health receptors of '**High'** (see **Table 9.4**), the significance of effect is assessed as **Major (Significant)**, although the likelihood of occurrence of this effect is considered to be '**Low'**. Nevertheless, additional mitigation is required to manage this effect (see Section 9.8).

Effects on Soil and Groundwater Quality as a Result of Encountering Contaminated Soils During Intrusive Works, including from Landfills

9.7.21 Construction earthworks have the potential of encountering unexpected contaminants in the soil, potentially leading to mobilisation into groundwater caused by, for example, leaching due to greater exposure to rainfall, alterations in shallow drainage patterns, or interaction with perched or shallow groundwater. As most of the Proposed Development is on undeveloped land in agricultural use, the risk of encountering potentially contaminated land is considered to be low, and mainly restricted to the localised areas where historic or current land use presents potential contamination sources, including small areas of registered and historic landfills located on Cable Route B between W2 and W3, and areas of past coal mining related activities (see Section 9.5, **ES Volume 3, Appendix 9.2-9.5: Landmark Envirocheck® Reports [EN0110020/APP/6.20]** and **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**). These have been assessed in the **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]** in line with the approach in LCRM[15]

9.7.22 As stated in Section 9.7.18, the design of the Proposed Development has been refined such that the most significant potential sources of contamination are now avoided, including the Maltby Brickworks and Kiveton Park Landfills.

9.7.23 Remaining potential sources identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Report [EN0110020/APP/6.20]** include named historic landfill sites within Cable Route B (Lidget Lane, Hellaby Landfill, Hellaby Park Farm and Bantry Road), records of potentially infilled land and land associated with historic coal mining, including mine entries and historic surface mining.

9.7.24 The magnitude of impact to soils and groundwater when accounting for the implementation of the embedded mitigation measures set out above is assessed as '**Medium'** to **'High'** (see **Table 9.5**). Accounting for the sensitivity of the identified soil and groundwater receptors ('**Medium'** to '**High**' (see **Table 9.4**), the significance of effect is assessed as '**Moderate'** to **'Major' (Significant)**. The likelihood of occurrence of this effect is anticipated to be '**Low'**. Nevertheless, additional mitigation is required to manage this effect (see Section 9.8).

Dewatering of Trenches and Excavations

9.7.25 During construction, dewatering of excavations (e.g. for foundation excavations or trenchless crossing launch pits) may be required which, without mitigation, could result in impacts on groundwater flow and/or quality and knock-on effects to abstractions, springs and surface watercourses, including ecological receptors dependent on those watercourses. Potential impacts on surface watercourses and ecology are assessed in **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]** and **ES Volume 2, Chapter 6: Biodiversity and Nature Conservation [EN0110020/APP/6.6]**, respectively. Groundwater monitoring will be undertaken as part of ground investigation prior to construction to better understand the hydrogeological regime and inform the design of the dewatering system. The methodology for treatment of the water removed from excavations, alongside surface water runoff from construction areas, is presented in the **oCEMP [EN0110020/APP/5.9]** to reduce sediment load and contamination, if present, prior to discharge via an appropriate, approved route. Any dewatering activities undertaken will be done in line with EA guidance[51].

9.7.26 The magnitude of impact on identified groundwater receptors when accounting for the implementation of the embedded mitigation measures set out above is assessed to be **Negligible** (see **Table 9.5**). Accounting for the '**Medium'** to '**High'** sensitivity of the groundwater receptors (see **Table 9.4**), the significance of effect is assessed as **Negligible** (**Not Significant).**

Physical Intrusion into Groundwater Resources

9.7.27 Without mitigation, potentially Significant effects could occur as a result of drilling fluids, or impacted shallow groundwater, migrating into the deeper aquifers via preferential pathways, i.e. along piles or during the installation of trenchless cable laying. The installation of sub-surface infrastructure, such as buried electrical cables, piles and foundations may also locally alter ground conditions and create new preferential pathways for the migration of contaminants or ground gases between superficial deposits and underlying aquifers. The introduction of permanent below-ground structures may disrupt natural groundwater flow paths, reduce the integrity of low-permeability strata, or provide vertical conduits along Cable Corridors, foundations and piles.

9.7.28 Areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as having the highest risk of potential impact include areas identified as higher contamination risk such as records of potentially infilled land and registered and historic landfills within the Cable Route B (Lidget Lane, Hellaby Landfill and Hellaby Park Farm). Areas of intersecting bedrock classified as Principal Aquifer (Cable Route L) are also considered a higher risk of potential impact due to the high sensitivity of the bedrock aquifer.

9.7.29 Secured within the embedded mitigation, Foundation Works Risk Assessments will be undertaken in these areas, in line with EA guidance prior to construction to evaluate the potential risk to the bedrock aquifer from pile construction and mitigation measures implemented as required. Furthermore, horizontal drilling will be undertaken in line with industry best practice in regard to depths and control of drilling fluids. The magnitude of impact on identified groundwater receptors when accounting for the implementation of the embedded mitigation measures set out above is assessed to be '**negligible'** (see **Table 9.5**). Accounting for the '**Medium'** to '**High'** sensitivity of the groundwater receptors (see **Table 9.4**), the significance of effect is assessed as **Negligible** (**Not Significant).** Furthermore, the likelihood of occurrence of this effect is anticipated to be '**Low'**.

Potential Contamination of Soil and Groundwater by Accidental Leaks and Spillages

9.7.30 Potential leaks and spills may occur from a number of scenarios during construction, such as refuelling machinery / vehicles, from tanks and pipe work (containing oils / fuels) or from hazardous substance stores (containing fuels, oils and chemicals). In the event of a spill or leak, this may affect local ground conditions including BMV soils (**'High'** sensitivity) and potentially the quality of shallow groundwater underlying the area (superficial aquifers being '**Medium'** sensitivity). However, the proposed prevention and containment embedded mitigation measures (see Section 9.6) will significantly reduce the likelihood and magnitude of potential impacts**.**

9.7.31 Accounting for the '**Medium**' to '**High**' sensitivity of receptors and the '**Low**' magnitude of impact following the embedded mitigation, the potential effect is assessed as '**Minor**' to '**Moderate**'. However, as described in Section 9.4.19, this

is based on the effect having occurred. With the proposed embedded mitigation in place, the likelihood of occurrence is assessed as '**Low'**. Therefore, the overall effect is considered to be **Minor (Not Significant)**.

Potential Effects Resulting from Construction on Land with Potentially Deleterious Ground Conditions

9.7.32 Certain areas of the Proposed Development are located within zones historically associated with coal mining infrastructure (see **ES Volume 3, Figure 9.3: Coal Mining High Risk Development Areas [EN0110020/APP/6.19]**). These may present geotechnical risks due to subsidence or from the presence of potentially collapsible or compressible ground from unknown infilled ground and underground infrastructure, such as shallow coal workings, or capped mine and air shafts. In addition, mine gases may be generated which have the potential to accumulate in subsurface voids and pore spaces of soils and bedrock within the Proposed Development. These conditions could pose risks to the construction workers and long-term structural integrity of the Proposed Development.

9.7.33 Further data review has been undertaken in **ES Volume 3, Appendix 9.10-9.12: Phase 1 Coal Mining Risk Assessments [EN0110020/APP/6.20]**. These have identified areas of the Proposed Development with increased risk of unstable land due to historic coal mining activity, as well as other potential risks to development, including mine entries and areas with higher potential for mine gas.

9.7.34 The areas identified as having the highest risk of unstable land are predominantly located in sections of historic opencast surface mining, located in the western section of W2, Cable Route D1 between the western and northern sections of W2, and the eastern section of W3. These sections coincide with known historic surface coal mining and are considered to have moderate risk of compressible ground. The CMRAs have also identified 13 claims of subsidence made to the Coal Authority due to coal mining within W1 and Cable Route B between W1 and W2, and a further one 50m south of W3. At least five of these claims were substantiated with compensation or repair work. Although the most recent claim was over 20 years ago, ground subsidence within the Proposed Development has the potential to occur in the future.

9.7.35 Two other areas of the Proposed Development, both in W2, have been identified as having a moderate landslip risk. The first, and most significant, is located within Cable Route G1 in northwest W2 including a planned access road in the across the steeper slopes around Bole Hill. As outlined in Section 9.6, prior to construction, geotechnical investigations will be undertaken in order to inform the design of a roadway and cable installation method in this area of steeper terrain. The other area identified is located in the southern section of W2, south of Ulley. This is also an area with steeper terrain likely driving the higher risk of landslip hazards. Unlike at Bole Hill, this land is designated as mitigation land and as such, no construction or groundworks will take place.

9.7.36 In addition to coal mining, land instability may arise from infilled land / landfills (e.g. compressible ground). The current design avoids identified registered and historical landfills, where possible. However, in localised areas the Cable Routes cross through small areas of identified filled land (see **ES Volume 3, Appendix 9.5: Landmark Envirocheck® Report for Cable Corridors [EN0110020/APP/6.20]**). These include the Lidget Lane recorded landfill, Hellaby Landfill, Hellaby Park Farm registered landfill and Bantry Road BGS recorded landfill (Cable Route B). The extent and likely nature of ground in these areas has

been further assessed in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]**.

9.7.37 Substations and the BESS have been located away from all of the areas with potential for deleterious ground conditions described above, although solar arrays, low-voltage and high-voltage Cable Corridors and access tracks do overlap with relatively small areas with the potential hazards described above.

9.7.38 Considering the size of the potentially impacted areas (greater than 20ha), the magnitude of effects is considered '**High'** and with the sensitivity of the receptors considered '**High'** to '**Low',** the potential effect in relation to the risk of ground stability issues would be assessed as '**Moderate** to '**Major'**. However, as described in Section 9.4, this is based on the effect having occurred, and with the proposed embedded mitigation the likelihood of occurrence of this effect is considered to be '**Low'**. Nevertheless, additional mitigation is required to manage this effect (see Section 9.8).

Sterilisation of Mineral Resources by Construction on Land designated as a Mineral Safeguarding Area

9.7.39 Construction within MSAs has the potential to isolate or neutralise the minerals mapped as being present within the footprint of the Proposed Development (see **ES Volume 3, Figure 9.4: Mineral Resource [EN0110020/APP/6.19]**), potentially preventing them from being exploited by future minerals operations.

9.7.40 As described in Section 9.5 of this Chapter, the entire RMBC and DBC districts are classified as an MSA for coal, fireclay and brick clay. However, based on the district-wide designation and the very low likelihood of coal resources being exploited, and is not assessed further herein.

9.7.41 Otherwise, the Proposed Development overlaps an MSA (Magnesian Limestone) at W1 and along Cable Route L between W2 and W3. There are also sand and gravel MSA overlaps in small area of northernmost W1 (approximately 3ha) and where the Cable Route passes into the Long Lane 400kV Substation land northwest of W2 (approximately 1.5ha in the north of the Long Lane 400kV Substation land parcel). The sand and gravel deposit areas are small, peripheral edges of larger outcrops, and at W1 are in proximity to residential properties and are considered of '**Negligible'** magnitude and not assessed further herein.

9.7.42 Similarly, at northern W1, the northern outcrop of the Cadeby Formation (Magnesian Limestone MSA) intersects with W1 over approximately 8 hectares along outcrop of the thin basal deposits, again in proximity to residential properties. Although the area is of '**Medium'** magnitude, the other features mean this is highly unlikely to be worked and is considered '**Low**' sensitivity.

9.7.43 A mineral assessment of the Cadeby Formation MSA (Magnesian Limestone) along Cable Route L between W2 and W3 is presented below.

Mineral Assessment of the Cadeby Formation East of Kiveton Park

- Cable Route L between W3 and W2 runs for about 2.1km along the edge of the Cadeby Formation outcrop, which defines the boundary of the MSA for the Magnesian / Cadeby limestone resource. The Cadeby Formation has been and is still exploited in the area. Harrycroft Quarry is an active limestone extraction operated by Lafarge Aggregates & Concrete UK, with a current quarry face around 750m east of the closest part of the Cable Corridor and a development boundary extending to 520m east of the Corridor, with permission for quarrying to 2031. Historically, limestone has also been

extracted at (south) Anston Quarry, adjacent to the Chesterfield Canal, with an old quarry face around 260m east of the closest part of the Cable Corridor;

- Development on MSAs calls for consideration of a 250m buffer, used to mitigate amenity impacts such as noise and dust. Most of the land around the 2.1km of Cable Route L crossing the MSA is within 250m of existing residential and commercial properties, roads, railways and the Chesterfield Canal, where the MSA could be considered as already effectively neutralised by these existing developments; and
- However, two short stretches of the Cable Corridor cross land that is not close to existing developments. These are a 240m stretch south of South Anston in the north, and a 200m stretch across Ladyfield in the south, southeast of Kiveton Park. These stretches are both close to the edge of the outcrop of the Cadeby Formation (165 to 265m in the north, and 100 to 200m in the south), where erosion and weathering will have thinned the potential limestone resource. Evidence for the depth of soils and weathering is recorded in borehole SK58SW59 (670m east of the northern stretch, close to Harrycroft Quarry) where 2m of soil is underlain by 7.5m of weathered limestone and mudstone before 4.5m of fresher limestone at the base of the Formation. Given the proximity of both stretches of the Cable Corridor to the western edge of the Cadeby outcrop, it is unlikely they are underlain by more than 5 to 6m of limestone and likely much less than that at the northern / western side of the Corridor, or where soils are thicker. In addition, it is likely these thinned deposits near to the surface are also weathered, as was observed to 9.5m depth in SK58SW59, and of lesser value as a building or aggregate stone.

9.7.44 Assessing the effect on the Cadeby Formation MSA (Magnesian Limestone) along the Cable Corridor between W2 and W3, considering the additional 250m buffer over MSA land could extend over several hectares of land not already neutralised by existing developments, the magnitude is considered '**Medium'**. However, as the corridor stretches are along the erosional up-dip outcrop at the edge of the Cadeby Formation, erosion and weathering mean that economically valuable deposits are thin compared to land further east where it is currently worked, and so the sensitivity of the geological resource in the area affected by the Proposed Development is considered as '**Low'**. Consequently, the impact from the Proposed Development is considered **Minor** (**Not Significant).**

Operation (including Maintenance)

9.7.45 This assessment considers the potential effects of the following activities in relation to the operational phase, as outlined in Section 9.4:

- Effects from maintenance activities involving ground disturbance (equivalent to those during construction, only at a much smaller scale, i.e. effects on soil and groundwater quality as a result of encountering (and disturbing) contamination, effects on groundwater quantity or quality as a result of dewatering of excavations, effects on groundwater quality as a result of physical intrusion into groundwater resource and exposure of construction workers to ground or groundwater contamination;
- Potential contamination of ground and groundwater by accidental leaks and spillages of potentially polluting substances which may be stored / used onsite;

- Thermal effects generated by buried high-voltage cables, which could influence groundwater temperature or create preferential pathways for contaminant movement;
- Pollution from potential firewater at BESS; and
- Effects due to the accumulation of mine gas.

9.7.46 Whilst comparable to the construction phase, effects from maintenance activities involving ground disturbance, accidental leaks and spillages and from the accumulation of mine gas all take into account different source-pathway-receptors in the operation phase, such as:

- Changes to receptors, including risks posed to site maintenance workers, nearby residents and site visitors, due to changes in contaminant exposure pathways;
- Changes to the amount and nature of wastes produced during maintenance activities; and
- Ground stability risks associated with maintenance works on or near infilled land, which may affect asset integrity or worker safety.

9.7.47 The likely significance of effect for all potential effects described above, accounting for the embedded mitigation described in Section 9.6, is anticipated to be the same as, or less than that during the construction phase. The magnitude of impacts, accounting for embedded mitigation, is presented **Table 9.5** and summarised below:

Effects from Maintenance Activities Involving Ground Disturbance

9.7.48 The significance of effects arising from maintenance activities during the operational phase which involve ground disturbance, accounting for the embedded mitigation described in Section 9.6, is anticipated to be the same as, or less than, that the equivalent activities during the construction phase (see Section 9.7.5 onwards), i.e.:

- Effects on soil and groundwater quality as a result of encountering (and disturbing) contamination – **Moderate to Major (Significant)**;
- Effects on groundwater quantity or quality as a result of dewatering of excavations – **Negligible (Not Significant)**;
- Effects on groundwater quality as a result of physical intrusion into groundwater resource – **Negligible (Not Significant)**; and
- Exposure of construction workers to ground or groundwater contamination - **Major (Significant)**.

9.7.49 As in the construction phase, additional mitigation is required to manage the two **Significant** effects (see Section 9.8).

Potential Contamination of Ground and Groundwater by Accidental Leaks and Spillages

9.7.50 During operation, there is the potential for leaks or spills from hazardous substance storage areas (holding fuels, oils, and chemicals). If such incidents occur, they could impact local ground conditions and potentially affect the quality of shallow groundwater beneath the Site. Permanent infrastructure where storage or use of hazardous substances will be located on hardstanding that offer primary

containment of any spills with bunding and closed drainage systems offering secondary containment where required. In addition, potentially polluting substances (e.g. fuels) may be used during maintenance activities. Operational mitigation measures implemented under the **oOEMP [EN0110020/APP/5.10]** (Section 9.6), will significantly reduce both the likelihood and severity of any leaks or spills to ground.

9.7.51 Accounting for the **'Medium'** to **'High'** sensitivity of receptors and the **'Low'** to **'Medium'** magnitude of impact, the potential effect in relation to contamination of ground and groundwater resources by accidental leaks and spillages would be assessed as **'Minor'** to **'Major'**. However, as described in Section 9.4.19, this is based on the effect having occurred. With the embedded mitigation in place and the anticipated low volumes of potentially polluting substances present, the likelihood of occurrence is assessed as **'Very Low'**. Therefore, the overall likely effect is considered to be **Negligible (Not Significant)**.

Ongoing Potential for Sterilisation of MSAs

9.7.52 The effect in operation is the same as that considered in construction described above, where for the Cadeby Formation east of Kiveton Park the effect from the Proposed Development is considered **Minor** (**Not Significant**). Elsewhere the effect is considered **Negligible (Not Significant)**.

Potential Thermal Effects on Groundwater due to Buried Electrical Infrastructure

9.7.53 Buried high voltage electrical infrastructure has the potential to generate localised increases in ground temperature during operation, which could heat groundwater (considered a form of pollution), with consequent effects where infrastructure is installed within or in proximity to sensitive aquifers. These effects are most likely where sub-surface works intersect Principal Aquifers within the Cable Corridor connecting W2 and W3 and in areas of shallow groundwater. Design and construction controls, including appropriate cable burial depths, thermal rating design, sealing of annular spaces, and adherence to best practice for installation, will be implemented to minimise the potential for such effects. Where necessary, further assessment of thermal and hydrogeological effects will be undertaken as part of detailed design to confirm that groundwater resources are adequately protected.

9.7.54 Accounting for the **'Medium'** to **'High'** sensitivity of receptors, the **'Negligible'** magnitude of impact, and the '**Very Low'** likelihood of occurrence because of the embedded mitigation proposed, the effect in relation thermal effects on groundwater is assessed as **Negligible (Not Significant)**.

Effects due to the Migration and Accumulation of Mine Gas

9.7.55 Section 9.5 describes multiple records of mine entries and a small number of recorded incidents of mine gas within the vicinity of the Proposed Development. Cable Corridors may pass through or close to small areas of historic landfills. During operation, the potential remains for the build-up of undetected mine gas in mine entries, and landfill gas, and their displacement during maintenance activities or along new pathways introduced by the construction of the Proposed Development (e.g. piles and cable trenches). Other areas with historical shallow coal mining activity may also have the potential for the build-up of mine gas.

9.7.56 Operational mitigation measures implemented under the **oOEMP [EN0110020/APP/5.10]** (Section 9.6), will build on the understanding of gas risk developed in the construction phase to reduce both the likelihood and severity of gas occurrence. The sensitivity of receptors is assessed as '**Medium'** to '**High'**, with '**Low'** to '**High'** magnitude of impact. The potential effects of mine gas during operation are assessed as '**Minor'** to '**Major'.** Although the likelihood of occurrence of this effect is considered to be '**Low'**. Nevertheless, additional mitigation is required to manage this effect which is consistent with the need for additional mitigation identified for the construction phase (see Section 9.8).

Decommissioning

9.7.57 At this stage, as a worst-case, decommissioning in 60 years after construction is assumed to be the reverse of the construction sequence. Decommissioning is likely to involve the dismantling and recycling of the PV arrays and reinstatement of the land to a similar condition as it was prior to the Proposed Development, likely with the majority returned to agricultural land use. Removal of BESS and substation foundations to 1.2m BGL would be completed subject to landowner agreement. Components of the Proposed Development such as mitigation planting, Site accesses, and ducts for cabling buried beneath plough-depth would be left in place subject to landowner agreement. These activities would be managed through appropriate environmental management plans and industry best practices and are not expected to result in any adverse environmental impacts.

9.7.58 In general, it is assumed that the environmental effects on ground conditions and land quality from decommissioning will be usually similar to, or of a lesser magnitude, and therefore significance, than construction effects. The full assessment of residual effects during construction is presented in **Table 9.9**. Mitigation measures will be included within a DEMP. An **oDEMP [EN0110020/APP/5.11]** has been submitted as part of the Application and describes the framework of mitigation measures as identified in the ES to be followed and carried forward into a DEMP, which accords with the principles of the oDEMP, prior to decommissioning.

9.8 Additional Mitigation and Residual Effects

Additional Mitigation

9.8.1 The Proposed Development would incorporate additional mitigation to reduce any potential adverse effects on sensitive receptors. The primary additional mitigation is focussed Phase 2 ground investigation of soil, groundwater, ground gas or ground conditions. This will be required to the mitigate certain potential effects in certain specific areas of the Proposed Development, as described below.

9.8.2 Prior to construction, intrusive ground investigations and / or further data review will be undertaken in areas where the Cable Corridors intersect with identified known landfills. Although works will only create a temporary ground disturbance when installing the cabling, Phase 2 ground investigations will be required in these areas in order to establish the presence of contamination prior to construction as well as to better understand the ground stability risks. In other identified areas of potential contamination, such as the known historic surface coal mine areas, intrusive investigations will only be undertaken if contamination

is encountered during construction works. For mine entries, a 20m exclusion zone has been established such that no construction works can be undertaken within this zone unless Phase 2 ground investigations are undertaken first, co-ordinated by the MRA. This is partially due to the risk from contamination and ground gas, but also due to potential ground stability risks.

9.8.3 Phase 2 investigations required in the 20m zone around mine entries will include ground stability risks and a mine gas assessment. In other areas, such as known surface coal workings, if voids or potentially gas-generating pollutants are encountered during construction, then appropriate Phase 2 investigations for ground stability risks and gas monitoring will also be undertaken. In the operation phase, routine monitoring will be undertaken in areas identified by previous Phase 2 ground investigations as having higher potential for mine gas hazards. Details on the method of monitoring will be determined following Phase 2 investigations and details will be incorporated in the OEMP.

9.8.4 Contamination and / or ground gas impacted areas (if any are identified) will be avoided to the extent practicable by refinement of the Proposed Development design, or mitigation measures in relation to potential contamination will be secured via the CEMP (as outlined in Section 9.6 of this document). If unexpected contamination is encountered during construction, contamination will be subject to appropriate risk assessment. If required, the impacted material will be removed or remediated, in line with LCRM guidance[15], or additional mitigation measures will be implemented, as appropriate.

9.8.5 Ground investigation and / or further data review will be undertaken in areas of the Proposed Development coinciding with Principal Aquifer (Cable Route L), prior to construction to inform on the presence of contamination and the sensitivity of the groundwater regime.

Summary of Additional Mitigation

9.8.6 **Table 9.8** summarises the proposed additional mitigation measures for Ground Conditions and Land Quality impacts.

Table 9.8: Proposed Additional Mitigation

Potential Effect	Phase	Proposed Mitigation	Residual Effect
Exposure of Construction Workers to Contamination through Encountering Contaminated Soils as a Result of Ground Works	Construction	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination	Phase 2 Ground Investigations will identify any existing contamination in these areas and help establish the requirement for additional PPE or ground remediation strategies, if deemed appropriate, prior to construction. Undertaking the Phase 2 Ground Investigations will reduce the overall

		encountered during construction.	likelihood of occurrence to **'Very Low'** and potential magnitude to '**Low**', which will reduce the overall effect from **Major** to **Negligible** (**Not Significant)**.
Potential Effects Resulting from Construction on Land with Deleterious Ground Conditions - Unstable Land Associated with Historic Coal Mining and / or Landfills	Construction	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in any areas within 20m of identified mine entries prior to construction, in coordination with the MRA. Phase 2 Ground Investigations in areas of historic surface coal mining required if ground stability issues are encountered during construction.	With the implementation of effective Phase 2 Ground Investigations, the likelihood of occurrence is considered **'Very Low'**. This means that the overall significance of effect of **Moderate** to **Major** is now considered **Minor** (**Not Significant**).
Potential Effects Resulting from Construction on Land with Deleterious Ground Conditions - Exposure of Construction Workers to Ground Gas as a Result of Ground Works	Construction	In areas such as known surface coal workings, if voids or potentially gas-generating pollutants are encountered during construction, then appropriate Phase 2 investigations and gas monitoring will also be undertaken.	Phase 2 Ground Investigations will identify any existing gas in these areas and help establish the requirement for additional PPE or ground remediation strategies, if deemed appropriate, prior to construction. The Phase 2 Ground Investigations in areas identified as higher risk of ground gas will reduce the overall likelihood of occurrence to **'Very Low'**, which will reduce the overall effect from **Major** to **Negligible** (**Not Significant).**
Effects on soil and groundwater quality as a result of encountering	Construction	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1**	Phase 2 Ground Investigations will identify any existing contamination in these areas and help establish the

(and disturbing) contamination		**Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination encountered during construction.	requirement for remediation strategies, if deemed appropriate, prior to construction. Undertaking the Phase 2 Ground Investigations will reduce the overall likelihood of occurrence to **'Very Low'** and potential magnitude to '**Low**', which will reduce the overall effect from **Moderate** - **Major** to **Negligible** (**Not Significant)**.
Exposure of construction workers to ground or groundwater contamination	Operation	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination encountered during construction.	The Phase 2 Ground Investigations will be undertaken prior to construction. The significance of the effect will carry over from the construction phase with the already implemented additional mitigation. The likelihood of occurrence is considered **'Very Low'** and potential magnitude '**Low**', reducing the overall effect from **Major** to **Negligible** (**Not Significant)**.
Effects on soil and groundwater quality as a result of encountering (and disturbing) contamination	Operation	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination	The Phase 2 Ground Investigations will be undertaken prior to construction. The significance of the effect will carry over from the construction phase with the already implemented additional mitigation. The likelihood of occurrence is considered **'Very Low'** and potential magnitude '**Low**', reducing the overall

		encountered during construction.	effect from **Moderate** - **Major** to **Negligible** (**Not Significant)**.
Effects due to the accumulation of mine gas	Operation	Ongoing mine gas monitoring undertaken in areas previously identified as at risk from ground gas and subject to Phase 2 investigations prior to construction.	The effective implementation of mine gas monitoring, along with already embedded mitigation measures outlined in the **oOEMP [EN0110020/APP/5.10]** (Section 9.6), will significantly reduce the severity of any mine gas incidents and the likelihood of effect is also considered **Very Low** and potential magnitude is **'Low'**. This in turn reduces the likely significant effect from **Minor** - **Major** to **Minor (Not Significant).**

Residual Effects

9.8.7 A summary of the potential Ground Conditions and Land Quality residual effects, following both embedded and additional mitigation is presented in **Table 9.9.**

Table 9.9: Summary of Residual Effects

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
Construction								
Permanent loss of soil function in areas of non-BMV soil	oCEMP, oSMP, soil handling guidelines, stockpile management	Non-BMV Soils	Medium	Low	High	Minor	No additional mitigation	**Minor (Not Significant)**
Permanent loss of soil function in areas of BMV soil from permanent buildings and infrastructure	Outline Design Principles - avoidance and minimisation of overlap	BMV Soils	High	Negligible	High	Negligible	No additional mitigation	**Negligible (Not Significant)**
Soil compaction and changes to current drainage and water infiltration to ground	oCEMP, SMP, soil handling guidelines, stockpile management	All Soils	Medium to High	Negligible	Moderate	Negligible	No additional mitigation	**Negligible (Not Significant)**
Exposure of ground workers to contamination through encountering	oCEMP and Outline Design Principles	Construction workers	High	Medium	Low	Major	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume**	**Negligible (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
contaminated soils during ground works							**3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination encountered during construction.	
Effects on soil and groundwater quality as a result of encountering contaminated soils during intrusive works, including from landfills	oCEMP and design principles	BMV Soils and Groundwater Resources	High – Medium	Medium – High	Low	Moderate – Major	Phase 2 Ground Investigations (contaminated land, ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal	**Negligible (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
							mining required if there is evidence of contamination encountered during construction.	
Dewatering of trenches and excavations	oCEMP and Outline Design Principles	Groundwater Resource - Secondary and Principal Aquifers	Moderate and High	Negligible	High	Negligible	No additional mitigation	**Negligible (Not Significant)**
Physical intrusion into groundwater resources	oCEMP and design principles	Groundwater Resource - Secondary and Principal Aquifers	Moderate and High	Negligible	Low	Negligible	No additional mitigation	**Negligible (Not Significant)**
Potential contamination of soil by accidental leaks and spillages	oCEMP, Controlled drilling, spill control	BMV Soils	High	Low	Low	Minor	No additional mitigation	**Minor (Not Significant)**
Potential contamination of groundwater by accidental leaks and spillages	oCEMP, Controlled drilling, spill control	Groundwater Resource (superficial aquifers)	Medium	Low	Low	Minor	No additional mitigation	**Minor (Not Significant)**
Construction on land with Potentially	oCEMP and design principles	Ground Structural Stability,	High - Low	High	Low	Moderate – Major	Phase 2 Ground investigations in areas within 20m of mine	**Minor (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
Deleterious Ground Conditions		Risk to built infrastructure and to construction workers					entries, known historical and registered landfills, and in areas of infilled historic surface coal activities, if deleterious ground conditions are encountered.	
Sterilisation of Mineral Resources by Construction on Land designated as a Mineral Safeguarding Area	Design Principles - avoidance and minimisation of overlap	Designated Mineral Resources - Cadeby Formation east of Kiveton Park (land, in eastern W3)	Low	Medium	Certain	Minor	No additional mitigation	**Minor (Not Significant)**
Sterilisation of Mineral Resources by Construction on Land designated as a Mineral Safeguarding Area	Design Principles - avoidance and minimisation of overlap	Designated Mineral Resources - Cadeby Formation (along the northern boundary of W1)	Low	Low	Low	Negligible	No additional mitigation	**Negligible (Not Significant)**
Operation								
Effects on soil and groundwater quality as a	oOEMP	BMV Soils and Groundwater Resources	High – Medium	Medium – High	Low	Moderate – Major	Phase 2 Ground Investigations (contaminated land,	**Negligible (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
result of encountering and disturbing contamination							ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination encountered during construction.	
Dewatering of excavations	oOEMP	Groundwater Resource - Secondary and Principal Aquifers	Moderate and High	Negligible	High	Negligible	No additional mitigation	**Negligible (Not Significant)**
Physical intrusion into groundwater resources	oOEMP	Groundwater Resource - Secondary and Principal Aquifers	Moderate and High	Negligible	Low	Negligible	No additional mitigation	**Negligible (Not Significant)**
Exposure of ground workers to	oOEMP	Construction workers	High	Medium	Low	Major	Phase 2 Ground Investigations (contaminated land,	**Negligible (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
contamination through encountering contaminated soils during ground works							ground gas and ground stability) in areas identified in **ES Volume 3, Appendix 9.7 – 9.9: Phase 1 Contaminated Land Reports [EN0110020/APP/6.20]** as registered or historic landfills. Phase 2 Ground Investigations in areas of historic surface coal mining required if there is evidence of contamination encountered during construction.	
Potential Contamination of Ground and Groundwater by Accidental Leaks and Spillages	oOEMP	BMV Soils and Groundwater Resource (superficial aquifers)	Medium – High	Low – Medium	Very Low	Negligilbe	No additional mitigation	**Negligible (Not Significant)**
Ongoing potential for sterilisation of MSAs	Design Principles - avoidance and	Designated Mineral Resources - Cadeby Formation	Low	Medium	Certain	Minor	No additional mitigation	**Minor (Not Significant)**

Activity and Impact	Embedded Mitigation	Receptor	Sensitivity	Magnitude of Impact	Likelihood of Effect	Significance of Effect	Additional Mitigation	Significance of Residual Effect
	minimisation of overlap	east of Kiveton Park (land, in eastern W3)						
Ongoing potential for sterilisation of MSAs	Design Principles - avoidance and minimisation of overlap	Designated Mineral Resources - Cadeby Formation (along the northern boundary of W1)	Low	Low	Low	Negligible	No additional mitigation	**Negligible (Not Significant)**
Potential thermal effects on groundwater due to buried electrical infrastructure	Outline Design Principles	Groundwater Resource - Secondary and Principal Aquifers	Medium and High	Negligible	Very Low	Negligible	No additional mitigation	**Negligible (Not Significant)**
Effects due to the migration and accumulation of mine gas	Design Principles - avoidance and minimisation of overlap	Operations workers and nearby residents	Medium to High	Low - High	Low	Minor - Major	Mine gas monitoring in areas identified as having higher potential risk during Phase 2 Ground Investigations	**Minor (Not Significant)**
Decommissioning								

9.9 Cumulative Effects

9.9.1 This section assesses the potential cumulative Ground Conditions and Land Quality effects of the Proposed Development. The methodology of this assessment is presented in **ES Volume 1, Chapter 2: EIA Methodology [EN0110020/APP/6.2]**.

Intra-Cumulative Effects

9.9.2 Intra- cumulative impacts can be defined as those that occur where a single receptor is affected by more than one source of effect arising from different aspects of the project.

9.9.3 Intra-cumulative Ground Conditions and Land Quality impacts arising from overlapping construction activities (including earthworks, cable installation, foundation construction, dewatering and material handling) have been assessed inherently within this Chapter through consideration of a reasonable worst-case construction programme and maximum design scenario. This approach captures the combined effects of concurrent ground-disturbing activities on soils, groundwater, land stability, and human health. On this basis, intra-cumulative effects on ground conditions and land quality during construction are not expected to exceed those reported for the individual effects assessed in Section 9.7.

9.9.4 In addition to the intra-cumulative assessment undertaken within this Chapter, the potential for combined effects on human health arising from construction-phase ground conditions and land quality impacts in combination with other relevant topics (including Traffic and Transport, Noise and Vibration, Air Quality, Water Resources and Flood Risk, and Socio-economics and Land Use) is considered within **ES Volume 2, Chapter 17: Cumulative Effects [EN0110020/APP/6.17]**.

9.9.5 Ground-related effects on controlled waters, including groundwater and surface water receptors, are assessed within **ES Volume 2, Chapter 10: Water Resources and Flood Risk [EN0110020/APP/6.10]**, taking account of potential pollutant linkages arising from construction and operational activities. Construction-phase effects on human health associated with exposure to ground contamination are assessed within this Chapter, with any wider combined or inter-topic human health effects addressed within **ES Volume 2, Chapter 17: Cumulative Effects [EN0110020/APP/6.17]**.

Inter-Cumulative Effects

9.9.6 Inter-cumulative effects refer to the impacts that arise from other existing and, or approved development within reasonable proximity of the Proposed Development, which individually might not be Significant, but when considered together could create a Significant cumulative effect on a shared receptor.

9.9.7 As part of the assessment, all Tier 1 projects and plans are considered alongside the Proposed Development, comprising those which are:

- Under construction;
- Permitted application;
- Submitted application; and

- Those currently operational that were not operational when baseline data were collected, and / or those that are operational but have an ongoing impact

9.9.8 The specific projects, plans and activities within 250m of the Proposed Development (the Study Area) scoped into the inter-cumulative assessment, are outlined in **Table 9.10**. All land quality and ground condition cumulative effects are considered for these project locations within 250m, whereas only cumulative effects within the Order Limits are considered for agricultural land. This is because detailed ALC mapping has not been undertaken outside of the Order Limits and the generic, regional mapping of ALC that is available is not considered robust enough to compare with that obtained as baseline for this Proposed Development.

9.9.9 Using the screening approach outlined above: Tier 1 projects and plans within 250m of the Proposed Development, some were discounted from the land quality and ground condition assessment due to their distance from the Site.

Table 9.10: List of Other Tier 1 Projects, Plans and Activities Considered within the Inter-Cumulative Effects Assessment

Project / Plan	Status	Distance from the Proposed Development	Description of Project / plan	Temporal Overlap with Construction?	Temporal Overlap with Operation?	Spatial Overlap with the Proposed Development
Land off Moat Lane Wickersley (RB2024/0063 (Appeal ref. APP / P4415 / W / 25 / 3363208))	Approved at Appeal	Within the Cable Route 2A.	Erection of battery storage facility and associated works.	Likely	Likely	Yes
Land off Moat Lane Wickersley (RB2024/0321 (Appeal ref. APP / P4415 / W / 25 / 3365059))	Approved at Appeal	Within the Cable Route 2A.	Erection of battery storage facility and associated works.	Not Known	Likely	Yes
Land off Carr Lane Ulley (RB2025/0029)	Awaiting Decision	Within the Site - Whitestone 2.	Proposed ground-mounted solar PV arrays, supporting energy infrastructure (including battery storage (BESS), access improvements and ancillary development including, landscaping and biodiversity enhancements and continued shared agricultural use	Likely	Likely	Yes
Land at Hard Lane Kiveton Park (RB2025/0240)	Awaiting Decision	Adjacent to Whitestone 3, land parcel	Proposed Battery Energy Storage Scheme (BESS)	Likely	Likely	No

Project / Plan	Status	Distance from the Proposed Development	Description of Project / plan	Temporal Overlap with Construction?	Temporal Overlap with Operation?	Spatial Overlap with the Proposed Development
		west of Hard Lane.				
Land at Cumwell Lane, Hellaby (RB2025/0599)	Awaiting Decision	0.35km east of Cable Route E	Outline Application for residential development including details of appearance, landscaping, layout and scale	Likely	Likely	No
Land to the north west of Worry Goose Lane, Whiston (RB2024/0104)	Awaiting Decision	0.76km north of Cable Route E	Reserved matters application (details of internal access, landscaping, layout, scale, appearance) for the erection of 450 dwellinghouses (reserved by outline permission RB2019/0552)	Likely	Likely	No
Land off Morthen Lane Morthen (RB2025/0714)	Awaiting Decision	Within the Cable Route 2A	Construction, operation, and subsequent decommissioning of a renewable energy park, comprising ground mounted solar photovoltaic (PV) together with associated infrastructure including inverters, substation compound, cabling, access tracks, fencing, and landscaping	Likely	Likely	Yes

Project / Plan	Status	Distance from the Proposed Development	Description of Project / plan	Temporal Overlap with Construction?	Temporal Overlap with Operation?	Spatial Overlap with the Proposed Development
Land east of Moor Lane, South Bramley (RB2025/0979)	Awaiting Decision	0.4km west of Cable Route B	Outline Application for residential development of up to 349 dwellings including details of the access	Likely	Likely	No
Land south of West Bawtry Road Whiston (RB2025/1420)	Awaiting Decision	Adjacent to Cable Route 2C and within 0.1km of the Site - Whitestone 2.	Outline planning application for the construction of up to 170 dwellings with associated landscaping, open space, drainage infrastructure and associated works (all matters reserved except access from Long Lane)	Likely	Likely	No
Land at Long Lane Whiston (RB2025/1468)	Awaiting Decision	Within the Site - Whitestone 2/Brinsworth Substation Extension.	Erection of a new 400kV Gas Insulated Switchgear (GIS) substation including gantries, internal access roads, a GIS building, parking, drainage, emergency diesel generator, lighting and CCTV, permanent access road from Long Lane, earthworks, landscaping and biodiversity enhancement, and fencing and the permanent	Likely	Likely	Yes

Project / Plan	Status	Distance from the Proposed Development	Description of Project / plan	Temporal Overlap with Construction?	Temporal Overlap with Operation?	Spatial Overlap with the Proposed Development
			realignment of Whiston Footpath 10			
Best Meats UK Ltd Houghton Road North Anston Trading Estate North Anston (RB2025/1648)	Granted conditionally	0.12km north of the Site - Whitestone 2.	Erection of new sub station	Likely	Likely	No
Land west off Hard Lane Kiveton Park (RB2024/1582)	Complete	Adjacent to the Site - Whitestone 3.	Environmental Impact Assessment (EIA) for a screening opinion for proposed battery energy storage scheme (BESS)	Not Known	Not Known	No
Land east of Cumwell Lane, Hellaby (RB2025/1223)	Awaiting Decision	0/26km east of Cable Route B	Outline Application for residential development with main points of access, all other matters reserved	Likely	Likely	No
Land at Long Lane Whiston (RB2025/1674)	No objections	Within the Site - Whitestone 2.	Installation of 2 replacement terminal single poles (application under Overhead Lines (Exemption) (England and Wales) Regulations 2009)	Likely	Not Known	Yes
Land Off Moor Lane Micklebring Rotherham S66 7RN (22/00840/SCRE)	Decided - Not EIA	Adjacent to Cable Route 1A.	Request for an EIA screening opinion for the Proposed Mere Flats Solar Energy Supply Project	Not Known	Not Known	No

Project / Plan	Status	Distance from the Proposed Development	Description of Project / plan	Temporal Overlap with Construction?	Temporal Overlap with Operation?	Spatial Overlap with the Proposed Development
Land South East Of Old Road Conisbrough Doncaster DN12 3LR (24/01404/FULM)	Decided - Granted conditionally subject to Section 106 Agreement	Adjacent to the Site - Whitestone 1	Proposed residential development with public open space, access, landscaping and associated infrastructure.	Likely	Likely	No
Norwood Cottage Farm Cinder Lane Killamarsh Sheffield S21 2AT (25/00377/EIA)	Decided - Not EIA	0.2km from the Site - Whitestone 3.	Environmental Impact Assessment Screening Opinion Request for a proposed Enercon E82 (3MW) Wind Turbine	Likely	Likely	No
Common Farm, Bookers Lane, Dinnington (RB2022/1203)	Approved	Adjacent to Site - Whitestone 2.	Installation and operation of a solar energy park and associated infrastructure.	Likely	Likely	No
Land north of Woodhall Services Killamarsh Lane, Woodall (RB2026/0228)	Proposed to be Delegated	Adjacent to Whitestone 3	Erection of new substation, associated infrastructure	Likely	Likely	No
Land at Green Lane, Thurcroft (RB2022/1767)	Granted Conditionally	0.2km south of Cable Route E	Battery energy storage facility and associated works	Likely	Likely	No
Brampton Stables, Penny Hill Lane, Ulley (RB2025/1478)	Awaiting Decision	Adjacent to Whitestone 2				No

9.9.10 The inter-cumulative effect for each of the residual effects of the Proposed Development, as presented in Section 9.8 is considered in **Table 9.11**. The maximum design scenario is that described for the Proposed Development (Section 9.8) assessed cumulatively with the other Tier 1 projects / plans in **Table 9.10**.

Table 9.11: Maximum Design Scenario for the Assessment of Cumulative Effects

Potential Cumulative Effect	Construction	Operation	Decommissioning	Cumulative Magnitude and Assessment of Effect
Permanent loss of soil function in areas of non-BMV soil from permanent buildings and infrastructure – in the Proposed Development this is Minor (Not Significant)	Yes	N/A	Yes	Overlapping areas of other Tier 1 projects / plans are small, and from narrow cable routes, overhead cables or roads and so no additional permanent buildings will overlap, and the cumulative magnitude is Low and the cumulative effect is **Minor (Not Significant).**
Permanent loss of soil function in areas of BMV soil from permanent buildings and infrastructure – in the Proposed Development this is Negligible (Not Significant)	Yes	N/A	Yes	Only one other Tier 1 project / plan overlaps with BMV land within the Proposed Development. This is short, narrow cable routes or roads and so the cumulative magnitude is Negligible and the cumulative effect is **Negligible (Not Significant).**
Soil compaction and changes to current drainage and water infiltration to ground – in the Proposed Development this is Negligible (Not Significant)	Yes	N/A	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Negligible and the cumulative effect is **Negligible (Not Significant)**
Exposure of ground workers to contamination through encountering	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures

contaminated soils during ground works – in the Proposed Development this is Negligible (Not Significant)				similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Low and the likelihood is Very Low therefore cumulative effect is **Negligible (Not Significant).**
Effects on soil and groundwater quality as a result of encountering contaminated soils during intrusive works, including from landfills – in the Proposed Development this is Negligible (Not Significant)	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Low and the likelihood is Very Low therefore cumulative effect is **Negligible (Not Significant).**
Dewatering of trenches and excavations – in the Proposed Development this is Negligible (Not Significant)	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Negligible and the cumulative effect is **Negligible (Not Significant)**
Physical intrusion into groundwater resources – in the Proposed Development this is Negligible (Not Significant)	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Negligible and the cumulative effect is **Negligible (Not Significant)**
Potential contamination of soil by accidental leaks and spillages to BMV soils – in	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures

the Proposed Development this is Minor (Not Significant)				similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Low, likelihood is Low and the cumulative effect is **Minor (Not Significant)**
Potential contamination of groundwater by accidental leaks and spillages – in the Proposed Development this is Minor (Not Significant)	Yes	Yes	Yes	Assumption that other projects will be undertaken in accordance with best practice construction measures similar to those described in Section 9.6 and 9.8. The cumulative magnitude is Low and the cumulative effect is **Minor (Not Significant)**
Construction on land with Potentially Deleterious Ground Conditions (historic coal mining leading to ground instability) – in the Proposed Development this is Minor (Not Significant)	Yes	Yes	Yes	No adjacent or overlapping projects occur on the same areas of land affected by historic coal mining and so **no cumulative effects** can occur.
Sterilisation of Mineral Resources by construction on Land designated as a Mineral Safeguarding Area (Cadeby Formation east of Kiveton Park) – in the Proposed Development this is Minor (Not Significant)	Yes	Yes	N/A	No adjacent or overlapping projects occur on the MSA for the Cadeby Formation, east of Kiveton Park and so **no cumulative effects** can occur.
Sterilisation of mineral resources by construction on land designated as a Mineral Safeguarding Area (for Cadeby	Yes	Yes	N/A	Only one other Tier 1 project (a solar farm) on MSA land (for Cadeby Formation dolostone) adjacent to the Proposed Development, west of Hill Top Farm in northern W1.

Formation dolostone) along the northern boundary of W1 – in the Proposed Development this is Negligible (Not Significant)				Approximately 75% of the adjacent Tier 1 project area is within 250m of existing residential properties and so considered low likelihood of developing as quarried land. As in W1, the MSA designation is mainly the erosional edge of the Cadeby Formation, where the deposit is thinner and weathered, and of lower economic value. The cumulative magnitude is Low, the likelihood is Very Low and the cumulative effect is **Negligible (Not Significant)**
Potential thermal effects on groundwater due to buried electrical infrastructure – in the Proposed Development this is Negligible (Not Significant)	N/A	Yes	N/A	Assumption that other projects will be undertaken in accordance with best practice construction and operation measures similar to those described in Section 9.6. The cumulative magnitude is Negligible and the cumulative effect is **Negligible (Not Significant)**
Effects due to the migration and accumulation of mine gas – in the Proposed Development this is Negligible (Not Significant)	N/A	Yes	N/A	No adjacent or overlapping projects occur on the same areas of land affected by historic coal mining and so **no cumulative effects** can occur.

9.9.11 The Inter-Cumulative Effects Assessment considers the residual effects of the Proposed Development with adjacent and overlapping Tier 1 projects / plans.

9.9.12 Inter-Cumulative effects of the maximum design scenario are **Minor (Not Significant)** to **Negligible (Not Significant)** (see **Table 9.11**). Therefore, it is considered that the Proposed Development would not contribute to any Significant adverse inter-cumulative effects in relation to land quality and ground conditions and no additional mitigation measures are required for managing cumulative effects.

9.10 Summary

Statement of Significance

9.10.1 Information on Ground Conditions and Land Quality within the Study Area was collected through desktop review and consultation with officers of RMBC and City of Doncaster Council (CDC), the Environment Agency, the Mining Remediation Authority and Natural England along with ALC surveys of the Site.

9.10.2 The assessment has considered potential impacts on the underlying aquifers, surface watercourses, human health (construction workers and future site users), agricultural land, land instability and mineral resources. Considering embedded and additional mitigation, the significance of adverse effects in the **construction phase** are all assessed as **Minor or Negligible Significance**.

9.10.3 Considering embedded and additional mitigation, the significance of adverse effects in the **operations phase** are all assessed as **Minor or Negligible significance.**

9.10.4 Considering the **decommissioning phase** it is assumed that the environmental effects on ground conditions and land quality from decommissioning will be no worse than those that occur during construction.

9.10.5 It is concluded that there will be **No Significant Cumulative Effects** from the Proposed Development alongside other Tier 1 projects / plans.

9.10.6 To summarise, there are **No Significant Effects** on Ground Conditions and Land Quality from the Proposed Development following the application of embedded and identified additional mitigation measures and considering the likelihood of effects.

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WHITESTONE
solar farm

Contact

Whitestone Net Zero Ltd

info@whitestonesolarfarm.co.uk

0800 688 9936