



Botley West Solar Farm

Preliminary Environmental Information Report

Volume 1

Chapter 11: Ground Conditions

30 November 2023

Approval for issue

Christopher Lecointe

30 November 2023

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Glossary

Term	Meaning
Code of Construction Practice (CoCP)	A document detailing the overarching principles of construction, contractor protocols, construction related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
Geodiversity	The range of rocks, minerals, fossils, soils and landforms.
Mineral Consultation Area	A geographical area based on a Mineral Safeguarding Area, where the district or borough council should consult the Mineral Planning Authority for any proposals for non-minerals development.
Mineral Safeguarding Area	An area designated by minerals planning authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Minerals resources of local and national importance	Minerals which are necessary to meet society's needs, including aggregates, brick clay (especially Etruria Marl and fireclay), silica sand (including high grade silica sands), coal derived fly ash in single use deposits, cement raw materials, gypsum, salt, fluorspar, shallow and deep-mined coal, oil and gas (including conventional and unconventional hydrocarbons), tungsten, kaolin, ball clay, potash, polyhalite and local minerals of importance to heritage assets and local distinctiveness
Desk Top Study	A desk study is the collation and review of information already available in the public domain and is carried out at an early stage of site appraisal and forms the basis of the preliminary risk assessment
Preliminary Risk Assessment	Report that presents a summary of readily-available information on the geotechnical and/or geo-environmental characteristics of the site and provides a qualitative assessment of geo-environmental and/or geotechnical risks in relation to the proposed development.
Site of Special Scientific Interest	Sites designated by Natural England under the Wildlife and Countryside Act 1981. This can include sites of national and international importance for sediments, rocks, fossils, and features of the landscape
Conceptual Site Model	used to identify potential sources, pathways and receptors and how they interact (i.e. potential pollutant linkages) on site post development
Source	Source of contamination
Pathway	How the contaminant may be expected to move/migrate to a receptor
Receptor	Target that could be adversely affected by contaminants
Controlled Waters	Controlled waters means territorial waters within the 3 nautical mile limit, coastal waters extending inland, inland waters and ground water
Principal Aquifer	These formations provide a high level of water storage and may support water supply and/or river base flow on a strategic scale
Secondary A Aquifer	These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers.

Term	Meaning
Secondary B Aquifer	These formations are generally formed of lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering
Secondary Undifferentiated Aquifer	Secondary undifferentiated are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value
Unproductive Strata	These formations have a low permeability and have negligible significance for water supply or base flow

Abbreviations

Abbreviations	Meaning
bgl	Below Ground Level
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
CoCP	Code of Construction Practice
CS	Characteristic Situation
CSM	Conceptual site model
DMRB	Design Manual for Roads and Bridges
DTS	Desk Top Study
EA	Environment Agency
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
ES	Environmental Statement
GCR	Geological Conservation Review
GWDTE	Groundwater Dependent Terrestrial Ecosystems
JNCC	Joint Nature Conservation Committee
MCA	Mineral Consultation Area
MSA	Mineral Safeguarding Area
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NVZ	Nitrate Vulnerable Zone
PEIR	Preliminary Environmental Information Report
PRA	Preliminary Risk Assessment
RBMP	River Basin Management Plan

Abbreviations	Meaning
SAC	Special Area of Conservation
SOM	Soil Organic Matter
SPA	Special Protection Area
SPZ1	Groundwater Source Protection Zone - Inner Zone
SPZ2	Groundwater Source Protection Zone - Outer Zone
SPZ3	Groundwater Source Protection Zone - Total Catchment
RBMP	River Basin Management Plan
SSSI	Site of Special Scientific Interest
UXO	Unexploded Ordnance
WFD	Water Framework Directive

Units

Unit	Description
%	Percentage
km	Kilometre
km ²	Square kilometres
m	Metres

11 Ground Conditions

11.1 Introduction

11.1.1 Overview

11.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) has been prepared by RPS on behalf of Photovolt Development Partners GmbH. (PVDP) for the Applicant, SolarFive Ltd. (SolarFive). SolarFive is a licence holder under the Electricity Act 1989. SolarFive is also a company registered in England and Wales (company no. 12602740).

11.1.1.2 PVDP intends to submit an application on behalf of SolarFive for development consent to the Planning Inspectorate (PINS) under the Planning Act 2008. The proposal is to install and operate approximately 840MWe of solar generation in parts of West Oxfordshire, Cherwell and Vale of White Horse Districts (the Project). The application will be accompanied by an Environmental Statement (ES) prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended (the EIA Regulations), and other required documents including a statement on pre-application consultation.

11.1.1.3 This PEIR summarises preliminary results of the assessment to date, before being further refined and reported within the Environmental Statement. The assessment was carried out in accordance with the approach set out in the Scoping Report. The purpose of the PEIR is to inform the statutory consultation process, enabling consultees to understand and comment on the likely significant effects of the Project.

11.1.1.4 The proposed content, methodologies and key issues to be included within the Environmental Impact Assessment (EIA) process are detailed in Chapter 1.

11.1.1.5 The assessment presented is informed by the following technical chapters:

- Chapter 1 - Introduction
- Chapter 2 - Existing baseline
- Chapter 3 – Consenting Process
- Chapter 4 - Approach to Environmental Assessment
- Chapter 5 – Need, National Planning Policy, and Alternatives Considered
- Chapter 6 – Project Description.

11.1.1.6 This chapter also draws upon information contained within;

- Appendix 11.1. - Botley North – Land Parcel 2, Desk Top Study And Preliminary Risk Assessment
- Appendix 11.2. - Botley North – Land Parcel 3, Desk Top Study And Preliminary Risk Assessment
- Appendix 11.3. - Botley North – Land Parcel 4, Desk Top Study And Preliminary Risk Assessment

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- Appendix 11.14 - Mineral Resource Assessment for Photovolt Development Partners GmbH – Botley West Solar Farm

11.1.1.7 The PEIR will inform pre-application consultation. Following consultation, comments on the PEIR will be reviewed and taken into account, where appropriate, in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate for development consent.

11.1.1.8 This chapter of the PEIR presents the findings of EIA work undertaken to date concerning the potential impacts of the Project on Geology, Hydrogeology and Ground Conditions with respect to;

- Possible land and groundwater contamination;
- Geological conservation sites designated as Sites of Special Scientific Interest (SSSIs) or are being considered for notification as such by the Joint Nature Conservation Committee (JNCC) in the Geological Conservation Review (GCR);
- Ground instability resulting from the Project; and
- Nature and extent of Mineral Safeguarding Areas.

11.2 Legislative and policy context

11.2.1 National Legislation

11.2.1.1 The following key national legislation is relevant to ground conditions and provides the technical framework relevant to this chapter;

The Environmental Protection Act 1990

11.2.1.2 The Environmental Protection Act 1990 (EPA) has been amended by The Environment Act 1995 (Section 57) and makes provisions for a risk based framework for the identification, assessment and management of contaminated land within the UK. The provisions of the Act came into effect in April 2000.

11.2.1.3 Part 2A of the Environmental Protection Act is implemented by the Contaminated Land (England) Regulations (CLR) 2006 and the Contaminated Land (England) (Amendment) Regulations 2012.

11.2.1.4 The Part 2A regime is aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk that considers the 'contaminant-pathway-receptor' scenario (contaminant linkage). Under the section 78A(2) of the EPA legislation, contaminated land is defined as:

"...any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

(a) 'Significant harm' is being caused or there is a significant possibility of such harm being caused; or

(b) Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused."

11.2.1.5 Under the section 78A(4) of the EPA legislation, 'Harm' is defined as:

"Harm" means harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property.

Environmental Protection Act 1990: Part 2A: Contaminated Land Statutory Guidance (2012)

11.2.1.6 The definition of 'Significant harm' is not included in the Act but provides for statutory guidance to elaborate further. The 'statutory guidance' for Part 2A was issued in 2000, revised in 2006 and 2012. 'Significant harm' is defined in the guidance as "death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive functions".

11.2.1.7 Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant pathway-receptor linkages – 'contaminant linkage' – by which a relevant receptor might be affected by the contaminants in question. The guidance provides the following definitions for these elements as follows;

- A “contaminant” is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.
- A “receptor” is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters.
- A “pathway” is a route by which a receptor is or might be affected by a contaminant.

11.2.1.8 A source, pathway and receptor must all be present to complete the pollutant linkage and for a potentially significant risk to exist. As such, the presence of contamination in itself does not necessarily indicate a need for remedial action. Accordingly, a site can only be considered 'contaminated' when a risk to the environment or human health is present due to the presence of a 'source-pathway-receptor' linkage. The Act provides a means of identifying and remediating land that poses a significant risk to human health and/or the environment, where there is no alternative solution. It also works alongside the planning system to help ensure that land is made suitable for use following redevelopment.

11.2.1.9 If risks are presented by groups of substances that are likely to behave in a similar manner relating to the risks that they present, then the groups of contaminants and multiple linkages can be treated as a single contaminant and linkage should it be demonstrated scientifically through risk summary that there is reason to do so.

11.2.1.10 In considering contaminant linkages, it should be considered whether if there are several different pathways linking one or more contaminants to the same receptor there may be a significant contaminant linkage and if there is more than one significant linkage identified whether required remediation should be dealt with separately.

Hazardous Waste (England and Wales) Regulations 2005

11.2.1.11 The aim of the Hazardous Waste (England and Wales) Regulations 2005 is to set out a regime to control and track the movement of hazardous waste in England and Wales. Under the Regulations, a process of registration of hazardous waste producers and a system for recording the movement of waste has been developed, to ensure that certain sites where hazardous waste is produced are notified to the Environment Agency.

The Contaminated Land (England) Regulations 2006 (as amended 2012)

11.2.1.12 These regulations make provisions for a contaminated land regime, in accordance with Part IIA of the EPA 1990, which includes actions for the remediation of such land. These regulations (and the accompanying 2012 statutory guidance (Defra, 2012)) introduced a four category test which is intended to clarify when land does, and does not, need to be remediated.

Water Resources Act 1991

- 11.2.1.13 The Water Resources Act principally relates to the protection of controlled water (i.e. rivers, lakes, canals and groundwater) from pollution. It sets out the responsibilities of the Environment Agency in relation to water pollution, resource management, flood defence, fisheries and, in some areas, navigation. It also regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater.

Water Supply (Water Quality) Regulations 2016 (as amended in 2018)

- 11.2.1.14 The Water Supply Regulations set out measures to protect the quality of water intended for human consumption.

Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (as amended in 2017 and 2019)

- 11.2.1.15 The aim of the Environmental Damage Regulations is to prevent and remedy damage to land, water and biodiversity.

11.2.2 European Legislation

- 11.2.2.1 The following European legislation is also relevant to the assessments undertaken in this chapter;

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

- 11.2.2.2 These regulations were prepared to implement the European Water Framework Directive in the UK. Although the Directive no longer has effect, the regulations remain in place to control groundwater pollution and contaminated land and establish a legislative framework for the protection of surface waters and groundwater.

11.2.3 Planning policy context

- 11.2.3.1 The Botley West Solar Farm (BWSF) Project will be located in the county of Oxfordshire, across an area of approximately 1,300 ha. The Project extends from an area of land in the north, situated between the A4260 and the Dorn River Valley near Tackley and Wootton, through a central section, situated broadly between Bladon and Cassington, and connecting to a section further south near to Farmoor Reservoir and north of Cumnor, where the Project will connect to the National Grid transmission network. The name 'Botley West' is derived from the location of the grid connection point.
- 11.2.3.2 The Project lies within the administrative areas of Cherwell (CDC), West Oxfordshire (WODC) and Vale of White Horse (VWHDC) District Councils, all of which lie within Oxfordshire County Council (OCC). The majority of the Project lies within West Oxfordshire.

National Policy Statements

- 11.2.3.3 There are currently six energy National Policy Statements (NPSs) that set out the decision making processes for applications for development consent under the 2008 Act for energy Nationally Significant Infrastructure Projects (NSIPs). These are as follows;
- Overarching National Policy Statement for Energy (NPS EN-1) (2011);
 - National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (NPS EN-2) (2011);
 - National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2011);
 - National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN-4) (2011);
 - National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (2011); and
 - National Policy Statement for Nuclear Power Generation (NPS EN-6) (2011)
- 11.2.3.4 In December 2020, these NPSs were subject to review to ensure they continued to reflect the policies set out in the Energy White Paper and that the planning policy framework continued to support infrastructure required for the transition to net zero. The review determined that the existing EN-1 to EN-5 documents should be amended. Closure of the period for consultation on the draft NPSs was 23 June 2023. For any application accepted for examination before designation of the 2023 amendments, the 2011 suite of NPSs should have effect in accordance with the terms of those NPS. The 2023 amendments will therefore have effect only in relation to those applications for development consent accepted for examination, after the designation of those amendments. However, any emerging draft NPSs (or those designated but not yet having effect) are potentially capable of being important and relevant considerations in the decision-making process and therefore have also been reviewed in preparation of this chapter.
- 11.2.3.5 For the Project the contents of NPS EN-1 and NPS EN-5 and their draft 2012-2023 equivalents are therefore considered relevant documents.
- 11.2.3.6 Table 11.1 sets out a summary of the policies within these NPSs relevant to Ground Conditions.

Table 11.1: Summary of designated and draft NPS document requirements relevant to this chapter

Summary of NPS requirement	How and where considered in the PEIR
Geological Conservation Sites	
<p>Where the development is subject to EIA the applicant should ensure that the Environmental Statement clearly sets out the effects on internationally, nationally and locally designated sites of ecological or geological conservation importance (paragraph 5.4.17 of draft NPS EN-1).</p>	<p>Review of Designated and Non-designated Geological Conservation Sites in Section 11.5.4 confirms that there are no geological conservation sites within the Project area. As such a Geodiversity Management Strategy is not considered necessary.</p> <p>Opportunities to avoid effects have been taken during the site selection process and are set out in Volume 1: Chapter 5: Need, National Planning Policy and Alternatives Considered.</p>
<p>The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests (paragraph 5.4.19 of draft NPS EN-1).</p>	
<p>To further minimise any adverse impacts on geodiversity, where appropriate applicants are encouraged to produce and implement a Geodiversity Management Strategy to preserve and enhance access to geological interest features, as part of relevant development proposals. (paragraph 5.4.38 of draft NPS EN-1).</p>	
<p>Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. (paragraph 5.4.46 of draft NPS EN-1).</p>	
<p>There is a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to “have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest”. (paragraph 2.2.10 of draft NPS EN-5).</p>	
<p>There are no specific requirements for assessment relating to geology other than for its consideration within the ES and that appropriate mitigation measures are implemented where necessary (Section 2.9 of draft NPS EN-5).</p>	
Land Contamination	
<p>Where pre-existing land contamination is being considered within a development, the objective is to ensure that the site is suitable for its intended use. Risks would require consideration in accordance with the contaminated land statutory guidance as a minimum (paragraph 5.11.5 of draft NPS EN-1).</p>	<p>The PEIR considers the risk posed by land contamination in section 11.9.</p>
<p>The sustainable reuse of soils needs to be carefully considered in line with good practice guidance where large quantities of soils are surplus to requirements or are affected by contamination. (paragraph 5.11.14 of draft NPS EN-1).</p>	
<p>Applicants should ensure that a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. (paragraph 5.11.17 of draft NPS EN-1).</p>	

Summary of NPS requirement	How and where considered in the PEIR
<p>For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination, and where contamination is present, applicants should consider opportunities for remediation where possible. (paragraph 5.11.8 and 5.11.18 of draft NPS EN-1).</p>	
<p>Hydrogeology</p>	
<p>Infrastructure development can have adverse effects resulting in groundwater or protected areas failing to meet environmental objectives established under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (paragraphs 5.16.1 and 5.16.2 of NPS EN-1).</p>	<p>Assessment of ground disturbance is undertaken specifically on Principal Aquifers and Secondary A Aquifers in section 11.9.</p>
<p>Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and the impacts of the proposed project on water quality, water resources and physical characteristics of the water environment. In particular the Environmental Statement should describe, any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive (WFD) and Source Protection Zones (SPZs) around potable groundwater abstractions (paragraphs 5.16.3 and 5.16.7 of NPS EN-1).</p>	<p>The risk of potential impacts on the water environment will be reduced through design to facilitate adherence to good pollution control practice, as discussed in section 11.7. Impacts on SPZs and water bodies protected under the WFD are assessed in section 11.9.</p>
<p>Land Instability</p>	
<p>Applicants should ensure that a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. (paragraph 5.11.17 of NPS EN-1).</p>	<p>An evaluation of the potential risks of land instability from natural processes or mining related activities is included for each of the land parcels in the supporting Appendices 11.1 – 11.13.</p>
<p>Developments should contribute to and enhance the natural and local environment by preventing new and existing developments from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. (paragraphs 5.16.1 and 5.16.2 of NPS EN-1).</p>	
<p>Mineral Reserves</p>	
<p>Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place. (paragraph 5.11.19 of NPS EN-1).</p>	<p>A MSA for sand and gravels has been identified within the Project area. In a accordance with local planning policy and consultation with the Minerals and Waste Local Plan Principal Officer, a Mineral Resource Assessment (MRA) has been undertaken and is presented as Appendix 11.14.</p>
<p>Where a proposed development has an impact upon a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources. (paragraph 5.11.28 of NPS EN-1)</p>	

The National Planning Policy Framework

- 11.2.3.7 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019, 2021 and 2023 (Department for Levelling Up, Housing and Communities, 2023). The NPPF sets out the Government’s planning policies for England.

11.2.3.8 The Planning Practice Guidance (PPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) supports the NPPF and provides guidance across a range of topic areas. The NPPG includes guidance on the following topics relevant to this chapter:

- land affected by contamination;
- land stability;
- minerals;
- natural environment; and
- water supply, waste water and water quality.

11.2.3.9 **Table 11.2** sets out a summary of the NPPF/NPPG policies relevant to this chapter.

Table 11.2: Summary of NPPF/NPPG requirements relevant to this chapter

Policy	Key provisions	How and where considered in the PEIR
15. Conserving and Enhancing the Natural Environment (para 174)	<p>Planning policies and decisions should contribute to and enhance the natural and local environment by:</p> <ul style="list-style-type: none"> • preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of pollution including soil and water or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality; and • remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. 	<p>11.5.10 Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks.</p> <p>11.15 Next Steps – additional investigation required to inform whether there are contamination or land instability risks.</p>

Policy	Key provisions	How and where considered in the PEIR
Ground Conditions and Pollution (para 183)	<p>Planning policies and decisions ensure that:</p> <ul style="list-style-type: none"> • Site should be suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. • After remediation as a minimum land should not be capable of being determined as contaminated land under Part 2A. • Adequate site investigation information is available to inform these assessments. 	<p>11.5.10 Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks.</p> <p>11.15 Next Steps – additional investigation required to inform whether there are contamination or land instability risks.</p>
17. Facilitating the sustainable use of minerals (para 210)	<ul style="list-style-type: none"> • Safeguarding of mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided. 	<p>Following the identification of the Minerals Safeguarding Areas within the extents of the Project in the scoping exercise a Minerals Resource Assessment (Appendix 11.14) has been undertaken to evaluate the constraint that mineral resources, present on the Project, are likely to place on the proposed development given local mineral planning policy.</p>
Facilitating the sustainable use of minerals (para 212)	<ul style="list-style-type: none"> • Local planning authorities should not normally permit other development proposals in Mineral Safeguarding Areas if it might constrain potential future use for mineral working. 	

Local planning policy

11.2.3.10 The relevant local planning policies applicable to Ground Conditions based on the extent of the study areas for this assessment are summarised in **Table 11.3**.

Table 11.3: Summary of local planning policy relevant to this chapter

Policy	Key provisions	How and where considered in the PEIR
West Oxfordshire Local Plan 2031		
EH8: Environmental Protection	<p>Contaminated Land – proposals for development of potentially contaminated land must incorporate appropriate level of investigation and if necessary remedial measures must be identified and implemented.</p> <p>Water Resources – proposals for development will only be acceptable provided there is no adverse impact on quantity and quality of water bodies and groundwater resources.</p>	<p>11.5.10 Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks.</p> <p>11.7 Measures adopted as part of the Project (Mitigation measures) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.</p>
EH3: Biodiversity and Geodiversity	Avoidance of loss or deterioration to locally important geological sites.	11.5.4 Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.
Cherwell District Council Local Plan 2011-2031		
ESD10: Protection and Enhancement of Biodiversity and the Natural Environment	<p>Development that would result in damage to or loss of a site of biodiversity or geological value of national importance will not be permitted unless benefits outweighs the harm caused to the site and the wider network of SSSIs and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity.</p> <p>Development that would result in damage to or loss of a site of biodiversity or geological value of regional or local importance will not be permitted unless the benefits of the development clearly outweigh the harm caused to the site and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity.</p>	11.5.4 Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.
ESD8: Water resources	Reduction of impact of development on the water environment and maintain water quality.	<p>11.5.10 Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks.</p> <p>11.7 Measures adopted as part of the Project (Mitigation measures) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.</p>

Policy	Key provisions	How and where considered in the PEIR
Vale of White Horse District Council Local Plan 2011-2031		
Core Policy 43: Natural Resources	The effective use of natural resources is encouraged by ensuring that the land is of a suitable quality for development and that remediation of contaminated land is undertaken where necessary.	11.5.10 Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks. 11.7 Measures adopted as part of the Project (Mitigation measures) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.
Core Policy 46: Conservation and Biodiversity	Development likely to result in the loss, deterioration or harm to habitats of importance for geological conservation interests (Locally Important Geological Sites), either directly or indirectly, will not be permitted unless the need for/benefits outweighs the adverse effect, it can be demonstrated that it could not reasonably be located on an alternative site that would result in less harm, or measures can be provided that would avoid/mitigate or compensate for the adverse effects likely to result from development.	11.5.4 Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.
Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy (Adopted September 2017)		
Policy M1: Recycled and Secondary Aggregate	So far as is practicable, aggregate mineral supply to meet demand in Oxfordshire should be from recycled and secondary aggregate materials in preference to primary aggregates, in order to minimise the need to work primary aggregates.	Appendix 11.14 – Mineral Resource Assessment and initial consultation summarised in Table 11.5.
Policy M3: Principal locations for working aggregate minerals	The land parcels located within Mineral Safeguarding Areas and Mineral Consultation Areas are situated within the Oxford Mineral Strategic Resource Area for sharp sand and gravel an area identified for proposed future working of sharp sand and gravel.	

Policy	Key provisions	How and where considered in the PEIR
<p>Policy M8: Safeguarding Mineral Resources</p>	<p>Mineral resources in Mineral Safeguarding Areas shown on the accompanying Policies Map are safeguarded for possible future use. Development that would prevent or otherwise hinder the possible future working of the mineral will not be permitted unless it can be shown that:</p> <ul style="list-style-type: none"> • The site has been allocated for development in an adopted local plan or neighbourhood plan; or • The need for the development outweighs the economic and sustainability considerations relating to the mineral resource; or • The mineral will be extracted prior to the development taking place. 	

11.3 Consultation and engagement

- 11.3.1.1 In June 2023, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas.
- 11.3.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 24th July 2023. Key issues raised during the scoping process specific to Ground Conditions are listed in **Table 11.4**, together with details of how these issues have been addressed within the PEIR.

Table 11.4: Summary of scoping responses

Comment	How and where considered in the PEIR
Planning Inspectorate	
<p>The Scoping Report proposes to scope this matter out on the basis that historic contamination information and other background information has ruled out contamination issues within these land parcels. However, this information has not been provided within the Scoping Report.</p>	<p>Baseline information regarding contamination is included in the supporting DTS and PRA documents forming the appendices to this chapter.</p>
<p>Scoping Report paragraph 7.5.14 states that ground instability may occur as a result of construction disturbance promoting landslips and landslides through slope destabilisation. Impacts from ground instability have been scoped out without any further explanation or justification.</p>	<p>Baseline information regarding ground instability is included in the supporting DTS and PRA documents forming the appendices to this chapter. Further assessment/mitigation measures by way of land instability incl in Table 11.12 of this chapter.</p>
<p>On the basis that these land parcels are not located in any Mineral Safeguarding Areas, the Inspectorate is content to scope them out from further assessment in relation to mineral resources.</p>	<p>No further comment required.</p>
<p>The Scoping Report mentions groundwater contamination but does not identify groundwater receptors with potential to be impacted by the Proposed Development. Please see ID 3.4.4 above in relation to this matter.</p>	<p>Baseline information regarding groundwater receptors is included in the supporting DTS and PRA documents forming the appendices to this chapter. Further risk assessment and subsequent mitigation measures to prevent potential groundwater contamination incl in Table 11.12 of this chapter.</p>
<p>Scoping Report paragraph 7.5.5 states that a data search buffer of up to 100m will be applied to this assessment but this study area is not justified. The ES should fully justify the study area and explain how it has been applied based on the ZOI.</p>	<p>The study area buffer has been increased to 250 m in preparation of this chapter. Based on professional judgement this is considered sufficient to enable the identification of off-site potential sources of contaminants of concern, other factors which may have influenced site conditions and/or sensitive off-site receptors that require consideration as detailed in section 11.4.3.</p>
<p>The Scoping Report states that six land parcels (7, 8, 9, 10, 12, and 13) and part of the cable route area (16) fall within Mineral Safeguarding Areas. The ES should demonstrate that the Mineral Planning Authority has been consulted and that the proposed development does not impact on future ambitions for mineral extraction within the region.</p>	<p>Table 11.5 consultation with Oxfordshire CC confirming the requirements for a Mineral Resource Assessment as presented in appendix 11.14. Further consultation will be undertaken with the regional Minerals Officer prior to ES chapter preparation to confirm no impact on future mineral resources.</p>
<p>Scoping Report Table 7.10 provides the combination of receptor sensitivity and magnitude of impact but does not explain which effects will be considered significant or how it will be determined whether an effect is significant if the outcome has potential to be either minor or moderate or either moderate or major etc. The ES should clearly set out how significant effects are defined and describe how any decisions are made where there is potential for an effect to either be significant or not.</p>	<p>The definition of significance of effects are included in Table 11.15.</p>

Comment	How and where considered in the PEIR
<p>Best practice measures are proposed to be secured through management plans to reduce/avoid risks of pollution to waterbodies and responses to accidental spills. Operational effects on water quality and availability are not anticipated on a scale that would lead to likely significant effects. Where significant adverse effects are identified in the Hydrology and Ground Conditions Chapters this impact will be included in the Human Health Chapter, otherwise it is proposed to be scoped out. The Inspectorate agrees that where potential significant adverse effects are identified to water quality/availability in the Hydrology/Ground Conditions Chapters, impacts to Human Health should be assessed and where no significant adverse effects are identified to water quality/availability in the Hydrology/Ground Conditions Chapters, this can be scoped out of the Human Health Chapter. Appropriate cross-reference should be made in the ES.</p>	<p>Assessment of effects considered in section 11.9 of this chapter. Mitigation measures to be adopted shown in Table 11.12.</p>
<p>Scoping Report paragraph 6.2.21 states that limited excavations will be associated with the Proposed Development (e.g., cable routes) and that material will be reused in reinstatement and landscaping and restoration of the site. Best practice measures are proposed to be secured through relevant management plans to manage impacts from contamination (existing historic, dust etc.). It is proposed that where significant effects are identified in the Agricultural Land and Soil Chapter of the ES, an assessment of significant effects to human health from potential land contamination will be included. The Inspectorate agrees with this approach and Appropriate cross reference should be made in the ES.</p>	<p>There is commitment to the adoption of best practice and management plans for all stages of the Project as identified in Table 11.12. Where significant effects to human health are identified in the Agricultural Land and Soil chapter (Chapter 17), these will be assessed in section 11.9.</p>
<p>Excavations are not anticipated to be required during operation. Best practice measures are proposed to be secured through management plans to reduce/avoid risks of contamination. Operational effects on land quality are not anticipated on a scale that would lead to likely significant effects. The Inspectorate agrees to scope this matter out.</p>	<p>There is commitment to the adoption of best practice and management plans for all stages of the Project as identified in Table 11.12.</p>
<p>Oxfordshire County Council</p>	
<p>Proposed approach is acceptable. Management of waste relating to replacement of any solar panels during the lifetime of the development and at the final decommissioning stage should be scoped in.</p>	<p>To be included in waste ES chapter to be included.</p>
<p>Cassington Parish Council</p>	
<p>Question the parsimonious nature of the buffer zones proposed (up to 100m), noting that in this instance there will only be a data (desktop) search within the buffer area</p>	<p>A Study Area with a buffer of 250m has been utilised in preparation of this PEIR chapter, which is considered appropriate. This is further detailed in section 11.4.3.</p>

Comment	How and where considered in the PEIR
<p>Contend that all phases will impact ground conditions and we would urge that all future communications dispense with the incorporation of this speculative narrative because of its inaccuracy.</p>	<p>All phases (construction, operation and decommissioning) have been assessed in section 11.9 and appropriate mitigation measures detailed in Table 11.12.</p>
<p>Majority of land parcels have potential to have impacts relating to land contamination, ground instability or mineral resources, with the need for further assessment indicated as necessary. However, the nature of that assessment is not indicated i.e. will it be primary surveys or will it be a reliance upon historical data? If it is the latter, then we consider this to be particular cause for concern as we draw into question the reliability of historic data collection and reporting mechanisms, especially as they will be used to both predict the magnitude of the impacts likely encountered and guide the sensitivity categories of the receptor sites.</p>	<p>An initial desk-based assessment has been undertaken for all but one of the land parcels and these have been included as appendices 11.1 to 11.13. These assessments have been completed in accordance with the LCRM guidance on managing the risks from land contamination through a staged risk based approach. Where any potentially unacceptable risks relating to ground conditions are identified these will be further assessed, with any intrusive investigation, remediation/mitigation implemented, as required.</p>
<p>Eynsham Parish Council</p>	
<p>No Comment</p>	<p>-</p>
<p>Hanborough Parish Council</p>	
<p>No Comment</p>	<p>-</p>
<p>Cumnor Parish Council</p>	
<p>Council requests that the cumulative effects on ground contamination and ground water contamination of the use of cleaning products and other materials on the PV panels and other infrastructure over 42 years be assessed.</p>	<p>Operational effects on land and groundwater quality to be mitigated by operational best practice measures and management plans. The Project has a 35 year lease with the option to extend to 42 years. The final two years of the lease will be the decommissioning phase.</p>
<p>Cherwell District Council</p>	
<p>Satisfied approach is acceptable</p>	<p>-</p>
<p>Vale of White Horse District Council</p>	
<p>Satisfied approach is acceptable</p>	<p>-</p>

- 11.3.1.3 Following scoping, consultation and engagement with interested parties specific to Ground Conditions has continued.
- 11.3.1.4 A summary of the key issues raised during consultation activities undertaken to date is presented in **Table 11.5**, together with how these issues have been considered in the production of this PEIR chapter.

Table 11.5: Summary of consultation relevant to this chapter

Date	Consultee and type of response	Issues raised	How and where considered in the PEIR
Geological Conservation Sites			
-	-	-	In the absence of any identified geo-conservation sites within the study area no further consultation is considered necessary.
Land Contamination			
-	-	-	No consultation at the time of PEIR compilation. Any additional consultation will be presented in the ES chapter.
Hydrogeology			
-	-	-	No consultation at the time of PEIR compilation. Any additional consultation will be presented in the ES chapter.
Land Instability			
-	-	-	No consultation at the time of PEIR compilation. Any additional consultation will be presented in the ES chapter.
Mineral Reserves			
14th July 2023	Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council – formal e-mail response	Confirmation requested for inclusion of Mineral Consultation Areas identified through Desk Study research as impinging within the BWSF within a Mineral Resource Assessment.	Following the identification of the Minerals Safeguarding Areas within the extents of the Project in the scoping exercise a Minerals Resource Assessment (Appendix 11.14) has been undertaken to evaluate the constraint that mineral resources, present within the Project, are likely to place on the proposed development given local mineral planning policy.

11.4 Baseline methodology

11.4.1 Relevant guidance

11.4.1.1 The following guidance documents that are relevant to ground conditions provides the basis of assessment relevant to this chapter.

Contaminated Land

Environment Agency (2020) Land Contamination: Risk Management (LCRM 2020)

11.4.1.2 Environment Agency guidance on managing the risks from land contamination through a staged risk based approach. There are three stages and each stage is broken down into tiers or steps:

- Stage 1 – Risk Assessment;
- Stage 2 - Options Appraisal; and
- Stage 3 – Remediation and Verification.

DEFRA Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance (2012)

11.4.1.3 Guidance detailing the responsibilities of the local planning authority in prioritising the inspection of sites under Part 2A of the Environmental Protection Act and sets out a revised framework for assessing risk associated with land contamination. Guidance on remediation is also presented and the document introduces the necessity for cost-benefit analysis when assessing appropriate remedial techniques.

British Standard requirements for the ‘Investigation of potentially contaminated sites - Code of practice’. BS10175:2011+A2:2017

11.4.1.4 This British Standard gives recommendations and guidance on the investigation of land that could potentially be affected by contamination. This includes land with naturally raised concentrations of harmful substances, to determine or manage any risks to human health or the environment.

British Standard requirement for ‘Soil quality - conceptual site models for potentially contaminated sites’. BS EN ISO 21365:2020

11.4.1.5 Good practice to be followed in compilation of the Conceptual Site Model (CSM) that underpins the three stages of LCRM (2020).

CIRIA Document C552 – Contaminated Land Risk Assessment: A Guide to Good Practice (2001)

11.4.1.6 Guidance on the process of risk assessment of contaminated land and the key elements of risk assessment practices and procedures.

CIRIA Document C665 – Assessing risks posed by hazardous ground gases to buildings (2007)

11.4.1.7 Guidance for the assessment of the risk of hazardous ground gas to buildings.

Mineral Reserves

Bureau of Land Management (BLM) Manual 3031 (1985) – Energy and Mineral Resource Assessment

11.4.1.8 This Manual Section sets standards for gathering and analysing information on mineral resources.

11.4.2 Scope of the assessment

11.4.2.1 The scope of this PEIR has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **Table 11.4** and **Table 11.5**.

11.4.2.2 Taking into account the scoping and consultation process, **Table 11.6** summarises the issues considered as part of this assessment.

Table 11.6: Issues considered within this assessment.

Activity	Potential effects scoped into the assessment
Construction phase	
Construction activities (including demolition if applicable)	Runoff from construction areas to soils (and subsequent leaching into controlled waters receptors) including compounds. Contamination risk to off-site users, e.g. airborne migration and subsequent dermal contact and ingestion of contaminants, ground gas migration during trench excavation.
Operation and maintenance	
Operation and maintenance of BWSF	Contamination risk from spillages during site operations. Contamination risk to site operatives/maintenance workers. Contamination risk to off-site users and controlled waters receptors. Potential temporary sterilisation of mineral reserves.
Decommissioning Phase	
Decommissioning and removal of BWSF infrastructure	Runoff from construction areas to soils (and subsequent leaching into controlled waters receptors). Contamination risk to off-site users, e.g. airborne migration and subsequent dermal contact and ingestion of contaminants, ground gas migration.

11.4.2.3 Effects which are not considered likely to be significant have been scoped out of the assessment. A summary of the effects scoped out is presented in **Table 11.7**.

Table 11.7: Issues scoped out of the assessment.

Issue	Justification
Construction Workers	
Exposure of construction workers to potential soil, groundwater or ground gas contaminants	The preliminary risk assessments undertaken do not consider pollutant linkages for construction workers. It is expected that any relevant linkages will be managed by appropriate health and safety measures. As construction workers are protected under existing health and safety legislation, any potential effects will be avoided, prevented and reduced through the implementation of standard mitigation measures (including personal protective equipment, training and toolbox talks) as included in the outline CEMP. Work will be carried out in accordance with relevant Construction Design Management (CDM) Regulations 2015.

11.4.3 Study area

11.4.3.1 The study area for this topic comprises the Project and a data search buffer of up to 250m. This distance has been selected based upon professional judgement. This enables the identification of both on-site and off-site sources of potential contamination and other factors which may influence ground conditions at the Project and also allows for any minor design scheme changes that have occurred since procurement of the environmental datasets used in the baseline assessment. The inclusion or otherwise of relevant sensitive sources and receptors gives due consideration to the following;

- The nature of the Project which would not typically include occupied buildings, therefore the risk from ground gases (including radon) is considered low. Potential ground gas sources are therefore restricted to features located within or adjacent to the Project;
- Pollution incidents classified as having a ‘major’ impact on land or controlled waters; and
- Active groundwater/surface water abstractions.

11.4.3.2 The extent of the data search buffer used in the assessment is represented on the mapping included in the Groundsure Insights Reports included in the Appendices accompanying this chapter.

11.4.3.3 In order to provide a sufficient level of detail for assessment, the BWSF site area was subdivided into 14 land parcel survey areas, as shown on Figure 11.1 with an additional two survey areas identified for the proposed cable routes linking Botley North to Botley Central (land parcel 15) and Botley Central to Botley South (land parcel 16).

11.4.3.4 Botley North comprises approximately 316 ha of land and is located north of the town of Woodstock, west of Tackley and east of Wootton. The majority of Botley North lies within West Oxfordshire District, but with some fields on the eastern edge falling into Cherwell District. None of the Northern Site is within the Oxford Green Belt. The area comprising Botley North comprises land parcels 1 to 4. Botley Central is the largest of the three areas defining The Project comprising approximately 910 ha. The large majority of the Central Site lies within West Oxfordshire District, but again some fields on the eastern

fringes, nearest to Oxford Airport and Begbroke, lie within Cherwell District. This area comprises land parcels 5 to 14. The southernmost area (Botley South) comprises approximately 81 ha and is located within Vale of White Horse District Council. This is designated land parcel 15.

- 11.4.3.5 Detailed scoping assessment based upon potential for resulting impacts relating to land contamination, ground instability and sterilisation of mineral resources was undertaken on the 16 land parcels to determine requirements for a more detailed desk study appraisal. Following completion of the scoping exercise it was possible to scope out Land Parcel 1 as requiring further detailed appraisal and PRA as part of the PEIR assessment.

11.4.4 Methodology for baseline studies

Desk studies

- 11.4.4.1 The Model Procedures for the Management of Land Contamination indicates that the first step in evaluating land contamination risks is a PRA. The objective of the PRA is to identify and evaluate potential land quality risks and development constraints associated with the Project and to construct an initial conceptual site model that can be used to inform future decision making and the design of future ground investigation.
- 11.4.4.2 A series of desk based Preliminary Risk Assessments (Appendix 11.1 to 11.13) and a Minerals Resource Assessment (Appendix 11.14) provide the prime source of data that informs this ground conditions chapter. As stated in 11.4.3.3, on completion of the scoping exercise 15 land parcels were scoped in as requiring more detailed PRA or MRA. The PRA consists of an appraisal of the source-pathway-receptor 'contaminant linkages', which is central to the approach used to determine the existence of 'Contaminated Land' as defined in Part 2A of the Environmental Protection Act 1990. For a risk to exist (under Part 2A), all three of the following components must be present to facilitate a potential 'contaminant linkage'.
- Source of contamination (e.g. primary sources – leaking above ground storage tanks; secondary sources – free phase product (typically hydrocarbon contamination present as a discrete product rather than mixed with soil or water) within the ground or soil/groundwater migration);
 - Receptor (living organisms, ecological systems or property which may be harmed, e.g. end users of site, groundwater, surface water and fauna and flora).
 - Pathway (a route or means by which a receptor can be exposed to or affected by a contaminant) i.e. Target mechanism between the source and receptor (e.g. gas/liquid migration through permeable strata).
- 11.4.4.3 The mere presence of a contaminant source does not mean that there will necessarily be attendant risks requiring remedial action or that the site will be designated as 'Contaminated Land'.
- 11.4.4.4 The Desk Study Assessments have also considered the potential risk of ground instability as a result of construction disturbance, for example promoting landslips/landslides through slope destabilisation or triggering of

potentially unstable natural solution features through vibration in construction or loading or changes of drainage patterns during operation.

11.4.4.5 The assessments include consideration of the Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy Adopted Plan (2017) and accompanying Policies Maps to determine which, if any, parts of the BWSF fall within designated Mineral Consultation or Mineral Safeguarding Areas.

11.4.4.6 The location of designated geological conservation sites listed by the Joint Nature Conservation Committee (JNCC) in the Geological Conservation Review (GCR) has been undertaken through inspection of the on-line GCR database maintained by the JNCC. The GCR is a database to identify those sites of national and international importance for sediments, rocks, fossils, and features of the landscape. These sites are typically notified as Sites of Special Scientific Interest (SSSIs) or are being considered for notification as such.

Site-specific surveys

11.4.4.7 No site specific surveys (walkovers or intrusive surveys) have been required for establishment of baseline conditions.

11.5 Baseline environment

11.5.1 Desk study

11.5.1.1 Information on Ground Conditions within the study area was collected through a detailed review of existing studies and datasets. These are summarised at **Table 11.8**.

Table 11.8: Summary of desk study sources used.

Title	Source	Year	Author
Insights Report Refs GSIP-2022-2757-10507 GSIP-2022-2757-10508 GSIP-2022-2757-10509 GSIP-2022-2757-10510 GSIP-2022-2757-10511 GSIP-2022-2757-10512	Groundsure	2022	N/A
Insights Report Refs GS-ETG-PQ3-HNB-71P (extension to land parcel 8)	Groundsure	2023	N/A
BGS Onshore Geoindex	British Geological Survey	2023	N/A
Zetica Unexploded Bomb Risk map	ZeticaUXO	2023	N/A

11.5.2 Site History

- 11.5.2.1 The land comprising Botley North (Land Parcels 1-4) has had a predominantly agricultural historical usage since the 1870s. There is little evidence of potentially contaminative historical industrial land use within the Study Area other than localised old pits or quarries (some of which may have been infilled with unknown materials) and farms, which represent potential locations for the storage and use of oils, fuels or agrochemicals.
- 11.5.2.2 A key historical feature identified for Botley North is a former railway cutting on the eastern side of Woodstock (Hensington Cutting) used for licensed landfill disposal for inert, industrial, commercial, household, special, liquid sludge wastes. The location of this feature is shown on Figure 11.1.
- 11.5.2.3 Although outside of the Study Area for the allocated area for PV panel distribution, the historical landfill site is within the corridor of the 220 kv proposed cable route linking Botley North to Botley Central. The details on this feature are included in Appendix 11.15 and are summarised in the table below.

Table 11.9: Summary of Hensington Railway Cutting Landfill Site.

Location/Operator	Waste Licence No	Waste types	Dates of operation
Hensington Railway Cutting/ J. Curtis and Sons	TP0420/0421, W10017, OCC/032, 13.6.4517	Inert, Industrial, Commercial, Household, Special and Liquid Sludge	31/12/1979 – 31/12/1980

- 11.5.2.4 Botley Central has also comprised an agricultural historical land usage, with former sand and gravel pits (both within the limits of the Project and within the Study Area) and farm buildings in close proximity. This area has been crossed by a railway line since the 1880s. Oxford Airport has been present close to the north-east boundary of Botley Central since 1973. The potentially infilled sand pit within the boundaries of the Project lies immediately south of Purwell Farm and was present on site between 1954 and 1956 (see Figure 11.3 below) before being restored as scrub woodland by 1981.

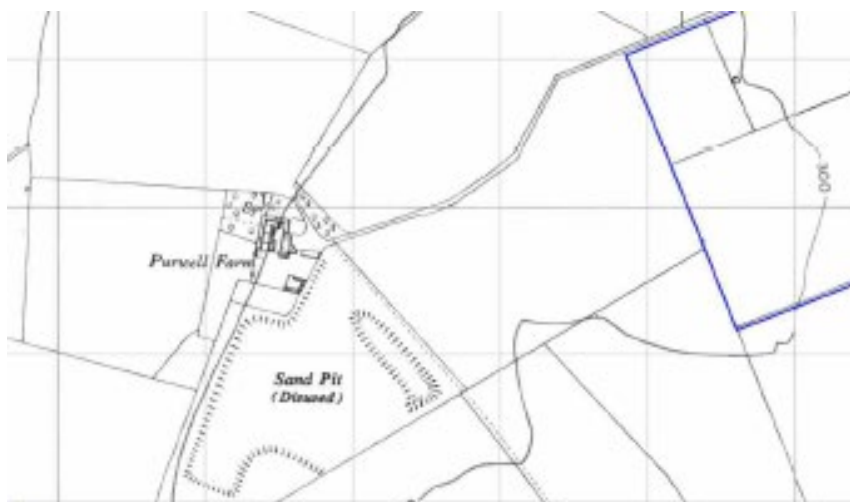


Figure 11.3: Purwell Farm Sand Pits

11.5.2.5 Botley South has also had an agricultural historical land usage, with a short period of time when some of the land was used as orchards (possible use of pesticides/herbicides) and a small chimney/kiln feature was present in the east between 1900 and 1937. No other possible sources of contamination were identified within the Study Area for Botley South.

11.5.3 Geology

11.5.3.1 Botley North has an absence of Superficial Deposits other than a small expanse of Head Deposits located in Land Parcel 4. The outcropping bedrock geology comprises strata of the White Limestone Formation tending to limestones of the Cornbrash Formation overlying interbedded mudstone and limestone of the Forest Marble Formation with distance from north to south. Sites underlain by limestone can be prone to the presence of natural solution features formed by dissolution of the soluble strata. Recorded evidence of cavities is noted in records reviewed for Botley North although the BGS hazard rating for instability from such features is recorded as being negligible to low.

11.5.3.2 Botley Central has sporadic superficial cover of Alluvium associated with the River Evenlode and River Terrace Sands and Gravels identified as the Hanborough Gravel Member, the Summertown-Radley Sand And Gravel Member and the Northmoor Sand And Gravel Member. These deposits become more extensive towards the south of Botley Central with the confluence with the River Thames. The bedrock strata in this area shows a transition from the limestone/mudstone dominated strata as present in Botley North to the mudstones weathering to clays of the Kellaways Clay and Sand Members and then the Oxford Clay Formation And West Walton Formation present in Botley South.

11.5.3.3 Botley South is located on outcropping strata of the Oxford Clay Formation And West Walton Formation. This material is prone to having elevated sulphate concentrations and also presents a potential risk of clay heave/shrinkage due to a typically high plasticity.

11.5.4 Designated and Non-designated Geological Conservation Sites

11.5.4.1 Through inspection of the on-line GCR database maintained by the JNCC, all statutory and non-statutory designated geological sites located in the Oxfordshire County Council area have been identified. It is concluded that there are no designated or non-designated geological sites located within the study area.

11.5.5 Hydrogeology

11.5.5.1 The Forest Marble Formation (limestone) and White Limestone Formation, both predominantly present in Botley North, are classed as Principal Aquifers. These formations provide a high level of water storage and may support water supply and/or river base flow on a strategic scale.

11.5.5.2 Where present the Alluvium and River Terrace Sands and Gravels are classified as a Secondary A Aquifer (These formations are formed of permeable layers capable of supporting water supplies at a local scale, in

some cases forming an important source of base flow to rivers). Similarly the Cornbrash Formation and Forest Marble Formation (if mudstone) or interbedded mudstone/limestone dominated and the Kellaways Sand and Clay Members are classified as Secondary A aquifers.

11.5.5.3 The Oxford Clay and West Walton Formation are classified as Unproductive Strata with low permeability and negligible significance for water supply.

11.5.5.4 There are no identified Source Protection Zones or potable abstractions within the Study Area. The only noted current groundwater abstraction in the Study Area is recorded approximately 210 m to the east of the site at Cassington Quarry from the Thames groundwater by Hanson Quarry Products Europe Ltd for 'transfer between sources'.

11.5.6 Surface Water

11.5.6.1 There are numerous surface watercourses/water bodies on the BWSF and within the Study Area. These include the River Glyme, a tributary of the River Evenlode, approximately 135 m west of Botley North, the River Evenlode which flows through the western part of Botley Central and the River Thames which flows south-west to north-east between Botley Central and Botley South. The main watercourse near Botley South is Filchamstead Brook which defines the northern boundary. These are all classified within a River Basin Management Plan published by the EA under the European Water Framework Directive (2000).

11.5.6.2 Numerous minor land ditches/drains, streams or tributaries are also present across the site, the majority draining into the watercourses described above.

11.5.7 Ground Instability and Mining

11.5.7.1 There is no recorded coal or underground non-coal mining within the Study Area. There has been a number of recorded past quarrying activities for clays, sands, gravels or limestone within the Study Area, some of which have been backfilled on closure.

11.5.7.2 Ground instability concerns predominantly relate to the potential for clay shrinkage/heave and sulphate attack on concrete slabs/footings associated with the Oxford Clay And West Walton Formation and potential for destabilisation of solution features/natural cavities within the limestone bedrock present across much of Botley North and the western and northern parts of Botley Central. Evidence of cavities in the limestone (White Limestone Formation) has been determined from nearby borehole records reviewed for Land Parcel 2 however the BGS hazard risk ratings typically record a very low to low subsidence risk potential for ground dissolution, which indicates that although some dissolution features may be present, localised subsidence need not be considered except in exceptional circumstances. As recommended in the DTS reports, geotechnical ground investigation is required to confirm anticipated design parameters for the proposed PV panel anchoring systems to be employed.

11.5.8 Mineral Resources

- 11.5.8.1 The Superficial Sands and Gravels recorded within Central Botley and associated with the River Thames and the Evenlode are identified as either safeguarded mineral reserves where a mineral resource assessment would be required to support a planning application or within a mineral consultation area (MCA) where further consultation with OCC Minerals and Waste Planning Team is required to determine the sensitivity of the resource.
- 11.5.8.2 The areas of mineral safeguarding and MCAs are shown on Figure 11.2.

11.5.9 Unexploded Ordnance

- 11.5.9.1 Reference to the Zetica Unexploded Bomb Risk mapping indicates that the Study Area is in an area of low potential risk from Unexploded Bombs. No further consideration of Unexploded Ordnance relating to wartime bombing is considered necessary.

11.5.10 Assessment of PRA findings

- 11.5.10.1 The Preliminary Risk Assessments undertaken for land parcels 2 to 16 has included, in line with current best practice, assessment of potential plausible source-pathway-receptor linkages within a Conceptual Site Model. This assessment takes into consideration the sources of possible contaminant risks and the presence of any plausible pathways or receptors.
- 11.5.10.2 Potential contaminative sources identified locally on-site are mainly associated with historical pits within the Study Area, which may have been filled with a variety of (potentially unlicensed) waste materials and rare evidence of kilns also associated with small pits/quarries. The key historical potential sources of contamination identified are the former railway cutting landfill site to the east of Hensington located on the proposed cable route and former sand pits around Purwell Farm that were potentially infilled post 1950s. Off-site sources may include farm buildings and yards where fuel and agrochemicals were/are stored although there is no indication of pollution incidents indicative of past major leaks or spillages from these locations.
- 11.5.10.3 The identified receptors include;
- Groundwater with Primary Aquifers (White Limestone Formation and Forest Marble Formation (limestone)) and Secondary A Aquifers (both superficial and bedrock strata) recorded within the North and Central Botley Study Areas. South Botley is located on unproductive Oxford Clay strata.
 - Surface water, the Project is crossed by a variety of Surface Watercourses from minor drains, ditches, streams and ponds to larger WFD recognised rivers.
 - Off-site residents – there are areas of larger scale residential development in close proximity to the Project that could be impacted by off-site migration of leachable or gaseous contaminants.

- Future site users – albeit a low risk due to anticipated part-time site attendance for maintenance work.
- Structures, foundations, slabs from natural soils with elevated sulphate concentrations or high water table.

11.5.10.4 Potential pathways relate to migration through permeable strata/fractures, shallow groundwater, leaching or for human health direct contact, ingestion or inhalation within buildings.

11.5.10.5 The majority of potential risks that have been identified have mainly been assessed by the PRA as being ‘not applicable’ to ‘low’ due to the shallow nature of proposed excavations and the non- and further assessment is not required to evaluate these linkages any further. There are currently no known active pollutant linkages whilst the Project remains in its current baseline condition and operates in accordance with existing procedures.

11.5.10.6 The two linkages identified as risks of moderate or above which may be active post development, relate to the Hensington Railway Cutting Landfill Site and the potentially infilled Purwell Farm Sand Pits both located within the boundaries of the Project and potential creation of new pathways through construction for gas or leachate migration to occur.

11.5.11 Future baseline conditions

11.5.11.1 The assessment of likely effects on geology and ground conditions considers any potential changes in baseline conditions that would alter the conclusions of the assessment. The primary sources of future change with respect to the baseline are changes in land use and climate change.

11.5.11.2 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 or destabilise dormant natural cavities within soluble limestone strata.

11.5.11.3 Prolonged dry spells or increased rainfall, along with increased temperatures may impacts 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.

11.5.11.4 Increased ambient temperatures may result in the warming of soils and groundwater beneath the Site, which could have the following impacts:

- Accelerated breakdown of putrescible material in Made Ground (particularly where associated with the historical landfill crossed by the northern cable route), resulting in increased rates of carbon dioxide and methane production. Increased volumes of leachate would also be produced with the accelerated breakdown of this material.

11.5.11.5 Changes in land use could influence the parameters upon which this assessment has been based by introducing new potential sources of contamination through industrial based development, or new receptors during the duration of the Project 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.

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

11.5.12 Key receptors

11.5.12.1 **Table 11.10** identifies the receptors taken forward in the assessment.

Table 11.10: Key receptors taken forward to assessment.

Receptor	Description	Sensitivity/value
Human Health - Future Site Users	Operatives and maintenance workers	Low sensitivity due to infrequent and short term periods of site attendance
Human Health – Off-site land users	Nearby residents, workers	Very High sensitivity – assumption that residential off site land users also include farm buildings
Controlled Waters – Principal Aquifer	Bedrock strata of the White Limestone Formation or Forest Marble Formation (Limestone)	High although the absence of source protection zones and potable abstractions within the Study Area would suggest that this is overly conservative.
Controlled Waters – Secondary A Aquifers	Superficial Deposits and Bedrock Strata of the Cornbrash Formation, Forest Marble Formation (mudstone or undifferentiated) and Kellaways Clay/Sand Members	Medium – again with no source protection zones and potable abstractions there is reason to reconsider the sensitivity as low.
Controlled Waters – Unproductive Strata	Bedrock of Oxford Clay and West Walton Formation	Low for the southern part of Botley Central and for Botley South.
Controlled Waters – Surface Watercourses/water bodies	Various Water framework Directive watercourses within a River Basin Management Plan including the Rivers Glyme, Dorn, Evenlode and Thames. Numerous minor watercourses forming tributaries of these rivers together with ponds/lakes primarily flooded sand and gravel pits	High as most conservative value through presence of watercourses having a WFD classification and shown in a RBMP

11.6 Key parameters for assessment

11.6.1 Maximum design scenario

11.6.1.1 The maximum design scenarios identified in **Table 11.11** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 4: Approach to EIA of the PEIR. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 11.11: Maximum design scenario considered for the assessment of potential impacts.

Potential impact	Phase ^a			Maximum Design Scenario	Justification
	C	O	D		
Temporary sterilisation of sharp sand and gravel reserves within designated Mineral Safeguarding Area (land parcels 9, 10, 12 and 13 in Botley Central)	Yes	Yes	No	<p>Construction phase</p> <p>AC and DC cables linking PV panels, inverters and sub-station to be placed at approximate depths of 0.40 m to 1.10 m below ground level (bgl), lengths to be determined. Total developable area of Botley Central for solar arrays 572 Ha. Estimated area of potentially viable sand and gravel resources within the Project is 223.5 Ha.</p> <p>Operation and maintenance phase</p> <p>No change anticipated.</p> <p>Decommissioning phase</p> <p>Temporary sterilisation until following completion of decommissioning then mineral reserves will again be accessible for extraction if required with no viable change to volume of available reserves.</p>	The maximum extent of safeguarded mineral reserves albeit without further consideration of likely stand-off distances from site boundary to edge of solar arrays and other buffer zones likely to be imposed around existing sensitive development, environmental receptors and strategic infrastructure. Whether this is to be assessed further as a potential impact will be dependent upon further consultation with the Local Authority minerals officer and their review of the MRA included as Appendix 11.14.
Creation of new pathways Mobilisation of ground gases from infilled railway cutting landfill site on northern cable route (land parcel 15).	Yes	Yes	Yes	<p>Construction phase</p> <p>600 mm wide cable trench to be placed within a designated 20 m wide working area and is scheduled to be excavated to a depth of 1.673 m below ground level. Cable excavation is to cross entire width of recognised former landfill site estimated to be approximately 30 m wide and more than 4.00 m deep (See Appendix 11.15).</p> <p>Operation and maintenance phase</p> <p>No change anticipated. Pathway if created will still be present and potentially active.</p> <p>Decommissioning phase</p> <p>Pathway if created will still be potentially active following decommissioning unless excavation completely sealed off to mitigate pathway.</p>	Reasonable maximum design scenario for works in area with proposed ground disturbance and depth of excavations, with potential to encounter ground contamination.

Potential impact	Phase ^a			Maximum Design Scenario	Justification
	C	O	D		
Mobilisation of leachate/leachable contaminants from potentially infilled sand pit in land parcel 9.	Yes	Yes	Yes	<p>Construction phase Infilled former sand pit measuring approximately 300 m x 300 m, depth unknown. Location is within area of proposed solar PV panels to be supported by driven or screw-piles to between 1.00 m and 2.00 m depth.</p> <p>Operation and maintenance phase Change in existing drainage patterns may occur through preferential runoff from PV panels locally increasing leaching potential.</p> <p>Decommissioning phase Pathway if created will still be potentially active following decommissioning unless excavation completely sealed off to mitigate pathway.</p>	Proposed ground disturbance and depth of excavations, with potential to encounter ground contamination or mobilise contaminants through creation of new pathway via shallow groundwater or penetration of low permeability basal layer if present.
Potential for construction activity to cause soil or groundwater contamination	Yes	No	Yes	<p>Construction phase Storage of fuel, oils, chemicals or minor maintenance of construction plant within construction compounds (Volumes TBC). The temporary construction compounds will be returned to original state upon completing construction.</p> <p>Operation and maintenance phase Not Applicable</p> <p>Decommissioning phase Similar activities and plant anticipated for decommissioning as for construction. Unknown as to number of compounds, material utilised. These will be identified in a Decommissioning Plan to be developed.</p>	<p>Construction phase Storage of potentially contaminating substances in four proposed construction compounds and frequency of maintenance or repair activities are reasonable maximum design scenario for risk of soil or groundwater contamination. To be confirmed by appointed construction contractor.</p> <p>Decommissioning phase On-site disassembly of equipment and demolition of structures would have similar potential for soil or groundwater contamination as construction phase.</p>

^a C=construction, O=operational and maintenance, D=decommissioning

11.7 Mitigation measures intended to be adopted as part of the Project

- 11.7.1.1 For the purposes of the EIA process, the term ‘Measures adopted as part of the Project’ is used to include the following types of mitigation measures (adapted from IEMA, 2016).
- Primary (inherent) mitigation - measures included as part of the project design. IEMA describes these as ‘*modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken*’. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the DCO and/or marine licences. For example, a reduction in footprint or height.
 - Secondary (foreseeable) mitigation. IEMA describes these as ‘*actions that will require further activity in order to achieve the anticipated outcome*’. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through environmental management plan.
 - Tertiary (inexorable) mitigation. IEMA describes these as ‘*actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects*’. It may be helpful to secure such measures through a Code of Construction Practice or similar.
- 11.7.1.2 For the purposes of this PEIR, mitigation measures set out are those considered to be appropriate for the Project at this time. They may evolve and/or be refined in response to the statutory consultation process and/or other considerations.
- 11.7.1.3 Where relevant, measures have been identified that may result in enhancement of environmental conditions. The mitigation measures relevant to this chapter are summarised in **Table 11.12**.
- 11.7.1.4 Primary and tertiary measures that are intended to form part of the final design (and/or are established legislative requirements/good practice) have been taken into account as part of the initial assessment presented in **section 11.9** below (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures that the Applicants are intending to commit to, are taken into account in the assessment of effects.
- 11.7.1.5 Where an assessment identifies likely significant adverse effects, further mitigation measures may be applied. These are measures that could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as actions that will require further activity in order to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the Environmental Statement (referred to as secondary

mitigation measures in IEMA, 2016). For further or secondary measures both pre-mitigation and residual effects are presented.

Table 11.12: Mitigation measures intended to be adopted as part of the Project.

Mitigation number	Measure adopted	How the measure will be secured
11.1	Discovery Strategy - The discovery strategy would comprise a watching brief that would be undertaken by suitably trained personnel during construction activities. The strategy would also include a procedure for construction workers to follow in the event that previously unknown contamination is discovered during the construction phase.	Secured as a requirement of the DCO.
11.2	Ground Investigations – As there has been minimal previous ground investigation across the BWSF Project, ground investigation and geotechnical testing, primarily for confirmation on potential land instability and pile design parameters would be undertaken. This should include geo-environmental testing in areas where DTS and PRA assessment has identified more than a low risk of contamination.	Secured as a requirement of the DCO.
11.3	Remediation Strategy – Should ground investigation or the discovery strategy determine that remediation is required to ensure that the site is suitable for its proposed use, a remediation strategy would be prepared and agreed with the Environment Agency/relevant local planning authority prior to its implementation.	Secured as a requirement of the DCO.
11.4	To facilitate the management of soils - A Materials Management Plan would be prepared in accordance with the CL:AIRE Code of Practice (CL:AIRE, 2011). to document the management of soils on the site.	Secured through the DCO and the Outline Code of Construction Practice (CoCP)
11.5	Implementation of measures to prevent and control spillage of oil, chemicals and other potentially harmful liquids - appropriate storage and handling of materials and products in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001	Secured through the DCO and the Outline Code of Construction Practice (CoCP)
11.6	To help avoid pollution incidents occurring -Implementation of measures to protect groundwater during construction, including good environmental practices based on legal responsibilities and guidance on good environmental management in: CIRIA C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (2001b).	Secured through the DCO and the Outline Code of Construction Practice (CoCP)

Mitigation number	Measure adopted	How the measure will be secured
11.7	To mitigate risks to construction workers - Implementation of control measures, use of appropriate personal protective equipment and adoption of high levels of personal hygiene by construction workers. Health and Safety risk assessments to be completed prior to construction workers in line with Construction (Design and Management) Regulations 2015	Secured through the DCO and the Outline Code of Construction Practice (CoCP)
11.8	To help avoid pollution incidents occurring - During operation, maintenance activities may involve the use of chemicals and oils. Secure storage facilities would be provided, including a secondary containment system. A spillage control procedure would be implemented to ensure that any spillages are contained and removed	Secured through the DCO and the Outline Code of Construction Practice (CoCP)

11.8 Impact assessment methodology

11.8.1 Overview

11.8.1.1 The overall assessment has been carried out in accordance with guidance as set out in the the Design Manual for Roads and Bridges (DMRB) Sustainability and Environment Appraisal, LA109: Geology and Soils (Highways England et. al., 2019) and DMRB Sustainability and Environment Appraisal, LA113: Road drainage and the water environment (Highways England et. al., 2020), whilst the detailed assessment of the magnitude of impacts and significance criteria for effects has been undertaken using the methodology outlined in DMRB Sustainability and Environment Appraisal, LA104: Environmental assessment and monitoring (Highways England et. al., 2019).

11.8.1.2 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: Need, National Planning Policy, and Alternatives Considered. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges (DMRB) methodology (Highways England et al., 2020).

11.8.2 Receptor sensitivity/value

11.8.2.1 The criteria for defining sensitivity in this chapter are outlined in **Table 11.13** below.

Table 11.13: Sensitivity criteria

Sensitivity	Definition
Very High	<p>Geology: very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSI's and GCR where citations indicate features of international importance). Geology meeting international designation criteria which is not designated as such.</p> <p>Excellent quality economically extractable mineral resource.</p> <p>Contamination:</p> <p>1) human health: very high sensitivity land use such as residential or allotments;</p> <p>2) surface water: Watercourse having a WFD classification shown in a RBMP and $Q_{95} \geq 1.0 \text{ m}^3/\text{s}$. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation; and</p> <p>3) groundwater: Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation. Groundwater locally supports GWDTE SPZ1.</p>

Sensitivity	Definition
High	<p>Geology: rare and of national importance with little potential for replacement (e.g. geological SSSI, ASSI, National Nature Reserves (NNR)). Geology meeting national designation criteria which is not designated as such.</p> <p>Good quality economically extractable mineral resource</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) human health: high sensitivity land use such as public open space; 2) surface water: Watercourse having a WFD classification shown in a RBMP and $Q_{95} < 1.0 \text{ m}^3/\text{s}$. Species protected under EC or UK legislation; and 3) groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater locally supports GWDTE SPZ2.
Medium	<p>Geology: of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation criteria which is not designated as such.</p> <p>Mineral resource present but unlikely to be economically viable for extraction.</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) human health: medium sensitivity land use such as commercial or industrial; 2) surface water: Watercourse not having a WFD classification shown in a RBMP and $Q_{95} > 0.001 \text{ m}^3/\text{s}$; and 3) groundwater: Secondary aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3.
Low	<p>Geology: of local importance/interest with potential for replacement (e.g. non designated geological exposures, former quarries/mining sites).</p> <p>Mineral resource not of sufficient quality or quantity to be economically viable;</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) human health: low sensitivity land use such as highways and rail; 2) surface water: Watercourses not having a WFD classification shown in a RBMP and $Q_{95} \leq 0.001 \text{ m}^3/\text{s}$; and 3) groundwater: Unproductive strata
Negligible	<p>No surface waterbodies.</p> <p>Mineral Resource not present.</p>

11.8.3 Magnitude of impact

11.8.3.1 The criteria for defining magnitude in this chapter are outlined in **Table 11.14** below.

Table 11.14: Impact magnitude criteria

Magnitude of impact		Definition
High	Adverse	<p>Geology: loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements, large scale landslides or ground destabilisation across a wide area.</p> <p>Contamination:</p> <p>1) human health: significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) SP1010 with potential for significant harm to human health. Contamination heavily restricts future use of land;</p> <p>2) surface water: Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.; and</p> <p>3) groundwater: Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.</p>
	Beneficial	<p>Highly beneficial to the geology/hydrogeology environment resources of the area. e.g. exposure of new geological formations that may become designated sites of significant regional and or national interest or removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to an aquifer/watercourse. Improvement in water body WFD classification. Recharge of an aquifer.</p>
Medium	Adverse	<p>Geology: partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements, Moderate scale landslides or ground destabilisation within a localised area.</p> <p>Contamination: 1) human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (e.g. category 4 screening levels) SP1010. Significant contamination can be present. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use;</p> <p>2) surface water: Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification. and</p> <p>3) groundwater: Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/industrial/agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification.</p>
	Beneficial	<p>Moderate benefit to the hydrogeological environment/soils resource of the area e.g., the Proposed Development results in a brownfield contaminated site that is or is likely to be determined as contaminated land being remediated, contribution to improvement in water body WFD classification or reduction of groundwater hazards to existing structures.</p>

Magnitude of impact		Definition
Low	Adverse	<p>Geology: minor measurable change in geological feature/designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, Small scale localised landslides/ground destabilisation.</p> <p>Contamination:</p> <p>1) human health: contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels) SP1010 [Ref 4.N]. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health;</p> <p>2) surface water: Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually. Minor effects on water supplies. and</p> <p>3) groundwater: Potential low risk of pollution to groundwater from routine runoff. Minor effects on an aquifer, GWDTEs, abstractions and structures.</p>
	Beneficial	<p>Minor benefit to the hydrogeological environment/mineral resources. E.g., the Proposed Development may result in the exposure of geological formations that may become of significant local interest.</p> <p>Reduction of groundwater hazards to existing structures.</p>
Negligible	Adverse	<p>Geology: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected. Very limited or no landslides.</p> <p>Contamination:</p> <p>1) human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels) SP1010 No requirement for control measures to reduce risks to human health/make land suitable for intended use;</p> <p>2) surface water; No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages $< 0.5\%$. and</p> <p>3) groundwater: No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages $< 0.5\%$.</p>
	Beneficial	<p>Surface Water; HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more.</p>
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

11.8.4 Significance of effect

11.8.4.1 The significance of the effect upon Ground Conditions has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in **Table 11.15**. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.

11.8.4.2 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

11.8.4.3 For the purpose of this assessment, any effects with a significance level of Minor or less are not considered to be significant in terms of the EIA Regulations.

Table 11.15: Assessment matrix

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

11.8.4.4 Where the magnitude of impact is ‘no change’, no effect would arise.

11.8.4.5 The definitions for significance of effect levels are described as follows.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
- Moderate: These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- No change: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

11.8.5 Assumptions and limitations of the assessment

11.8.5.1 **No** walkover surveys or intrusive ground investigations have been undertaken to support the findings of the DTS and PRA reports. The information used to determine the significance of potential impacts is therefore based primarily upon a review of the desk-based information detailed within the DTS and PRA

reports and the Minerals Resource Assessment as presented in Appendices 11.1 to 11.14.

- 11.8.5.2 The limitations of the DTS and PRA are set out in Annex 2 in each PRA report (Appendix 11.1 to 11.13). No further assumptions or limitations have been identified in the preparation of this chapter with regard to ground conditions that would prevent a preliminary assessment of the potential effects being made for PEIR purposes.

11.9 Assessment of effects

11.9.1 Introduction

- 11.9.1.1 The impacts of the construction, operation and maintenance, and decommissioning phases of the Project have been assessed. The potential impacts arising from the construction, operation and maintenance and decommissioning phases of the Project are listed in the following sections, along with consideration of the maximum design scenario against which each impact has been assessed.

- 11.9.1.2 A description of the potential effect on receptors caused by each identified impact is given below.

11.9.2 Impacts from ground contamination on groundwater

- 11.9.2.1 With the act of breaking ground for construction there is a risk of increased potential for mobilisation of contaminants either through leaching from increased exposure to rainfall, changes in shallow drainage patterns or via perched or shallow groundwater, particularly where there are identified potential contamination sources within the Project boundaries. The majority of the Project comprises agricultural land and is not therefore considered to represent a potentially significant source of contaminants of concern. However, there are on-site potentially infilled areas of ground and former landfill which could represent sources of contaminants of concern.

- 11.9.2.2 There is also the potential for new contaminants during construction as a result of spillages or leakages from plant or fuel storage in compounds, albeit this should be mitigated by best practice measures and construction drainage design included in the CoCP.

Construction phase

Sensitivity of the receptor

- 11.9.2.3 The Project lies outside of any existing Source Protection Zones and there are no recorded potable groundwater abstractions within the Study Area.

- 11.9.2.4 The sensitivity of the groundwater as a receptor varies from Low, where there are outcropping strata designated as unproductive strata, to Medium for superficial deposits and bedrock Secondary A Aquifers, to High where there are limestone strata classed as Principal Aquifers:

- the vulnerability of the receptor varies from Low (unproductive strata) to Medium to High where there are outcropping Secondary A Aquifer and Principal Aquifer strata;
- the recoverability of the receptor varies from Low (Unproductive Strata) to Moderate (Secondary A Aquifers and Principal Aquifers);
- the overall sensitivity and value of the receptor is considered to be Medium given the absence of potable water supplies and SPZs.

11.9.2.5 The sensitivity of the receptor is considered to be **Medium**.

Magnitude of impact

11.9.2.6 The magnitude of the impact for impacts of ground contamination on groundwater during construction is:

- direct;
- short term;
- intermittent; and
- The overall magnitude of the impact is Negligible (adverse) across the majority of the Project or Low (adverse) of the historical landfill (indicated to be located above the Forest Marble Formation).

11.9.2.7 The magnitude is therefore Negligible (adverse) to Low (adverse).

Significance of the effect

11.9.2.8 Overall, the magnitude of the impact is Negligible/Low (adverse) and the sensitivity of the receptor is Medium. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant.

Operation and maintenance

11.9.2.9 Operational impacts are considered to be unlikely, given that operations will be limited to any maintenance or replacement of installed equipment. Any potential leaks and spillages will be minor and localised.

Sensitivity of receptor

11.9.2.10 Remains unchanged from construction i.e. **Medium**.

Magnitude of impact

11.9.2.11 The magnitude of the impact for impacts of ground contamination on groundwater during operation and maintenance is:

- direct;
- short term;
- intermittent; and
- The overall magnitude of the impact is **Negligible (adverse)**.

Significance of effect

- 11.9.2.12 Overall, the magnitude of the impact is Negligible (adverse) and the sensitivity of the receptor is Medium. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant.

Further mitigation and residual effects

- 11.9.2.13 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Decommissioning

- 11.9.2.14 Potential impacts from the decommissioning of the Project are assumed to be similar in nature with regard to receptors, magnitude of impact and significance of effect as those during construction, as some groundworks would be required to remove the foundations and other infrastructure installed.
- 11.9.2.15 As with the construction phase it is considered that the mitigation measures of standard industry good practice would be adopted and these would be set out in a decommissioning strategy to accompany the CoCP produced for the works involved with the construction phase.

Further mitigation and residual effects

- 11.9.2.16 Given the risks presented by contamination are considered to be very low other than the cable crossing of the historical landfill site.

11.9.3 Impacts from ground contamination on surface water

- 11.9.3.1 Impacts of the Project on surface water quality may arise from runoff from construction areas and also as a result of mobilisation of contaminants in shallow soils or perched groundwater migrating to surface waters.
- 11.9.3.2 The nearest identifiable surface water course to the historical landfill is the River Glyme, located approximately 1 km to the west. The nearest identifiable surface water course to the potentially infilled sand pits is the River Evenlode, located approximately 280 m to the west. Given the distance and underlying geology, the potential for contaminants of concern associated with these potential sources to impact these surface water receptors is considered to be limited.

Construction Phase

Sensitivity of the receptor

- 11.9.3.3 The sensitivity of surface water as a receptor varies from Medium where there are minor waterbodies not having a WFD classification shown in a RBMP to High for some of the larger watercourses within a RBMP e.g. Rivers Glyme, Dorn, Evenlode and Thames:

- Given the status of the WFD classified watercourses (typically overall ratings of 'Poor' to 'Moderate' the vulnerability of the receptors are considered to be Low to Medium;
- the recoverability of the receptor varies from Low to Moderate;
- the overall sensitivity and value of the receptor is considered to be Medium to High given the absence of surface water abstractions.

11.9.3.4 The sensitivity of the receptor is considered to be **Medium to High**.

Magnitude of impact

11.9.3.5 The magnitude of the impact for impacts of ground contamination on surface water during construction is:

- direct;
- short term;
- intermittent; and
- The overall magnitude of the impact is **Negligible (adverse)**.

11.9.3.6 The magnitude is therefore Negligible (adverse)

Significance of the effect

11.9.3.7 Overall, the magnitude of the impact is **Negligible/Low (adverse)** and the sensitivity of the receptor is **Medium to High**. The effect will, therefore, be of **Negligible to Moderate (adverse)** significance, which is not significant.

Operation and maintenance

11.9.3.8 No change is anticipated to the effects on surface water across the Project during the operational period of infrequent maintenance works, following completion of trench excavation and infilling of the cable route and PV panel placement. Operational areas with infrequent maintenance works will be managed in accordance with standard operational procedures and the mitigation measures identified in **Table 11.12**.

Significance of the effect

11.9.3.9 Overall, the magnitude of the impact is No Change and the sensitivity of the receptor is Medium to High. The effect will, therefore, be No Change, which is not significant.

Decommissioning

11.9.3.10 Potential impacts from the decommissioning of the Project are assumed to be similar in nature with regard to receptors, magnitude of impact and significance of effect as those during construction, as some groundworks would be required to remove the foundations and other infrastructure installed.

11.9.3.11 As with the construction phase it is considered that the mitigation measures of standard industry good practice would be adopted and these would be set out

in a decommissioning strategy to accompany the CoCP produced for the works involved with the construction phase.

11.9.4 Impacts from ground contamination on future site users

Construction Phase

11.9.4.1 Future site users will not be present as part of the construction phase, therefore there is no viable source-pathway-receptor linkage involved during this period.

Operation and maintenance

11.9.4.2 During the operational period it is envisaged that there will be periodic site access for maintenance staff to undertake routine inspection, maintenance, repairs and make adjustments to equipment as necessary.

Sensitivity of the receptor

11.9.4.3 The sensitivity of future site users as a receptor is considered to be Medium as per a commercial or industrial land use, albeit exposure to residual soils is likely to be limited in duration and undertaken in accordance with use of PPE suitable for tasks undertaken in accordance with Health and Safety Regulations:

- Vulnerability of the receptors are considered to be High;
- the receptor is not recoverable;
- the overall sensitivity and value of the receptor is considered to be Low in a similar way to highways/infrastructure workers.

11.9.4.4 The sensitivity of the receptor is considered to be **Low**.

Magnitude of impact

11.9.4.5 Following completion of the mitigation measures identified within **Table 11.12**, including any remediation deemed necessary, the magnitude of the impact for impacts on future site users for maintenance operations during operation is:

- direct;
- potentially long term;
- permanent; and
- The overall magnitude of the impact is Negligible (adverse)

11.9.4.6 The magnitude is therefore **Negligible (adverse)**

Significance of the effect

11.9.4.7 Overall, the magnitude of the impact is Negligible (adverse) and the sensitivity of the receptor is Low. The effect will, therefore, be of **Negligible (adverse)** significance, which is not significant.

Decommissioning

11.9.4.8 Not Applicable.

11.9.5 Impacts from ground contamination on off-site land users

11.9.5.1 Off-site land users include nearby residents of residential properties, or workers on farms or other nearby development. The Project area is mainly of low residential density and with limited contamination source potential there is not considered to be a viable risk over the majority of the Study Area, however there is residential development at Hensington on the eastern edge of Woodstock which is within 50 m of the proposed cable route crossing of the historical landfill site. Disturbance of historical landfill material has the potential to mobilise ground gas along preferential pathways, where present.

11.9.5.2 Outside of this location, where trenches are to be backfilled on completion of cable installation using materials identified as suitable for purpose, there is unlikely to be exposure of contaminated materials that could migrate via airborne pathways across the majority of the Project and a low risk is considered applicable.

Construction Phase

Sensitivity of the receptor

11.9.5.3 The sensitivity of nearby residents as a receptor is considered to be very high:

- the vulnerability of the receptor is High;
- the recoverability of the receptor is not recoverable;
- the overall sensitivity and value of the receptor is considered to be Very High.

11.9.5.4 The sensitivity of the receptor is considered to be **Very High**.

Magnitude of impact

11.9.5.5 The magnitude of impact for off-site receptors during construction is:

- direct;
- long-term;
- permanent; and
- The overall magnitude of the impact is Negligible (adverse) for the majority of the Project or Medium (adverse) for the crossing point of the cable route for the area of the historical landfill site and the development proposed on the potentially infilled sandpits. This will be reduced to Low following implementation of any remedial measures, which may be deemed necessary (e.g. reinstatement of an impermeable barrier).

11.9.5.6 Following completion of the mitigation measures identified within **Table 11.12**, including any remediation deemed necessary, the magnitude is considered **Low (adverse)**.

Significance of the effect

- 11.9.5.7 Overall, the magnitude of the impact is Negligible/Low (adverse) and the sensitivity of the receptor is Very High. The effect will, therefore, be of **Minor (adverse)** significance, increasing to **Moderate (adverse)** for the cable route crossing of the landfill site and development of the potentially infilled sand pits, which is not significant for the majority of the Project.

Operation and maintenance

- 11.9.5.8 Not applicable for the majority of the Project. There will be no perceived change during the period of operation to the Construction Phase assessment.

Decommissioning

- 11.9.5.9 As above.
- 11.9.5.10 Tertiary mitigation will be required to mitigate against possible creation of migration pathways for ground gases through excavation into the former landfill site on the cable route. Alternatively, where more cost effective, secondary mitigation by way of alteration to design methodologies to avoid excavation may be considered as a suitable method of 'secondary' mitigation.

11.9.6 Future monitoring

- 11.9.6.1 Future monitoring is not anticipated to be required as a result of the construction/operation or decommissioning phases unless there are requirements for such under an agreed remediation strategy or as a result of the discovery of any unexpected areas of ground contamination as measures adopted as part of the project and included in **Table 11.12**.

11.10 Cumulative effect assessment methodology

- 11.10.1.1 The Ground Conditions CEA methodology has followed the methodology set out in Volume 1, Chapter 4: Approach to EIA. As part of the assessment, all projects and plans considered alongside the Project have been allocated into 'tiers' reflecting their current stage within the planning and development process.

- Tier 1
 - Under construction
 - Permitted application.
 - Submitted application.
 - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact.
- Tier 2
 - Scoping report has been submitted.
- Tier 3

- Scoping report has not been submitted.
- Identified in the relevant Development Plan
- Identified in other plans and programmes.

- 11.10.1.2 For clarity, cumulative effects with the generation assets are considered first:
- Botley West Solar Farm
- 11.10.1.3 This assessment is followed by all other relevant projects, identified by tier.
- 11.10.1.4 This tiered approach is adopted to provide a clear assessment of the Project alongside other projects, plans and activities.
- 11.10.1.5 The specific projects, plans and activities scoped into the CEA, are outlined in **Table 11.16**.

Table 11.16: List of other projects, plans and activities considered within the CEA [to be based on the CIA screening matrix]

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
Tier 1-						
20/01734/OUT	Pending	Adjacent	Mixed (Residential development/employment land)	N/A	N/A	No
16/01364/OUT	Under construction	Adjacent	Residential/commercial mixed development	2024-2034	N/A	No
21/01364/OUT	Pending	0.2	Residential	N/A	N/A	No
18/01009/RES	Under construction	Adjacent	Residential	Unknown	N/A	No
22/00108/CC3REG	Permitted	Adjacent	Infrastructure (park and ride)	Unknown	Unknown	No
20/01817/FUL	Permitted	Adjacent	Energy	Unknown	Unknown	No
21/03522/OUT	Pending	Adjacent	Residential	N/A	N/A	No
22/01715/OUT	Pending	Adjacent	Residential	N/A	N/A	No
23/00517/F	Pending	Adjacent	Commercial	N/A	N/A	No
Tier 2-						
P22/V2581/SCO	Scoping Positive	- Adjacent	Energy	N/A	N/A	No
P22/VO144/SCR	Screening Positive	- Adjacent	Energy	N/A	N/A	No
P22/V2051/SCR	Screening Positive	- Adjacent	Energy	N/A	N/A	No

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
Tier 3-						
Adopted Cherwell Local Plan 2011-2031 PR8	Allocation	Adjacent – land east of A44	Residential	N/A	N/A	No
Adopted Cherwell Local Plan 2011-2031 PR9	Allocation	Adjacent – land west of Yarnton	Residential	N/A	N/A	No

11.10.2 Maximum design scenario – cumulative effects assessment

- 11.10.2.1 The maximum design scenarios identified in **Table 11.17** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in Volume 1, Chapter 6: Project Description, of the PEIR as well as the information available on other projects and plans, in order to inform a ‘maximum design scenario’. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different foundation type or substation layout), to that assessed here, be taken forward in the final design scheme.

Table 11.17 Maximum design scenario for the assessment of cumulative effects

Potential cumulative effect	Phase ^a			Maximum Design Scenario	Justification
	C	O	D		
Loss of identified safeguarded mineral reserves.	Yes	Yes	No	<p>Maximum design scenarios as described for the Project (Table 11.11) assessed cumulatively with the following other projects/plans:</p> <p>Tier 1</p> <ul style="list-style-type: none"> Two other projects (20/01734/OUT and 22/00108/CC3REG) are also located within the same MSA for sharp sand and gravel in the Botley Central area. <p>Tier 2</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 3</p> <ul style="list-style-type: none"> All as shown in Table 11.16 	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. As previously stated the inclusion of minerals will be dependent upon further discussions with Oxfordshire CC Minerals department and their assessment of the MRA produced for the Project. This would be incorporated in the ES chapter for this topic.
Mobilisation of ground gases from infilled railway cutting landfill site on northern cable route (land parcel 15).				<p>Maximum design scenarios as described for the Project (Table 11.11) assessed cumulatively with the following other projects/plans:</p> <p>Tier 1</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 2</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 3</p> <ul style="list-style-type: none"> All as shown in Table 11.16 	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. None of the additional developments considered under cumulative effects encroach on the infilled railway cutting landfill site.

Potential cumulative effect	Phase ^a			Maximum Design Scenario	Justification
	C	O	D		
Mobilisation of leachate/leachable contaminants from potentially infilled sand pit in land parcel 9.				<p>Maximum design scenarios as described for the Project (Table 11.11) assessed cumulatively with the following other projects/plans:</p> <p>Tier 1</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 2</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 3</p> <ul style="list-style-type: none"> All as shown in Table 11.16 	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. None of the additional developments considered under cumulative effects encroach on the site of the sand pits.
Potential for construction activity to cause soil or groundwater contamination		No	No	<p>Maximum design scenarios as described for the Project (Table 11.11) assessed cumulatively with the following other projects/plans:</p> <p>Tier 1</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 2</p> <ul style="list-style-type: none"> All as shown in Table 11.16 <p>Tier 3</p> <ul style="list-style-type: none"> All as shown in Table 11.16 	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. Assumption that other adjacent developments will be undertaken in accordance with best practice construction measures as in Table 11.12 .

^a C=construction, O=operational and maintenance, D=decommissioning

11.11 Cumulative effects assessment

11.11.1.1 In the assessment of effects scenario set out in **section 11.9** above, the Geology, Hydrogeology and Ground Conditions cumulative effects are not considered to be significant. As on the basis of the information available, only negligible to minor adverse effects have been identified in relation to ground conditions and contamination associated with the Project. The Project is therefore not considered to represent a significant risk in terms of contaminated soil and/or groundwater. *Therefore, it is not considered that the Project would contribute to any significant adverse cumulative effects in relation to ground conditions and contamination.*

11.12 Inter-related effects

- 11.12.1.1 Inter-relationships are the impacts and associated effects of different aspects of the Project on the same receptor. These are as follows.
- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Project (construction, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g., construction noise effects from piling, operational substation noise, and decommissioning disturbance).
 - Receptor led effects: Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on Ground Conditions, such as water pollution etc, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.
- 11.12.1.2 This chapter assesses the significance of potential effects on ground conditions. Potential effects on the water environment, including surface water, are considered within Chapter 10: Hydrology and Flood Risk, which provides a detailed assessment of the baseline water environment conditions.
- 11.12.1.3 The potential effects of The Project on Agricultural Land Use are presented in Chapter 17.
- 11.12.1.4 The design of the Project elements is discussed within Chapter 6: Project Description. The design aims for all surplus materials (excavations) generated by the Project to be reused within the Project, wherever possible.
- 11.12.1.5 The generation of construction dust is assessed within Volume 3, Appendix 4.5: Air Quality.
- 11.12.1.6 Inter-related effects methodology is provided in Chapter 19: Cumulative Effects and Inter-relationships of the PEIR and will be assessed further at the ES stage.

11.13 Summary of impacts and monitoring

- 11.13.1.1 Information on Ground Conditions within the study area was collected through desktop review and preliminary consultation with Oxfordshire County Council Minerals Department.
- 11.13.1.2 **Table 11.19** presents a summary of the potential impacts and residual effects in respect to Ground Conditions. The impacts assessed include:
- Ground contamination on groundwater;
 - Ground contamination on surface water;
 - Ground contamination on future users; and
 - Ground Contamination on off-site human health receptors.
- 11.13.1.3 The assessment has considered potential impacts on the underlying aquifers, surface watercourses, human health (construction workers and future site users) land instability and mineral resources. The significance of effect ranges from temporary minor/moderate adverse effects with regard to off-site human health, to no change during the operational phase, which are not considered significant.
- 11.13.1.4 It is concluded that there will no significant cumulative effects from the Project alongside other projects/plans.

Table 11.18: Summary of potential environmental effects and monitoring.

Description of impact	Phase ^a			Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D						
Ground contamination on groundwater	✓	✓	✓	C: Negligible (adverse)/Low (adverse) O: Negligible (adverse) D: Negligible (adverse)	C: Medium O: Medium D: Medium	C: Minor (adverse) O: Minor (adverse) D: Minor (adverse)	None None None	N/A N/A N/A	None None None
Ground contamination on surface water	✓	✓	✓	C: Negligible (adverse) O: Negligible (adverse) D: Negligible (adverse)	C: Medium/High O: Medium/High D: Medium/High	C: Minor (adverse) O: Minor (adverse) D: Minor (adverse)	None None None	N/A N/A N/A	None None None
Ground contamination on future users		✓		C: N/A O: Negligible (adverse) D: N/A	C: N/A O: Low D: N/A	C: N/A O: Negligible (adverse) D: N/A	N/A None N/A	N/A N/A N/A	N/A None N/A
Ground contamination on off-site users	✓	✓	✓	C: Negligible/Medium (adverse) O: Negligible/Medium (adverse) D: Negligible/Medium (adverse)	C: Very High O: Very High D: Very High	C: Minor/Moderate (adverse) O: Minor/Moderate (adverse) D: Minor/Moderate (adverse)	Yes None Yes	Low (adverse) Low (adverse) Low (adverse)	None None None

^a C=construction, O=operational and maintenance, D=decommissioning

11.14 Next steps

- 11.14.1.1 The next steps in finalisation of the assessment for this chapter are to complete consultation with the Minerals and Waste Local Plan Principal Officer of Oxfordshire County Council regarding the MRA submitted and whether there are any further requirements for further discussion or assessment on the proposed non-mineral development within the identified Mineral Consultation Areas within the boundaries of the BWSF.
- 11.14.1.2 Where recommended in the DTS and PRA reports ground investigation should be undertaken to inform design of the Project.

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