

# Sea Link

## Volume 6: Environmental Statement

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# 5. Geology and Hydrogeology

## 5.1 Introduction

- 5.1.1 This chapter of the Environmental Statement (ES) presents the assessment of the likely significant effects on geology and hydrogeology that could result from the Kent Onshore Scheme part of the Proposed Project (as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**).
- 5.1.2 Geology and Hydrogeology effects associated with the Kent Onshore Scheme relate to the potential impacts that construction, operation and decommissioning of the Proposed Project may have on existing geology and hydrogeology conditions. This includes an assessment of the potential for existing contamination and pollutant linkages with sensitive receptors such as site workers and groundwater. This also includes the potential for impacts on designated geological sites, mineral resources and changes to groundwater flow and levels.
- 5.1.3 The Order Limits, which define the boundary of the Proposed Project, are illustrated on **Application Document 2.2.1 Overall Location Plan** and the Kent Onshore Scheme Boundary is illustrated on **Application Document 2.2.3 Kent Location Plan**.
- 5.1.4 This chapter should be read in conjunction with the following ES chapters:
- **Application Document 6.2.1.3 Part 1 Introduction Chapter 3 Main Alternatives Considered;**
  - **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project;**
  - **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology;**
  - **Application Document 6.2.1.6 Part 1 Introduction Chapter 6 Scoping Opinion and EIA Consultation;**
  - **Application Document 6.2.3.2 Part 3 Kent Chapter 2 Ecology and Biodiversity;**
  - **Application Document 6.2.3.5 Part 3 Kent Chapter 4 Water Environment;** and
  - **Application Document 6.2.4.1 Part 4 Marine Chapter 1 Physical Environment.**
- 5.1.5 This chapter is supported by the following figures:
- **Application Document 6.4.3.5 Geology and Hydrogeology.**
- 5.1.6 This chapter is supported by the following appendices:
- **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment;**
  - **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment;**
  - **Application Document 6.3.3.5.C Appendix 3.5.C Ground Investigation Report – Kent;** and

- **Application Document 6.3.3.5.D Appendix 3.5.D Generic Quantitative Risk Assessment – Kent.**

5.1.7 This chapter is supported by the following application documents:

- **Application Document 7.5.3 Outline Onshore Construction Environmental Management Plan (CEMP);**
- **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice;** and
- **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC).**

## 5.2 Regulatory and Planning Context

- 5.2.1 This section sets out the legislation and planning policy that is relevant to the geology and hydrogeology effects assessment. A full review of compliance with relevant national and local planning policy is provided within the **Application Document 7.1 Planning Statement** submitted as part of the application for Development Consent.
- 5.2.2 Policy generally seeks to minimise geology and hydrogeology effects from development and to avoid significant adverse effects.

### Legislation

#### Environmental Protection Act 1990

- 5.2.3 Part 2A of the Environmental Protection Act 1990 (H.M Government, 1990) and associated Statutory Guidance is the primary legislation on contaminated land. It provides a framework for the assessment and, where necessary, the remediation of contaminated land. Part 2A focuses on the identification and remediation of land which in its current use poses an unacceptable risk to people or the environment.
- 5.2.4 The Statutory Guidance that accompanies the Environmental Protection Act 1990, includes the Contaminated Land Statutory Guidance (H.M Government, 2012) which provides a definition of what constitutes “contaminated land” and sets out the responsibilities of the Local Authority and the Environment Agency in the identification and management of contaminated land. The regulations also include a definition of 'risk', where a risk is said to be a combination of "*(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and (b) the scale and seriousness of such harm or pollution if it did occur*".

#### Environmental Damage (Prevention and Remediation) Regulations 2015

- 5.2.5 The Environmental Damage (Prevention and Remediation) Regulations 2015 (HM Government, 2015) aim to prevent new land contamination that will damage water or health. The Regulations also include enforcement procedures, including criminal sanctions, for breaches of the Regulations.

#### Environmental Permitting (England and Wales) Regulations 2016 and Environmental Permitting (England and Wales) (Amendment) (England) Regulations 2023

- 5.2.6 The Environmental Permitting (England and Wales) Regulations (HM Government, 2016) and the Environmental Permitting (England and Wales) (Amendment) (England) regulations (HM Government, 2023) include transposition of the EU Landfill Directive (The Council of the European Union, 1999) into UK law. These Regulations cover sites that are covered by environmental permits, such as landfills, and how these are regulated. The Proposed Project may cross sites where there are permits currently held.
- 5.2.7 These Regulations also cover the licensing of surface waters and groundwater abstractions and protect water resources through Source Protection Zones (SPZs). The Proposed Project may require abstractions or discharges during construction.

### **Water Resources Act 1991**

- 5.2.8 The Water Resources Act (HM Government, 1991) aims to maintain and improve the quality of controlled waters. Part II of the Act covers the licencing of surface water and groundwater abstractions.

### **The Water Environment (Water Framework Directive) Regulations 2017**

- 5.2.9 The Water Framework Directive (WFD) Regulations (HM Government, 2017) establish a framework for the protection of surface waters and groundwater and to prevent the deterioration of WFD water bodies.
- 5.2.10 A WFD assessment will be undertaken and included within **Application Document 6.9 Water Framework Directive Assessment** and is also described further in **Application Document 6.2.3.5 Part 3 Kent Chapter 5 Water Environment**.

### **The Groundwater Regulations 2009**

- 5.2.11 The Groundwater Regulations (HM Government, 2009) cover potential groundwater contamination that could eventuate from spillages or disturbance of contaminated ground. The Proposed Project has the potential to cross contaminated land or to create pollution risks during construction.

## **National Policy**

### **National Policy Statements**

- 5.2.12 National Policy Statements (NPS) set out the primary policy tests against which the application for a Development Consent Order (DCO) for the Proposed Project would be considered. Table 5.1 and Table 5.2 below provides details of the elements of NPS for Energy (EN-1) (Department for Energy Security and Net Zero, 2023) and NPS for Electricity Networks Infrastructure (EN-5) (Department for Energy Security and Net Zero, 2023) that are relevant to this chapter. NPS EN-3 Renewable Energy Infrastructure has relevance to the Proposed Project, but only in respect of the offshore elements. As such it has no relevance to the assessment presented in this chapter.

**Table 5.1 NPS EN-1 requirements relevant to geology and hydrogeology**

<b>NPS EN-1 section</b>	<b>Where this is covered in the ES</b>
5.4.17 “[...] Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ... geological conservation importance.”	The assessment presented in Section 5.7 of this chapter identifies designated geological sites within the study area and any potential for effects on these features. Where sites have been identified within the coastal margin, they have been assessed in <b>Application Document 6.2.4.1 Part 4 Marine Chapter 1 Physical Environment</b> .
5.4.19 “The applicant should show how the project has taken advantage of opportunities to conserve and enhance geological conservation interests.”	The optioneering of the Proposed Project has sought to avoid geological conservation sites where practicable. Further to this, the assessment presented in Section 5.7 of this chapter includes designated geological sites.
5.4.42 “As a general principle, and subject to the specific policies below, development should, in line with the mitigation hierarchy, aim to avoid significant harm to biodiversity and geological conservation interests, including through consideration of reasonable alternatives (as set out in Section 4.3 above). Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought.”	The assessment presented in Section 5.7 of this chapter identifies sites of geological importance within the study area and any potential for effects on these features, and if required presents appropriate mitigation measures. Effects on biodiversity are considered within <b>Application Document 6.2.3.2 Part 3 Kent Chapter 2 Ecology and Biodiversity</b> .
5.11.8 “For developments on previously developed land, the applicant should ensure that they have considered the risk posed by land contamination and how it is proposed to address this.”	<b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment to support the baseline information presented in Section 5.7 of this chapter and informs the assessment presented in Section 5.9.
5.11.19 “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.”	In accordance with the Scoping Report ( <b>Application Document 6.14 Environmental Scoping Report 2022</b> ) and subsequent Scoping Opinion ( <b>Application Document 6.15 Scoping Opinion</b> ), mineral resources were scoped out of the assessment, as safeguarded minerals have not been identified within the study area that would be impacted by the Proposed Project as described in Section 5.7.
5.11.28 “Where a proposed development has an impact upon a Mineral Safeguarding Area (MSA),	In accordance with the Scoping Report ( <b>Application Document 6.14</b>

NPS EN-1 section	Where this is covered in the ES
<i>the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.”</i>	<b>Environmental Scoping Report 2022)</b> and subsequent Scoping Opinion ( <b>Application Document 6.15 Scoping Opinion</b> ), mineral resources were scoped out of the assessment, as safeguarded minerals have not been identified within the study area that would be impacted by the Proposed Project as described in Section 5.7.
5.16.7 “ <i>The ES should in particular describe:… any impacts of the proposed project on… source protection zones (SPZs) around potable groundwater abstractions.</i> ”	The assessment presented in Section 5.7 of this chapter includes source protection zones (SPZs). Information has been obtained from the Local Planning Authority and the Environment Agency in relation to groundwater abstractions and the potential impacts and effects are discussed within <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b> .

**Table 5.2 NPS EN-5 requirements relevant to geology and hydrogeology**

NPS EN-5 section	Where this is covered in the ES
2.2.10 “[...] applicants must take into account Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to “have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest.”	The assessment presented in Section 5.7 of this chapter identifies designated geological sites within the study area and any potential for effects on these features, and if required presents appropriate mitigation measures. Effects on biodiversity are considered within <b>Application Document 6.2.3.2 Part 3 Kent Chapter 2 Ecology and Biodiversity</b> .
2.3.3 “Section 4.10 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Section 5.8 in EN-1).”	The future baseline in regard to geology and hydrogeology is set out in Section 5.7, and includes discussion relating to climate change impacts on geology, contamination and groundwater.

### National Planning Policy Framework

- 5.2.13 The National Planning Policy Framework (NPPF) as revised in December 2024 (Ministry of Housing, Communities and Local Government, 2024) sets out national planning policies that reflect priorities of the Government for operation of the planning system and the economic, social, and environmental aspects of the development and



use of land. The NPPF has a strong emphasis on sustainable development, with a presumption in favour of such development. The NPPF has the potential to be considered important and relevant to the Secretary of State 's (SoS) consideration of the Proposed Project.

5.2.14 Table 5.3 below provides details of the elements of the NPPF that are relevant to this chapter, and how and where they are covered in the ES.

**Table 5.3 NPPF requirements relevant to geology and hydrogeology**

<b>NPPF section</b>	<b>Where this is covered in the ES</b>
187 <i>“Planning policies and decisions should contribute to and enhance the natural and local environment by: ... remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”</i>	<b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment to support the baseline information presented in Section 5.7 of this chapter and assessment presented in Section 5.9.
192 <i>“To protect and enhance biodiversity and geodiversity, plans should: (a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity 65; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation 66; and (b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.”</i>	The assessment presented in Section 5.7 of this chapter identifies designated geological sites within the study area and any potential for effects on these and if required presents appropriate mitigation measures. Effects on biodiversity are considered within <b>Application Document 6.2.3.2 Part 3 Kent Chapter 2 Ecology and Biodiversity</b> .
196 <i>“Planning policies and decisions should ensure that: (a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation); (b) after remediation, as a minimum, land should not be capable of being determined as</i>	Impacts from land instability are considered within the engineering design of the Proposed Project (see Section 5.8 for further details). <b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> presents a contamination risk assessment which identifies potential sources of contamination to support the baseline information presented in Section 5.7 and the assessment presented in Section 6.9.

NPPF section	Where this is covered in the ES
<p><i>contaminated land under Part IIA of the Environmental Protection Act 1990; and</i></p> <p><i>(c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.”</i></p> <p>223 “Planning policies should:</p> <p><i>(a) provide for the extraction of mineral resources of local and national importance, but not identify new sites or extensions to existing sites for peat extraction;</i></p> <p><i>(b) so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously;</i></p> <p><i>(c) safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas 74 ; 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 (whilst not creating a presumption that the resources defined will be worked);</i></p> <p><i>(d) set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place;</i></p> <p><i>(e) safeguard existing, planned and potential sites for: the bulk transport, handling and processing of minerals; the manufacture of concrete and concrete products; and the handling, processing and distribution of substitute, recycled and secondary aggregate material; and...</i></p> <p><i>(h) ensure that worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and that high quality restoration and aftercare of mineral sites takes place.”</i></p>	<p>In accordance with the Scoping Report (<b>Application Document 6.14 Environmental Scoping Report 2022</b>) and subsequent Scoping Opinion (<b>Application Document 6.15 Scoping Opinion 2022</b>), mineral resources were scoped out of the assessment, as safeguarded minerals have not been identified within the study area that would be impacted by the Proposed Project as described in Section 5.7.</p>

## National Planning Practice Guidance

- 5.2.15 The National Planning Policy Framework is supported by the associated Planning Practice Guidance, including Land Affected by Contamination (Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities, 2019) which describes how to deal with land affected by contamination and also Land Stability (Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities, 2019) which describes how to ensure development is suitable for the ground conditions.

## Local Planning Policy

5.2.16 The Kent Onshore Scheme (refer to **Application Document 2.2.3 Kent Location Plan**) lies within the jurisdiction of Kent County Council. County and local planning policy and guidance which is relevant to a study of geology and hydrogeology and which has informed the assessment of effects in this chapter is as follows:

- Kent Minerals and Waste Local Plan (Kent County Council, 2020) and Safeguarding Supplementary planning Document (Kent County Council, 2020) which were adopted in September 2020;
- Dover District Council Local Plan to 2040 (Dover District Council, 2024) adopted in October 2024; and
- Thanet Local Plan (Thanet District Council, 2020), adopted July 2020.

### Local Plans

5.2.17 The Kent Onshore Scheme Boundary lies within the boundary of the Kent Minerals and Waste Local Plan (Kent County Council, 2020), the Thanet Local Plan (Thanet District Council, 2020) and the Dover District Local Plan (Dover District Council, 2024). Local Plan policies which are relevant to geology and hydrogeology matters and have informed the assessment in the ES are described in Table 5.4, Table 5.5 and Table 5.6.

**Table 5.4 Local planning policies relevant to geology and hydrogeology – Kent Minerals and Waste Local Plan**

Kent Minerals and Waste Local Plan and Safeguarding Supplementary Planning Document – Policy	Where this is covered in the ES
<b>CSM 5: Land-won Mineral Safeguarding</b> Policy CSM 5 relates to safeguarding minerals from unnecessary sterilisation by development. It points to a number of supporting plans identifying mineral safeguarded areas and mineral consultation areas.	In accordance with the Scoping Report ( <b>Application Document 6.14 Environmental Scoping Report 2022</b> ) and subsequent Scoping Opinion ( <b>Application Document 6.15 Scoping Opinion 2022</b> ), mineral resources were scoped out of the assessment, as safeguarded minerals have not been identified within the study area that would be impacted by the Proposed Project as described in Section 5.7.
<b>DM 7: Safeguarding Mineral Resources</b> Policy DM 7 describes a number of requirements that need to be demonstrated before planning permission would be granted for non-mineral development that is located within a minerals safeguarding area.	In accordance with the Scoping Report ( <b>Application Document 6.14 Environmental Scoping Report 2022</b> ) and subsequent Scoping Opinion ( <b>Application Document 6.15 Scoping Opinion 2022</b> ), mineral resources were scoped out of the assessment, as safeguarded minerals have not been identified within the study area that

Kent Minerals and Waste Local Plan and Safeguarding Supplementary Planning Document – Policy	Where this is covered in the ES
	would be impacted by the Proposed Project as described in Section 5.7.

**Table 5.5 Local planning policies relevant to geology and hydrogeology – Thanet Local Plan**

Thanet Local Plan – Policy	Where this is covered in the ES
<p><b>SE02: Landfill Sites and Unstable Land</b></p> <p>Policy SE02 relates to development on or near landfill sites or on land which is known or suspected to be unstable and describes requirements for planning applications on these types of sites.</p>	<p>Impacts from land instability are considered within the engineering design of the Proposed Project.</p> <p><b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment to support the baseline information presented in Section 5.7 of this chapter. This identifies potential sources of contamination (including landfills).</p>
<p><b>SE03 Land affected by Contamination</b></p> <p>Relates to bringing land affected by contamination into beneficial use and describes requirements for planning applications on land affected by contamination.</p>	<p><b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment which identifies any potential sources of contamination within the study area.</p>
<p><b>SE04: Groundwater Protection</b></p> <p>Policy SE04 states that development within a groundwater SPZ will only be permitted where there is no risk of contamination to groundwater.</p>	<p>The assessment presented in Section 5.7 of this chapter identifies SPZ's within the study area. A preliminary contamination risk assessment is presented in <b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> which identifies potential sources of contamination within the study area to support the baseline information and also the assessment of potential impacts on groundwater discussed within <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b>.</p>



**Table 5.6 Local planning policies relevant to geology and hydrogeology – Draft Dover District Local Plan**

<b>Draft Dover District Local Plan – Policy</b>	<b>Where this is covered in the ES</b>
<p><b>NE5: Water Supply and Quality</b></p> <p>Policy NE5 describes that development will only be permitted if it is demonstrated that there is no risk of contamination to groundwater. The policy lists developments that would only be permitted in SPZ 1 and 2 if adequate safeguards against possible contamination are provided.</p>	<p>The assessment presented in Section 5.7 of this chapter identifies SPZs within the study area. A preliminary contamination risk assessment is presented in <b>Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment</b> which identifies potential sources of contamination within the study area to support the baseline information and also the assessment of potential impacts on groundwater discussed within <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b>.</p>

## 5.3 Scoping Opinion and Consultation

### Scoping

- 5.3.1 A Scoping Report for the Proposed Project was issued to the Planning Inspectorate (PINS) on 24 October 2022 (**Application Document 6.14 Environmental Scoping Report 2022**) and a Scoping Opinion was received from the Secretary of State on 1 December 2022 (**Application Document 6.15 Scoping Opinion 2022**). Table 5.7 sets out the comments raised in the Scoping Opinion in relation to geology and hydrogeology and how these have been addressed in this ES. The Scoping Opinion takes account of responses from prescribed consultees as appropriate. **Application Document 6.3.1.6.A Appendix 1.6.A Responses to Scoping Opinion Tables** provides responses to all of the comments made by the prescribed consultees at scoping stage and how each comment has been considered.

**Table 5.7 Comments raised in the scoping opinion**

<b>ID</b>	<b>Inspectorate's comments</b>	<b>Response</b>
4.5.1	<p><i>[Connection of two aquifer units at trenchless crossings as a result of the excavation of trenchless crossings (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design. Table 3.6.2 does not expand on the specific 'mitigation by design'</p>	<p>The connection of two aquifer units at trenchless crossings has been scoped into the ES and is assessed in <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b>.</p>

ID	Inspectorate's comments	Response
	<p>proposed to ensure this does not occur. It is noted that the Code of Construction Practice (CoCP) measure GH02 comprises "Construction' methods such as appropriate piling techniques (if required) to minimise the risk of mixing of aquifer bodies through the creation of new pathways..."</p> <p>However, it is unclear whether this reference to piling methods would apply to trenchless crossings such that it would mitigate for effects. In the absence of supporting information on the location of crossings, proposed techniques including depths, and mitigation, the Inspectorate cannot agree to scope out this matter. The ES should include an assessment where likely significant effects could occur or provide further justification as to why this would not arise.</p>	
4.5.2	<p><i>[Introduction of new potential contaminants to the environment from leaks, spills, fuels and oils from construction activities (construction, maintenance, and decommissioning)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design. The Inspectorate is content to scope this matter out on the basis that such matters are capable of mitigation by standard measures. The ES must provide specific details regarding the mitigation measures to be adopted to demonstrate that such measures will be monitored and effective. However, as noted at point 2.1.6 above, there is some concern with regards to the potential for break outs or frack-outs of bentonite during HDD activities. The ES should provide details of protocols/measures to be put in place to prevent break outs or frackouts of bentonite from occurring or minimise impacts should such events occur.</p>	<p>Noted that the introduction of new potential contaminants can be scoped out of further assessment. Details on the mitigation measures is included within <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b>.</p> <p>Protocols for dealing within breakouts of drilling fluids during drilling activities are included within <b>Application Document 7.5.2 Outline Offshore Construction Environmental Management Plan (CEMP)</b> and <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b>.</p>
4.5.3	<p><i>[Physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design. The Scoping Report does not expand on the specific mitigation that would address this potential impact. The</p>	<p>Noted, physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering is scoped out of further assessment. This is based on mitigation measures included within <b>Application Document 7.5.3.1 CEMP Appendix A</b></p>

ID	Inspectorate's comments	Response
	<p>Inspectorate notes measure GH07 of the CoCP relating to temporary dewatering in accordance with EA guidance and an abstraction licence and EP (if required) and that dewatering activities during construction more generally are scoped into the assessment. The Inspectorate agrees that control measures applied would ensure no change to physical and chemical changes to groundwater and this matter can be scoped out of the assessment.</p>	<p><b>Outline Code of Construction Practice</b> in relation to the requirement for any temporary dewatering activities to be undertaken in accordance with Environment Agency guidance and the relevant licences/permits.</p>
4.5.4	<p><i>[Effects on construction activities and the built development (at the operational phase) from natural geological hazards (i.e. dissolution features/soft ground/landslides/ aggressive ground conditions etc) (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design. As previously, the Scoping Report does not expand on the specific measure to mitigate such effects, but it is assumed this relates to the inclusion of GH01, intrusive ground investigations and assessment will be undertaken prior to construction to inform appropriate geotechnical design in relation to the site/structure specific ground conditions including ground instability/adverse ground conditions. On the basis that natural hazards would be considered during the engineering design of the Proposed Development and avoided where possible, the Inspectorate is in agreement that this matter can be scoped out of the ES."</p>	<p>Noted, effects on construction activities and the built development from natural geological hazards is scoped out of further assessment. This is based on mitigation measures within <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b> which relates to the need for appropriate geotechnical design considering the ground conditions encountered by the intrusive ground investigation.</p>
4.5.5	<p><i>[Sterilisation of safeguarded minerals (construction and operation)]</i></p> <p>On the basis that no safeguarded minerals have been identified in the scoping study area through a desk-based assessment, the Inspectorate agrees to scope this matter out.</p>	<p>Noted that sterilisation of safeguarded minerals during construction and operations is scoped out of further assessment as safeguarded minerals have not been identified within the study area that would be impacted by the Proposed Project as described in Section 5.7.</p>
4.5.6	<p><i>[Human health exposure to existing contamination – site workers and neighbours (operation and maintenance)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the nature of the project and the incorporation of the mitigation</p>	<p>Noted that human health exposure to existing contamination during operation and maintenance is scoped out of further assessment as contamination will be assessed within the construction phase and</p>

ID	Inspectorate's comments	Response
	by design. The Inspectorate agrees, given the nature of the Proposed Development and existing legislation, that such effects are unlikely during the operation and maintenance stage and can be scoped out of the impact assessment.	therefore, significant effects during operation and maintenance stages are unlikely.
4.5.7	<p data-bbox="277 443 927 589"><i>[Introduction of new potential contaminants to the environment from leaks, spills, fuels and oils during the operational phase (operation and maintenance)]</i></p> <p data-bbox="277 600 943 779">This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect given the nature of the project and in consideration of best practice measures and maintenance.</p> <p data-bbox="277 790 935 936">The Inspectorate agrees that such effects are unlikely during the operation and maintenance stage and can be scoped out of the impact assessment.</p>	Noted the introduction of new potential contaminants to the environment during the operation and maintenance of the Proposed Project is scoped out of further assessment as the Proposed Project is not considered to be contaminative and in consideration of best practise measures during any maintenance activities.
4.5.8	<p data-bbox="277 958 948 1070"><i>[Changes to groundwater levels and/or recharge rates as a result of the introduction of impermeable surfaces (operation)]</i></p> <p data-bbox="277 1081 951 1809">This matter is proposed to be scoped out on the basis that it is not likely to result in significant effects due to the small surface area of the built parts of the Proposed Development. Any new areas of hardstanding would be designed to meet current drainage standards. The Scoping Report does not confirm the likely area of the converter site that would comprise hardstanding. Similarly, it does not confirm likely run-off rates and measures controlling these. The Inspectorate therefore cannot agree to scope this matter out at this stage. Details of the design of the converter site and the location of drainage should be included in the ES, together with an assessment of their effectiveness at mitigating operational discharges and runoff. The ES should assess effects on groundwater levels and/or recharge rates as a result of impermeable surfaces, where significant effects are likely to occur.</p>	Changes to groundwater levels and/or recharge rates as a result of the introduction of impermeable surfaces during the operation of the Proposed Project has been scoped into the ES and is assessed in <b>Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment</b> . Details of the converter site design and the location of drainage is shown on <b>Application Document 2.14.2 General Arrangement Plans - Kent</b> and the assessment of operational discharges and run off are presented in <b>Application Document 6.2.3.4 Part 3 Chapter 4 Water Environment</b> .
4.5.9	<p data-bbox="277 1832 927 1899"><i>[All phases - ground instability effects relating to historical coal mining]</i></p> <p data-bbox="277 1910 951 2056">The historical coal mining located within the scoping boundary is at 'significant depth' and is relatively thin and it is not located in a high risk area (Scoping Report paragraphs 3.6.4.11 and</p>	Noted, risks from coal mining are scoped out of further assessment as the Proposed Project is outside of a development high risk zone, where the Coal Authority consider instability risks from historical coal mining are



ID	Inspectorate's comments	Response
	3.6.4.12). Provided the ES demonstrates that construction would not interact with the historical coal mining measures, the Inspectorate agrees to scope this matter out.	low. In addition, the coal measures within the area of the Proposed Project are anticipated to be at a significant depth (>300 m) beneath the chalk bedrock, which significantly exceeds the maximum depth of the Proposed Project infrastructure. Strata interpreted as Coal Measures were not encountered by the intrusive ground investigation undertaken for the Proposed Project. It is therefore unlikely that construction would interact with historical coal mining measures and therefore this aspect is not considered further within the chapter.
4.5.10	<p><i>[Mobilisation of existing contamination during general construction, impacting on land and/or groundwater quality on environmentally sensitive sites, groundwater, GWDTE, surface water, land quality (operation and maintenance)]</i></p> <p>No reasoning is provided within the Scoping Report for the scoping out of this matter. Despite this, the Inspectorate is of the view that provided a comprehensive construction stage assessment of this matter has been provided and mitigation/remedial measures are secured (as appropriate) that effects during the operation and maintenance stage can be scoped out of the assessment.</p>	Mobilisation of existing contamination during the operation and maintenance phase is agreed to be scoped out as this will be dealt with during the construction phase of the Proposed Project as described in Section 5.9 of this chapter.
4.5.11	<p><i>[Changes to groundwater levels, quality and groundwater flow direction caused by dewatering and discharge on environmentally sensitive sites, groundwater, GWDTE, and surface water (operation, decommissioning, and maintenance)]</i></p> <p>The Inspectorate agrees that such effects are unlikely during the operation, maintenance and decommissioning stages and can be scoped out of the impact assessment.</p>	Noted that changes to groundwater levels, quality and flow by dewatering and discharge during the operation, decommissioning and maintenance phase can be scoped out of the ES.
4.5.12	<p><i>[Damage to/destruction of designated geological sites (operation, maintenance and decommissioning)]</i></p> <p>Scoping Report paragraph 3.6.4.13 identifies that the Sandwich Bay to Hacklinge Marshes Site of Special Scientific Interest (SSSI) is</p>	The Proposed Project has made a commitment that the Kent landfall will be made using trenchless crossing techniques, as stated in <b>Application Document 6.2.1.4 Part 1</b>

ID	Inspectorate's comments	Response
	designated as a geological conservation review site. The Scoping Report has not explained why there would be no impact pathway to this site during the operation, maintenance and decommissioning of the Proposed Development, therefore the Inspectorate does not agree to scope this matter out. The ES should explain what impact pathways there are to any geologically designated sites and assess significant effects where they are likely to occur.	<b>Introduction Chapter 4 Description of the Proposed Project</b> , and therefore where the Order Limits cross the SSSI, there will be no need for excavations associated with undergrounding cables. In this context it is not anticipated there will be any impacts on the designated site (from a geology perspective) during any phase – but particularly during the operational /maintenance /decommissioning phases as the cables will be in ducts below ground and any maintenance/decommissioning would be conducted from the transition joint bays outside of the SSSI. Therefore, physical damage to or destruction of the designated site (in the context of geological importance) is scoped out of the assessment for the operational/maintenance and decommissioning phases.

## Statutory Consultation

- 5.3.2 Statutory Consultation for the Proposed Project took place between 24 October and 18 December 2023. A further Targeted Consultation exercise on the main changes to the Proposed Project introduced after the 2023 statutory consultation, was undertaken between 8 July and 11 August 2024. In addition, a project update and local engagement exercise took place between 22 November 2024 and 12 January 2025, focusing on design amendments made following Targeted Consultation. A summary of relevant feedback received during statutory consultation relating to geology and hydrogeology is provided below. Further details on how consultation responses have informed the assessment can be found in **Application Document 5.1 Consultation Report** and **Application Document 5.1.9 Appendix H Summary 2023 Response**.
- 5.3.3 Feedback was received from a number of stakeholders, including Thanet District Council and the Environment Agency. The statutory consultation comments predominantly related to the potential for existing contamination, including impacts and effects on groundwater quality and also the potential for dewatering - which are all discussed within this chapter.
- 5.3.4 The feedback comments relating to existing contamination were in relation to the recommendation of the inclusion of specific sites (identified by the Local Authority) within **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**. The groundwater quality comments related to the potential for

unplanned losses of drilling fluids impacting groundwater and in turn the environment and protected species. The dewatering comments were in relation to ensuring the inclusion of private water supplies in the assessment and using additional assessment (groundwater risk assessment/hydrogeological risk assessment) to inform the mitigation measures.

## Further Engagement

- 5.3.5 A thematic meeting was held with Kent County Council, Thanet District Council and Dover District Council to discuss the Statutory Consultation feedback received in relation to geology and hydrogeology and also the baseline information in relation to minerals, designated geological sites, contaminated land and groundwater.
- 5.3.6 A thematic meeting was held with the Environment Agency to discuss the location of a construction compound within a groundwater SPZ 1.

## Summary of Scope of Assessment

- 5.3.7 This section describes which aspects of geology and hydrogeology have been scoped in and scoped out of the assessment through the scoping process and consultation with stakeholders.

### Aspects scoped into the assessment

- 5.3.8 The following impacts have been scoped into the assessment:
- damage to/destruction of designated geological sites through physical destruction during construction where the Proposed Project directly interacts with the designated site;
  - human health exposure to existing potential contamination through ground disturbance during construction and decommissioning activities;
  - mobilisation of existing contamination, during general construction/decommissioning, impacting on land and/or groundwater quality;
  - ingress and accumulation of ground gas in buildings/confined spaces/trenches during construction and operation – resulting in explosion/asphyxiation/exposure;
  - mixing of aquifer bodies due to the connection of aquifer units at trenchless crossings;
  - changes to groundwater levels, quality and groundwater flow direction caused by dewatering during construction; and
  - changes to groundwater levels and/or recharge rates from the introduction of impermeable surfaces during operation.

### Aspects scoped out of the assessment

- 5.3.9 Several aspects have been scoped out of the assessment in accordance with the Scoping Opinion as summarised in Table 5.7 and are as follows:
- damage to/ destruction of designated sites of geological importance during operation, maintenance and decommissioning;
  - sterilisation of safeguarded minerals during all phases;

- damage to/destruction of the built development due to natural geological hazards during all phases;
- ground instability effects relating to historical coal mining during all phases;
- mobilisation of existing contamination, during operation and maintenance, impacting on land and/or groundwater quality;
- introduction of new potential contaminants to the environment from leaks, spills, fuel and oils from construction activities and during all phases;
- human health exposure to existing contamination during operation and maintenance;
- changes to groundwater levels, quality and groundwater flow direction caused by dewatering during operation, decommissioning and maintenance; and
- physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering during all phases.

## 5.4 Approach and Methodology

5.4.1 **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology** sets out the overarching approach which has been used in developing the ES. This section describes the technical methods used to determine the baseline conditions, sensitivity of the receptors and magnitude of effects, and sets out the significance criteria that have been used for the geology and hydrogeology assessment.

### Guidance Specific to the Geology and Hydrogeology Assessment

5.4.2 The geology and hydrogeology assessment has been carried out in accordance with the following good practice guidance documents:

- Land Contamination Risk Management (LCRM) (Environment Agency, 2023);
- CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice (CIRIA, 2001);
- CIRIA 665: Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007);
- BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (British Standard Institution, 2019);
- The Environment Agency's Guiding Principles for Managing and Reducing Land Contamination (GPLC2) (Environment Agency, 2016);
- The Environment Agency's Hydrogeological Impact Appraisal for Dewatering Abstractions (Environment Agency, 2007);
- The Environment Agency's Groundwater Protection Position Statements (Environment Agency, 2018);
- Design Manual for Roads and Bridges (DMRB), LA 109: Geology and soils (Highways England, 2019);
- DMRB, LA 113: Road drainage and the water environment (Highways England, 2020); and



- Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Control, 2008).

## Baseline Data Gathering and Forecasting Methods

- 5.4.3 The methodology adopted in this assessment is qualitative with a progression from published and readily available information (stated with reasonable certainty) regarding the baseline conditions, to assessment informed by professional judgement and expression of opinions on the relative significance.
- 5.4.4 The baseline assessment has been informed by a desk-based study which has drawn on the following information sources:
- British Geological Survey (BGS) 1:50,000 scale geological mapping (British Geological Survey, 2024);
  - BGS Geoindex Viewer (British Geological Survey, 2024);
  - BGS Hydrogeological Map of Kent (British Geological Survey, 1970);
  - Defra mapped information, via the MAGIC website (Defra, 2024) for Source Protection Zones (SPZ), aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites;
  - The Environment Agency datasets for the locations for historical landfills and permitted landfill and waste sites, and category 1 and 2 pollution incidents (Environment Agency, 2024);
  - Environment Agency Catchment Data Explorer (Environment Agency, 2024)
  - Natural England, Designated Sites View (Natural England, 2024);
  - Geo Conservation Kent map of Regionally Important Geological Sites in Kent (GeoConservation Kent, 2024);
  - Georeferenced historical Ordnance Survey maps for the United Kingdom (National Library of Scotland, 2024);
  - Google Earth Historical Aerial Imagery;
  - Historical aerial photography; and
  - Groundwater abstraction data from the Environment Agency and private water supply information from Thanet District Council.

## Contaminated Land

- 5.4.5 The assessment methodology which has been used for assessing contaminated land and for developing the baseline is presented within **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment. Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**

provides a Preliminary Risk Assessment (PRA) (Tier 1<sup>1</sup>) (described in detail in Appendix 3.5.A) and identifies locations where there is potential for significant sources of contamination to be present in accordance with the method identified within LCRM (Environment Agency, 2023). In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology has been adopted, as described within **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**.

- 5.4.6 The risk assessment approach presented in this methodology is transposed into EIA classification by assigning receptor sensitivity and impact magnitude (significance criteria) to each potential effect using the criteria provided below. These are then combined to determine the significance of effect.

## Geology

- 5.4.7 A desk study has been undertaken to identify if there are any Sites of Special scientific Interest (SSSI) designated for geology, Geological Conservation Review sites and Local Geological Sites within the defined study area. The desk study information has been used to inform the assessment in this chapter relating to geology. There is no published assessment methodology that relates to impacts relating to geology (e.g. geo-conservation). For consistency, a similar approach has been adopted to the contamination assessment to assess these effects (i.e. combination of receptor identification and associated sensitivity and magnitude of potential impacts).

## Hydrogeology

- 5.4.8 The baseline assessment is informed by a desk-based study of available information, data collected from ground investigation and publicly available data such as abstractions and private water supply data.
- 5.4.9 The baseline information uses a source-pathway-receptor linkage approach, as described in the contamination methodology, to assess the potential impacts on groundwater quality and levels that may result in significant effects on identified receptors, in accordance with the policy guidance outlined.
- 5.4.10 The assessment methodology which has been used for assessing hydrogeology risks is presented within **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**. The risk approach presented in this methodology is transposed into EIA classification in the same way as the contaminated land methodology.

## Assessment Criteria

- 5.4.11 The assessment criteria for geology and hydrogeology is based on guidance (described above), professional judgement, and previous experience together with additional guidance set out in DMRB LA 109 Geology and Soils (Highways England, 2019) and DMRB LA 113 Road drainage and the water environment (Highways England, 2020).

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<sup>1</sup> The assessment of land contamination is based on guidance presented in Land Contamination Risk Management (LCRM) (Environment Agency, 2023) which sets out a three-stage process (Stage 1 risk assessment, Stage 2 options appraisal, Stage 3 remediation). Stage 1 comprises three tiers: Tier 1 (Preliminary Risk Assessment) - comprising a qualitative assessment of historical and published information in order to develop a preliminary conceptual site model to inform a preliminary risk assessment; Tier 2 (Generic Risk Assessment) - a quantitative assessment using published criteria to screen site specific ground condition data; and Tier 3 (Detailed Risk Assessment) - a quantitative assessment involving the generation of site specific assessment criteria.

Whilst primarily intended for use in assessing the impacts of highways projects, the methodology is widely accepted as suitable for assessing the effects of other types of linear infrastructure projects on identified receptors. The method promotes assessment that is proportionate to the scale and nature of the proposals and that considers the sensitivity of the identified receptors to change.

### Sensitivity of geology and hydrogeology receptors

- 5.4.12 The criteria used to determine the value and sensitivity of receptors specific to geology and hydrogeology are set out in Table 5.8. These values are based on the generic criteria presented in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology** and Table 3.70 of DMRB LA 113: Road drainage and the water environment (Highways England, 2020), Table 3.11 of DMRB LA 109: Geology and soils (Highways England, 2019) and professional judgement.

**Table 5.8 Sensitivity criteria**

Sensitivity	General criteria
Very High	<p>Very high importance and rarity. International scale and limited potential for substitution.</p> <p><b>Geology:</b></p> <p>Very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, Site of Special Scientific Interest (SSSI) and Geological Conservation Review (GCR) where citations indicate features of international importance). Geology meeting international designation criteria which is not designated as such.</p> <p><b>Contamination:</b></p> <p>1) human health: very high sensitivity land use such as residential or allotments;</p> <p>2) surface water: Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and <math>Q95 \geq 1.0 \text{ m}^3/\text{s}</math>. Site protected/designated under EC or UK legislation (Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Ramsar site); and</p> <p>3) groundwater: Principal aquifer providing a regionally important resource and regionally important public water supplies, Source Protection Zone (SPZ) 1.</p> <p><b>Hydrogeology:</b></p> <p>Principal aquifer providing a regionally important source and regionally important public water supplies. Groundwater quality associated with SPZ 1 associated with licensed abstractions.</p> <p>Water supplying groundwater dependant terrestrial ecosystems (GWDTEs) with a high groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).</p>

High	<p>High importance and rarity. National scale and limited potential for substitution.</p> <p><b>Geology:</b></p> <p>Rare and of national importance with little potential for replacement (e.g. geological SSSI, Area of Special Scientific Interest (ASSI), National Nature Reserves (NNR)). Geology meeting national designation criteria which is not designated as such.</p> <p><b>Contamination:</b></p> <ol style="list-style-type: none"> <li>1) human health: high sensitivity land use such as public open space, and construction workers;</li> <li>2) surface water: Watercourse having a WFD classification shown in a RBMP and Q95 &lt;1.0 m<sup>3</sup>/s; and</li> <li>3) groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem, SPZ 2.</li> </ol> <p><b>Hydrogeology:</b></p> <p>Principal aquifer providing a locally important source and locally important public water supplies, SPZ 2.</p> <p>Water supplying GWDTEs with a moderate groundwater dependence with high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly groundwater dependent GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.</p>
Medium	<p>Medium or high importance and rarity, regional scale, limited potential for substitution.</p> <p><b>Geology:</b></p> <p>Regional importance with limited potential for replacement (e.g. regionally important geological sites (RIGS)). Geology meeting regional designation criteria which is not designated as such.</p> <p><b>Contamination:</b></p> <ol style="list-style-type: none"> <li>1) human health: medium sensitivity land use such as commercial or industrial;</li> <li>2) surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 &gt;0.001 m<sup>3</sup>/s; and</li> <li>3) groundwater: Secondary A Aquifers. Extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming / animal estates). SPZ 3.</li> </ol> <p><b>Hydrogeology:</b></p> <p>Secondary A aquifer. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming / animal estates). Groundwater quality associated with SPZ2 (Outer Protection Zone) associated with licensed abstractions. Residential and commercial properties.</p>

	<p>Water supplying GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding moderately groundwater dependent GWDTE with a national non-statutory UK BAP priority.</p>
Low	<p>Low or medium importance and rarity, local scale.</p> <p><b>Geology:</b></p> <p>Local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarry's / mining sites).</p> <p><b>Contamination:</b></p> <ol style="list-style-type: none"> <li>1) human health: low sensitivity land use such as highways and rail;</li> <li>2) surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 <math>\leq 0.001</math> m<sup>3</sup>/s; and</li> <li>3) groundwater: Secondary B or Secondary Undifferentiated aquifer. Small scale private water abstractions (i.e. supplying fewer than ten properties).</li> </ol> <p><b>Hydrogeology:</b></p> <p>Secondary B or Secondary Undifferentiated aquifer. Groundwater flow and yield and quality associated with small scale private water abstractions (i.e. feeding fewer than ten properties). Groundwater quality associated with SPZ3 (Source Catchment Protection Zone) associated with licensed abstractions and with licensed abstractions for which no SPZ is defined.</p> <p>Water supplying GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water supplying highly or moderately groundwater dependent GWDTE sites with no conservation designation.</p>
Negligible	<p>Very low importance and rarity, local scale.</p> <p><b>Geology:</b></p> <p>No geological exposures, little / no local interest.</p> <p><b>Contamination:</b></p> <ol style="list-style-type: none"> <li>1) human health: undeveloped surplus land / no sensitive land use proposed;</li> <li>2) surface water: not present; and</li> <li>3) groundwater: Unproductive strata.</li> </ol> <p><b>Hydrogeology:</b></p> <p>Very poor groundwater quality and/or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply.</p> <p>Water supplying GWDTEs of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.</p>

## Magnitude of geology and hydrogeology effects



- 5.4.13 The criteria used to determine the magnitude of impact for geology and hydrogeology are set out in Table 5.9 These values are based on the generic criteria presented in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**, Table 3.71 of DMRB LA 113 (Highways England, 2020), Table 3.12 of DMRB LA 109 (Highways England, 2019) and professional judgement. The magnitude of impact considers the expected scale, extent and duration of change following consideration of the measures embedded into the design.

**Table 5.9 Magnitude criteria**

Magnitude	General criteria
Large	<p><b>Geology adverse:</b> Permanent loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p><b>Contamination adverse:</b> Significant contamination identified, and contamination level significantly exceed human health and environmental assessment criteria with the potential for significant harm to be caused. Contamination heavily restricts future use of land.</p> <p><b>Contamination benefit:</b> Substantial betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p><b>Hydrogeology adverse:</b> Major or irreversible change to groundwater aquifer(s) flow, water level, quality or available yield which endangers the resources currently available. Groundwater resource use / abstraction is irreparably impacted upon, with a major or total loss of an existing supply or supplies. Changes to water table level or quality would result in a major or total change in, or loss of, a groundwater dependent area, where the value of a site would be severely affected. Changes to groundwater aquifer(s) flow, water level and quality would result in major changes to groundwater baseflow contributions to surface water and/ or alterations in surface water quality.</p> <p><b>Hydrogeology beneficial:</b> Major increase in groundwater resource availability. Results in the achievement of Good Status for a WFD groundwater body or GWDTE which is currently failing its WFD objectives. Removal of existing or potential polluting discharge to groundwater.</p>
Medium	<p><b>Geology adverse:</b> partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p><b>Contamination adverse:</b> Contamination levels marginally exceed human health and environment assessment criteria. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use.</p> <p><b>Contamination benefit:</b> Moderate Betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p><b>Hydrogeology adverse:</b> Moderate long term or temporary significant changes to groundwater aquifer(s) flow, water level, quality or available yield which results in moderate long term or temporarily significant decrease in resource availability.</p>

	<p>Groundwater resource use / abstraction is impacted slightly, but existing supplies remain sustainable. Changes to water table level or groundwater quality would result in partial change in or loss of a groundwater dependent area, where the value of the site would be affected, but not to a major degree. Changes to groundwater aquifer(s) flow, water level and quality would result in moderate changes to groundwater baseflow contributions to surface water and/ or alterations in surface water quality, resulting in a moderate shift from baseline conditions.</p> <p><b>Hydrogeology beneficial:</b> Moderate increase in groundwater resource availability. Contributes, in combination with other effects, to the achievement of Good Status for a WFD groundwater body or GWDTE which is currently failing its WFD objectives. Significant reduction of existing or potential polluting discharge to groundwater.</p>
Small	<p><b>Geology adverse:</b> 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.</p> <p><b>Contamination adverse:</b> Contamination levels below human health and environment assessment criteria and remediation is not required. 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><b>Contamination benefit:</b> Slight betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p><b>Hydrogeology adverse:</b> Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the Proposed Project area. Changes to water table level, groundwater quality and yield result in little discernible change to existing resource use. Changes to water table level or groundwater quality would result in minor change to groundwater dependent areas, but where the value of the site would not be affected. Changes to groundwater aquifer(s) flow, water level and quality would result in minor changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a minor shift from baseline conditions.</p> <p><b>Hydrogeology beneficial:</b> Minor increase in groundwater resource availability. Leads to improvement of a WFD groundwater body which is currently failing its WFD objectives but insufficient effect to achieve Good Status. Minor reduction of existing or potential polluting discharge to groundwater.</p>
Negligible	<p><b>Geology adverse:</b> Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected.</p> <p><b>Contamination:</b> Contamination levels substantially below human health and environment assessment criteria and remediation is not required. No requirement for control measures to reduce risks to human health / make land suitable for intended use.</p>

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**Hydrogeology adverse:** Very slight change from groundwater baseline conditions, approximating to 'no change' conditions. Dewatering effects create no or no noticeable effects.

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### Significance of effects

- 5.4.14 The sensitivity of a receptor and magnitude of impact are combined to give an overall significance of effect using the matrix set out in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**. This has been supplemented by professional judgement, which where applicable has been explained to give the rationale behind the values assigned.

### Assumptions and Limitations

- 5.4.15 The assessment approach in this chapter is based on published and readily available information supported by site specific information where available and appropriate. Where site specific information is not available a 'reasonable worst case' assumption regarding the likely ground and groundwater conditions has been made when assessing effects, determined from the information collated and reviewed.
- 5.4.16 Information regarding private water supplies and abstractions has been requested and received from the relevant authorities however, the completeness and accuracy of this information is limited to that of the source records received.
- 5.4.17 The key parameters and assumptions considered within this assessment include:
- Piling assumptions: Percussive piling may be required at some pylon locations and for the foundations of the converter and substation, depending on ground conditions. The assessment set out in this chapter assumes that piling is required at all pylon locations, converter and substation (as a reasonable worst-case scenario).
  - Abstractions: It is assumed, based on available project information that no consumptive groundwater abstractions are required to facilitate construction of the Proposed Project, nor during operation.
  - Discharges: Discharges from dewatering of open cut trenches to remove rainwater and minor groundwater seepages would be made to ground. At deeper excavations, it is assumed that if required, discharges would be subject to treatment to settle sediments, prior to discharge to watercourses. It is assumed that all discharges will be subject to their own relevant permit applications.
  - Dewatering: Dewatering would be undertaken by pumping out of seepages of water, rather than active lowering of the groundwater table.
  - Construction methodology: The Proposed Project has committed to undertaking trenchless crossings at the landfall location utilising horizontal directional drilling (HDD). For the purpose of this assessment the trenchless crossing under the A256 Richborough Way has also been assumed to be drilled using HDD. It is assumed that the water used to facilitate the drilling technique will be brought to site in tankers to facilitate drilling.

## 5.5 Basis of Assessment

- 5.5.1 This section sets out the assumptions that have been made in respect of design flexibility maintained within the Proposed Project and the consideration that has been given to alternative scenarios and the sensitivity of the assessment to changes in the construction commencement year.
- 5.5.2 Details of the available flexibility and assessment scenarios are presented in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project** and **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**.

## Flexibility Assumptions

- 5.5.3 The environmental assessments have been undertaken based on the description of the Proposed Project provided in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**. To take account of the flexibility allowed in the Proposed Project, consideration has been given to the potential for effects to be of greater or different significance should any of the permanent or temporary infrastructure elements be moved within the Limits of Deviation (LoD) or Order Limits.
- 5.5.4 The assumptions made regarding the use of flexibility for the main assessment, and any alternatives assumptions are set out in Table 5.10.

**Table 5.10 Flexibility assumptions**

Element of flexibility	How it has been considered within the assessment
Lateral LoD HVDC cables	The entire lateral LoD of the HVDC cables within the Order Limits has been assessed in relation to the potential impacts on geology and hydrogeology. Positioning the HVDC cables anywhere within the LoD is not anticipated to change the assessment presented in this chapter as they remain inside the area assessed and no new receptors would be impacted.
Lateral LoD Minster Converter Station and Minster Substation	The entire lateral LoD of the Minster Converter Station and Substation within the Order Limits has been assessed in relation to the potential impacts on geology and hydrogeology. Positioning of Minster Converter Station and Minster Substation anywhere within the LoD is not anticipated to change the assessment presented in this chapter as they remain inside the area assessed and no new receptors would be impacted.
Vertical LoD Minster Converter Station and Minster Substation	<p>The vertical LoD above ground does not affect the likely significance of effects on geology and hydrogeology receptors which are predominantly below ground.</p> <p>It has been assumed that the Proposed Project will extend down to the White Chalk Subgroup to allow for the potential for a piled foundation solution into the chalk (bedrock). This is the most sensitive below ground receptor and therefore a reasonable worst case has been assessed.</p>

Element of flexibility	How it has been considered within the assessment
Lateral LoD overhead line	The entire lateral LoD of the overhead line within the Order Limits has been assessed in relation to the potential impacts on geology and hydrogeology. Positioning the overhead line anywhere within the LoD is not anticipated to change the assessment presented in this chapter as they remain inside the area assessed and no new receptors would be impacted.
Vertical LoD overhead line	<p>The vertical LoD above ground does not affect the likely significance of effects on geology and hydrogeology receptors which are predominantly below ground.</p> <p>It has been assumed that the Proposed Project will extend down to the White Chalk Subgroup to allow for the potential for a piled foundation solution (of the pylons) into the Chalk (bedrock). This is the most sensitive below ground receptor and therefore a reasonable worst case has been assessed.</p>
Order Limits – temporary construction works	The entire Order Limits have been assessed in relation to the potential impacts on geology and hydrogeology during construction phase.

## Sensitivity Test

- 5.5.5 It is likely that under the terms of the DCO, construction could commence in any year up to five years from the granting of the DCO which is assumed to be 2026. Consideration has been given to whether the effects reported would be any different if the works were to commence in any year up to year five. It is considered that if the works were to commence in any year up to year five this will not change the assessment of effects in relation to geology and hydrogeology.

## 5.6 Study Area

- 5.6.1 The study area for geology and hydrogeology comprises the Order Limits for the Kent Onshore Scheme plus a 250 m buffer for geology and contaminated land and up to a 500 m buffer for hydrogeology.
- 5.6.2 Given the scale and nature of the Proposed Project, this is considered a robust yet proportionate approach, and although not directly relevant for this development type, accords with the study area recommended in Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Control, 2008).

## 5.7 Baseline Conditions

- 5.7.1 This section of the chapter comprises an overview of the baseline conditions for geology and hydrogeology, in order to establish the likely type and nature of potential effects.

## Geology



## Superficial Deposits

- 5.7.2 The majority of the study area to the west of the A256 Richborough Way is indicated to be underlain by Tidal Flat Deposits, described by the BGS (British Geological Society, 2024) as typically comprising “*unconsolidated sediment, mainly mud and/or sand.... soft silty clay, with layers of sand, gravel and peat*”. Further areas of Tidal Flat Deposits are present to the east of the A256 Richborough Way beneath St. Augustine’s and Stonelees Golf Course.
- 5.7.3 To the east of the Tidal Flat Deposits, along the eastern boundary of the Order Limits of the Kent Onshore Scheme, around Pegwell Bay, the BGS indicates deposits of Beach and Tidal Flat Deposits (Undifferentiated) described by the BGS (British Geological Society, 2024) as a “*composite of Beach Deposits: Shingle, sand, silt and clay;...and the Tidal Flat Deposits*” described above.
- 5.7.4 Limited areas along the northern boundary of the Order Limits, mainly the access roads at the temporary construction compound, are indicated to be underlain by Head Deposits, described as a poorly sorted and poorly stratified deposit described by the BGS (British Geological Society, 2024) as typically comprising “*sand and gravel, locally with lenses of silt, clay or peat and organic material*”.
- 5.7.5 A limited area to the northwest of Sandwich Road is indicated to be underlain by Storm Beach Deposits which are described by the BGS (British Geological Society, 2024) as “*a low rounded ridge of coarse materials (gravel, cobbles and boulders) at the inland margin of a beach*”.
- 5.7.6 There are also some areas of the study area, predominantly immediately adjacent either side of the A256, where there are no superficial deposits recorded on the BGS mapping.
- 5.7.7 The superficial geology present beneath the study area for the Kent Onshore Scheme is shown on **Application Document 6.4.3.5.1 Superficial Geology**.

## Bedrock Geology

- 5.7.8 The majority of the study area within the Kent Onshore Scheme is indicated to be underlain by bedrock of the Thanet Formation, described by the BGS (British Geological Society, 2024) as typically a “*silty fine-grained sand, with sandy silt, silt or sandy, silty clay especially in the lower part, forming a coarsening-upwards sequence*”. The BGS 1:50,000 geological map (British Geological Survey, 2024) indicates that the Thanet Formation is approximately 30 m thick.
- 5.7.9 Beneath the Thanet Formation, the BGS geological mapping (British Geological Survey, 2024) and archive borehole logs record (British Geological Survey, 2024) indicates chalk bedrock of the White Chalk Subgroup. The BGS map indicates that the chalk is in excess of 200 m thick. In the northern area of the study area, the Thanet Formation is absent and the superficial deposits are directly underlain by the White Chalk Subgroup.
- 5.7.10 The bedrock geology present beneath the study area is shown on **Application Document 6.4.3.5.2 Bedrock Geology**.

## Site specific ground conditions information

- 5.7.11 An intrusive ground investigation was undertaken across parts of the Order Limits between September and December 2023 and a Ground Investigation Report for the Kent Onshore Scheme is included within **Application Document 6.3.3.5.C Appendix**

**3.5.C Ground Investigation Report - Kent.** The ground investigation generally confirmed the anticipated geology within the area of the Proposed Project as described from the published information.

- 5.7.12 A summary of the ground conditions encountered within specific areas of the Proposed Project is presented in **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**.

### Geo-Conservation

- 5.7.13 A review of the Geo Conservation Kent interactive map (GeoConservation Kent, 2024) and DEFRA's MAGIC map (Defra, 2024) indicates that with one exception, there are no Regionally Important Geological Sites (RIGS) or geological Sites of Special Scientific Interest (SSSI) present within the study area.
- 5.7.14 The exception to this is the Sandwich Bay to Hacklinge Marshes SSSI which is also designated as a Geological Conservation Review Site and forms the eastern part of the Order Limits within the Kent Onshore Scheme, at Pegwell Bay.
- 5.7.15 The Sandwich Bay to Hacklinge Marshes SSSI also forms the wooded area between the former Richborough Power Station and Weatherlees Hill water treatment works in the southeast of the Order Limits, however this part of the SSSI isn't designated for its geological importance (based on the citation for the site (Natural England, 2024)).
- 5.7.16 The Sandwich Bay and Hacklinge Marshes SSSI is located within the landfall area of the Proposed Project and any impacts on the geological aspects of the SSSI are discussed within **Application Document 6.2.4.1 Part 4 Marine Chapter 1 Physical Environment** therefore geo-conservation sites are not considered further within this chapter.

### Minerals

- 5.7.17 The sterilization of minerals was scoped out of the assessment at Scoping stage, on the basis that safeguarded minerals were not identified within the study area, and this predominantly remains the case.
- 5.7.18 Since scoping however, a review of the Kent County Council Minerals and Waste local plan (Kent County Council, 2020) and the draft Minerals and Waste Local Plan (Kent County Council, 2023) indicates the presence of safeguarded Storm Beach Deposits within a very localized and limited part of the study area in the coastal transition zone.
- 5.7.19 A ground investigation for the Proposed Project, undertaken in the area of the Storm Beach Deposits did not identify the presence of the deposit, and at this location the Proposed Project comprises a section of trenchless technique at relative depth (which will mean the cable will be underground at some depth beneath the Storm Beach Deposits). It is therefore considered that there remains no potential impact and effect on safeguarded minerals and minerals are not considered further in this assessment.

## Hydrogeology

### Aquifer Designation – Superficial

- 5.7.20 DEFRA's MAGIC map (Defra, 2024) indicates that the Undifferentiated Beach and Tidal Flat Deposits to the east of the study area as a Secondary Undifferentiated Aquifer and the Storm Beach Deposits are classified as a Secondary A Aquifer. The Tidal Flat

Deposits to the west of the study area and the Head Deposits to the north are classified as Unproductive Strata.

- 5.7.21 Secondary A Aquifers are described by the Environment Agency as “*permeable layers that can support local water supplies, and may form an important source of base flow to rivers*”. The Secondary Undifferentiated Aquifer classification is applied by the Environment Agency “*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*” (Environment Agency, 2024).
- 5.7.22 Unproductive Strata is described by the Environment Agency as “*largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them*” (Environment Agency, 2024).
- 5.7.23 Groundwater flow within the shallow aquifer is likely to be generally to the east, towards the River Stour and the sea. Groundwater levels and movement may exhibit some tidal influence in the eastern part of the study area which is also indicated by the groundwater monitoring undertaken as part of the intrusive ground investigation as reported in **Application Document 6.3.3.5.C Appendix 3.5.C Ground Investigation Report - Kent**.

### Aquifer Designation – Bedrock

- 5.7.24 The bedrock of the Thanet Formation, present beneath the whole of the study area, is classified by the Environment Agency as a Secondary A Aquifer (Defra, 2024). The White Chalk Subgroup, which is present beneath the Thanet Formation and directly underlying the superficial deposits to the north, is classified as a Principal Aquifer (Defra, 2024).
- 5.7.25 Principal Aquifers are described by the Environment Agency as strata that “*provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands*” (Environment Agency, 2024).
- 5.7.26 The contours of ‘Estimated minimum level of the chalk water table or pressure surface’ as shown on BGS’ hydrogeological map (British Geological Survey, 1970), indicate that the piezometric surface within the study area is likely to be zero metres above Ordnance Datum (m AOD).

### Groundwater Monitoring

- 5.7.27 Groundwater monitoring was undertaken as part of the intrusive ground investigation and further information can be found within **Application Document 6.3.3.5.C Appendix 3.5.C Ground Investigation Report - Kent** and in **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**.
- 5.7.28 The results of the ground investigation generally confirms the anticipated sequence of strata and presence of Tidal Flat Deposits, Thanet Formation and Chalk.
- 5.7.29 Groundwater monitoring data indicates that groundwater is likely to be close to the surface within the areas of the open cut trenches and the proposed Minster Converter Station and Substation which is discussed further within **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**.

### Groundwater Vulnerability

- 5.7.30 DEFRA's MAGIC map (Defra, 2024) indicates that the groundwater beneath the eastern part of the study area, i.e., approximately beneath areas where Undifferentiated Beach and Tidal Flat Deposits are present overlying the Thanet Formation, is of Medium to High vulnerability.
- 5.7.31 Within areas where the Thanet Formation is exposed at the surface, and not covered by a layer of superficial deposits, the groundwater vulnerability is considered to be High.
- 5.7.32 Within the remaining parts of the study area, where the Tidal Flat Deposits overlie the Thanet Sand Formation the groundwater vulnerability is considered to be Medium to Low Vulnerability.
- 5.7.33 The Environment Agency define High vulnerability as “*Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits*”, and areas of Low vulnerability as “*Areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability*”. Medium vulnerability is described as intermediate between Low and High vulnerability (Environment Agency, 2017).

### Groundwater Source Protection Zones

- 5.7.34 A groundwater source protection zone (SPZ) is a zone placed around a groundwater source, such as a well, borehole or spring, by the Environment Agency to protect a drinking water supply from pollution. Groundwater SPZ's are generally split into three zones showing the level of risk to a groundwater source from contamination.
- 5.7.35 A SPZ 1 is defined as the inner zone which is a 50-day travel time of a pollutant to the abstraction point. A SPZ 2 Outer Zone is defined as a 400-day travel time of a pollutant to a abstraction source. A SPZ 3 is defined as the total catchment, which is the area around a source within which all the groundwater ends at the abstraction point (Environment Agency, 2024).
- 5.7.36 DEFRA's MAGIC map (Defra, 2024) indicates the Order Limits cross a SPZ 1 and corresponding SPZ 2 in the northeast of the Proposed Project. This section of the Order Limits comprises a temporary construction compound and access road, located off Sandwich Road.
- 5.7.37 The study area crosses a further SPZ 1 and corresponding SPZ 2 to the northwest. The proposed works in the area of the Order Limits closest to the SPZ comprises only minor works to existing access roads. Correspondence with the Environment Agency confirms that the abstractions associated with the SPZs are from the White Chalk Subgroup.
- 5.7.38 The location of the SPZs is shown on **Application Document 6.4.3.5.3 Groundwater Receptors**.
- 5.7.39 The MAGIC map indicates that a groundwater Drinking Water Safeguard Zone (DWSZ) and groundwater Nitrate Issues Priority Zone (NIPZ) (Defra, 2024) are located within the Order Limits around the SPZ 1 in the northeast of the Proposed Project.

### Groundwater Body

- 5.7.40 The Environment Agency's Catchment Data Explorer (Environment Agency, 2024) indicates that groundwater beneath the study area is part of the East Kent Tertiaries groundwater body (ref: GB40702G501600). This groundwater body received an overall

Water Framework Directive (WFD) status of “Poor” in 2019. This can be further broken down into a “Good” status for chemical quality and a “Poor” quantitative status.

## Groundwater Abstractions

- 5.7.41 Information has been obtained from the Environment Agency regarding groundwater abstractions and deregulated groundwater abstractions. The information indicates one groundwater abstraction within the study area at the location of St Nicolas Court Farm. The location of the groundwater abstraction is shown on **Application Document 6.4.3.5.3 Groundwater Receptors**.
- 5.7.42 The information indicates that the abstraction is from the chalk at this location.
- 5.7.43 Information obtained from Thanet District Council indicates that there are no private water supplies located within the study area. A request for this information was not made to Dover District Council. The works proposed within the area under the jurisdiction of Dover District Council mostly comprises only minor works to existing access roads and reconductoring of existing pylons and therefore is unlikely to have any significant effect on groundwater or therefore private water supplies.

## Potentially contaminative land uses

- 5.7.44 The majority of the Order Limits for the Kent Onshore Scheme and the study area is indicated to have remained as undeveloped/agricultural land since the earliest historical mapping reviewed dated 1884/1885 (National Library of Scotland, 2024). In these areas it is considered that there is a very low risk of a significant source of potential contamination.
- 5.7.45 However, there are discrete areas within the Order Limits and study area where either the historical land use or the current land use have been identified as potentially contaminative. Where these areas are identified, readily available information relating to the Potential Sources of Contamination (PSC) has been gathered and an initial assessment has been undertaken to provide a classification score for their potential for generating contamination.
- 5.7.46 Where the initial classification score is moderate or above within the study area these sites are taken forward for further assessment in relation to the risk to sensitive receptors. This assessment is presented in **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**.
- 5.7.47 Based on the assessment presented in **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**, following the Tier 1 assessment, there were no sites that were assessed to have a potential Moderate or above risk to sensitive receptors from existing contamination.
- 5.7.48 In addition, a Tier 2<sup>1</sup> generic quantitative risk assessment (as described in **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**) has been undertaken by Mott Macdonald, and is included as **Application Document 6.3.3.5.D Appendix 3.5.D Generic Quantitative Risk Assessment – Kent** which identified that all the soil samples were below the selected generic assessment criteria for a public open space and commercial/industrial end use and therefore the risks to human health receptors from existing contamination were generally assessed to be low to very low. Some minor exceedances of the groundwater generic assessment criteria were noted therefore the risk to groundwater from mobilizing existing contamination was assessed to be moderate.



## Identified receptors

- 5.7.49 The following receptors have been identified within the study area that are relevant to the potential impacts scoped into the geology and hydrogeology assessment, the sensitivity of the receptor is also given based on the descriptions in Table 5.8:
- construction and maintenance workers – high sensitivity; and
  - groundwater and groundwater receptors (e.g. groundwater abstractions, ecological receptors, surface water that is groundwater fed) – very high to high sensitivity.

## Future Baseline

- 5.7.50 There are no foreseeable significant changes anticipated in relation to geology, hydrogeology or land contamination either prior to, or during the construction and operational phases in relation to direct man-made changes. It is assumed that any man-made changes (e.g., due to new developments) would be appropriately permitted/controlled and operated in accordance with current legislation to prevent or limit adverse impacts to ground conditions or controlled waters.
- 5.7.51 Climate change predictions for the UK indicate a trend of wetter winters, drier summers, higher average temperatures and higher intensity rainfall events. These could have an impact on soil erosion, groundwater levels, and indirectly (through groundwater level changes) - potential for mobilisation of contamination.
- 5.7.52 In the context of soil erosion and groundwater levels, it is not considered these would have a significant impact on the significance of effects given the nature of the Proposed Project and the inherent engineering design. In relation to contamination, as any areas that may have a significant impact would be remediated or mitigated during design and construction of the Proposed Project, it is not considered that climate change would have a significant impact on the significance of effects for contamination.

## 5.8 Proposed Project Design and Embedded Mitigation

- 5.8.1 The Proposed Project has been designed, as far as practicable, following the mitigation hierarchy in order to, in the first instance, avoid or reduce geology and hydrogeology impacts and effects through the process of design development, and by embedding measures into the design of the Proposed Project.
- 5.8.2 As set out in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**, mitigation measures typically fall into one of three categories: embedded measures; control and management measures; and mitigation measures. Embedded, and control and management measures are set out below. Additional mitigation measures have not been identified as being required.

## Embedded Measures

- 5.8.3 Embedded measures have been integral in reducing, and where possible avoiding potential geology and hydrogeology effects of the Proposed Project. Measures that have been incorporated are:
- Sensitive routing and siting of infrastructure and temporary works as to avoid sensitive features such as groundwater Source Protection Zone (SPZ) 1, where possible;

- Commitments made within **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC)**; and
- The Proposed Project incorporates suitable consideration of the ground conditions in the design based on data from site specific ground investigation and assessment and therefore any risks from ground instability, chemical aggressivity of the ground, ground gases, and radon reports would be considered within the engineering design of the new infrastructure in accordance with best practice.

## Control and Management Measures

5.8.4

Measures relevant to the control and management of impacts during construction have been included within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**. The following measures include elements to control and manage the geology and hydrogeology effects of the Proposed Project and have been taken into account in this assessment: GG01, GG06, GG15, GG17, W05, W06, W08, W09. The measures below are specific to geology and hydrogeology.

- GH01 - Intrusive ground investigations and assessment will be undertaken prior to construction which will inform appropriate geotechnical design in relation to the site/structure specific ground conditions including ground instability/adverse ground conditions.
- GH02 - A Foundation Works Risk Assessment (FWRA) will be undertaken by the contractor where the use of piled foundations are anticipated and at trenchless crossings. The contractor will utilise construction methods such as appropriate piling techniques to minimise and avoid the risk of introducing new contamination (if required), creating new contamination pathways, and mixing of aquifer bodies. The FWRA would be undertaken once the proposed foundation solutions are known in accordance with Environment Agency guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination'.
- GH03 - Use of appropriate occupational health and safety measures e.g. Personal Protective Equipment (PPE), and statutory health and safety compliance (e.g. compliance with the Confined Spaces Regulations, 1997 in relation to ground gas from working in confined spaces/trenches) to minimise the risks associated with anticipated/unexpected contamination. Based on risk assessment informed by site specific information.
- GH04 - Appropriate training of construction and maintenance workers in the handling and use of potentially hazardous substances and the associated risks.
- GH05 - All materials that could be hazardous to water quality will be stored in suitable areas, more than 8 m away from a watercourse, away from site traffic and in containers which are fit for purpose, meeting the requirements of the Control of Pollution (Oil Storage) Regulations. The use and storage of chemicals and fuels will also be controlled and monitored under the Onshore Construction and Environmental Management Plan (CEMP) which will include, for example, protection from vandalism, procedures for good general construction site practices, environmental and waste management procedures, regular vehicle checks, use of spill kits, correct waste storage and disposal, use of oil-water separators as necessary (for example, for drainage from refuelling areas). Any washing of vehicles or equipment will only take place in controlled areas, and wash waters will not be discharged into the water environment. The wash water will be treated and discharged to an approved location.

- GH06 - The control of earthworks or materials movement (including any re-use of materials) under appropriate Environmental Permits, exemptions or Contaminated Land: Applications in the Real Environment (CL:AIRE) 'The definition of Waste: The development industry Code of Practice (2011).
- GH07 - Any temporary dewatering activities during construction will be undertaken in accordance with EA guidance, and if required, an Abstraction Licence and Environmental Permit (for the discharge) and will be limited to the depth and time required to facilitate construction activities.
- GH08 - A protocol will be developed for dealing with any unexpected contamination.
- GH09 - Where indicated in the ES, a Hydrogeological Risk Assessment will be undertaken during detailed design to assess the specific risks to groundwater and groundwater receptors at those locations and identify any additional mitigation or remediation that may be required. The nature and scope of any mitigation or remediation will be agreed with the Environment Agency or other stakeholders, as appropriate.
- GH10 - The provision of a drilling fluid breakout plan, where horizontal directional drilling is proposed, will be developed by the contractor and included within the Offshore and Onshore Construction and Environmental Management Plan's.
- GH11 – The proposed construction compound within the Source Protection Zone 1 within Kent, will be designed and operated in accordance with the following: 1. The conceptual ground model will be confirmed through intrusive ground investigation, 2. There will be no below ground storage of liquids/fuels/chemicals, 3. There will be no water abstractions or discharges within this compound, and 4. Best available techniques will be followed for both construction and operation of this compound. This will include commitments such as using double skinned and/or bunded tanks, drip trays, spill kits etc.

## 5.9 Assessment of Impacts and Likely Significant Effects

- 5.9.1 The assessment of the effects of the Proposed Project on geology and hydrogeology receptors described in this section considers the embedded and control and management measures described in Section 5.8.

### Construction Phase

#### Damage to/destruction of designated geological sites

- 5.9.2 During the construction of the Proposed Project there is the potential for damage to designated geological sites from any physical ground disturbance within any identified designated sites.
- 5.9.3 The Sandwich Bay to Hacklinge Marshes SSSI has been identified within the study area, however the impacts on this receptor are assessed within **Application Document 6.2.4.1 Part 4 Marine Chapter 1 Physical Processes** as it locates within the coastal marine section of the Proposed Project.
- 5.9.4 No further designated geological sites have been identified within the study area therefore there is anticipated to be no change from the baseline conditions and effects would be not significant.

## Exposure to existing potential contamination through ground disturbance

- 5.9.5 Where a significant source of potential existing contamination is identified, there is the potential for exposure of human health receptors if potential contamination is disturbed (e.g. by excavations).
- 5.9.6 A baseline assessment and preliminary contamination risk assessment (PRA) has been undertaken in accordance with the process of land contamination risk assessment defined within LCRM (Environment Agency, 2023) and is presented within **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**. This PRA has identified a generally very low to low risk of significant existing contamination within the study area, and where limited and localised sites with moderate or above risk have been identified, further assessment has identified a very low/low risk to sensitive receptors. The results of the Mott Macdonald Tier 2 generic quantitative risk assessment, included as **Application Document 6.3.3.5.D Appendix 3.5.D Generic Quantitative Risk Assessment – Kent**, identified the soil samples tested were below the selected assessment criteria and therefore the risk to human health receptors from existing contamination was generally assessed to be low to very low.
- 5.9.7 Therefore, with the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the potential temporary construction impacts on human receptors (construction workers) from existing contamination are considered to be negligible as the risk to receptors from any pre-existing contamination is considered to be very low/low. Therefore, for construction workers (high sensitivity), this would result in a **negligible** effect which would be not significant.

## The mobilisation of existing contamination

- 5.9.8 Where a significant source of potential existing contamination is identified exists there is the potential for exposure of groundwater and groundwater receptors (e.g. groundwater abstractions, ecological receptors, surface water that is groundwater fed) if the potential contamination is mobilised through the creation of new pathways (e.g. piling, trenchless crossing etc).
- 5.9.9 A baseline assessment and preliminary contamination risk assessment (PRA) has been undertaken in accordance with the process of land contamination risk assessment defined within LCRM (Environment Agency, 2023) and is presented within **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment**. A groundwater risk assessment has also been undertaken and is presented within **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**. The assessments concluded that there is a very low risk of mobilising any existing contamination within the soils (as significant sources of existing contamination in soil have not been identified) but there is a moderate risk of mobilising existing contamination within groundwater.
- 5.9.10 Therefore, with the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the potential temporary construction impacts are considered to be small. Therefore, for groundwater and groundwater receptors (very high to high sensitivity) this would result in a **minor effect**, which would be not significant.

## Ingress and accumulation of ground gases

- 5.9.11 If a potential source of ground gas exists within the study area (together with a pathway), there is the potential for ground gas to accumulate within any confined spaces, such as trenches which could result in significant effects on receptors such as construction workers.
- 5.9.12 As part of the phase 2 intrusive ground investigation ground gas monitoring and a ground gas risk assessment has been included within the Mott Macdonald generic quantitative risk assessment, included as **Application Document 6.3.3.5.D Appendix 3.5.D Generic Quantitative Risk Assessment - Kent**. The assessment concluded a low risk from ground gases, and that protection measures are not considered necessary. Therefore, with the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the temporary construction impacts from ground gases are considered to be negligible. For construction workers (high sensitivity), this would result in a **negligible** effect which would be not significant.

### **Mixing of aquifer bodies due to the connection of aquifer units at trenchless crossings**

- 5.9.13 The groundwater risk assessment presented in **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment** has assessed the potential risks to groundwater quality from the connection of different aquifer units at trenchless crossings and informs the impact assessment presented in this section.
- 5.9.14 The assessment concluded that the trenchless crossing is likely to connect two aquifer units due to the anticipated depth of the trenchless crossing. As described within the groundwater risk assessment there is a moderate risk of existing contamination in the groundwater. Commitment GH02 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** requires a Foundation Works Risk Assessment to be undertaken at all locations where trenchless crossings are proposed. Following completion of the assessment and implementation of any mitigation measures required, risks associated with creation of new flow/contamination pathways from the connection of aquifer units are expected to be very low. In addition, to mitigate against the trenchless crossing bore becoming a pathway, the surface casing at the entry point of the bore will be sealed into competent ground and extended above ground level to ensure surface run off cannot enter the casing or bore. Shallow groundwater bodies will also be sealed off to ensure they do not enter the chalk aquifer.
- 5.9.15 Therefore, the temporary construction impacts would be negligible and for groundwater and groundwater receptors (high sensitivity), this would result in a **negligible** effect which would be not significant.

### **Changes to groundwater levels, quality and groundwater flow direction caused by dewatering during construction**

- 5.9.16 The groundwater risk assessment presented in **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment** has assessed the potential risks associated with changes to groundwater levels, quality and groundwater flow as a result of dewatering associated with the Proposed Project, on groundwater receptors, and informs the impact assessment presented in this section.
- 5.9.17 The groundwater risk assessment concluded that the risk to groundwater receptors from dewatering within sections of overhead line is considered to be very low.



- 5.9.18 Within areas of open cut trenches, the groundwater risk assessment concluded that the risk to groundwater receptors (such as abstractions) from dewatering is also considered to be very low.
- 5.9.19 Dewatering is not anticipated to be required for the construction of the proposed Minster Converter Station and Substation or within the HDD launch/reception pits.
- 5.9.20 A saline intrusion assessment has also been undertaken as part of **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment** which assesses the potential risk from saline intrusion at the landfall location. The assessment concluded that there is a low risk of significant additional (to current natural processes) saline intrusion as a result of the Proposed Project.
- 5.9.21 Therefore, the temporary construction impacts from dewatering would be negligible and for groundwater and groundwater receptors (high sensitivity), this would result in a **negligible** effect which would be not significant.

### **Construction compound within the groundwater Source Protection Zone 1**

- 5.9.22 The groundwater risk assessment, presented in **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment** has assessed the potential risks to groundwater quality associated with a temporary construction compound located within a groundwater SPZ1.
- 5.9.23 The groundwater risk assessment concluded that the risk to groundwater quality at the proposed construction compound in the SPZ 1, from the activities proposed and following implementation of the proposed commitments, is considered to be low. Therefore, the temporary construction impacts would be negligible and for groundwater and groundwater receptors (very high sensitivity), this would result in result in a **negligible** effect which would be not significant.

## **Operation and Maintenance Phase**

### **Ingress and accumulation of ground gases**

- 5.9.24 If a potential source of ground gas exists within the study area (together with a pathway) there is the potential for ground gas to accumulate and ingress into confined spaces, which could result in significant effects on maintenance workers.
- 5.9.25 As part of the phase 2 intrusive ground investigation ground gas monitoring and a ground gas risk assessment has been undertaken which concluded a low risk from ground gas, and that protection measures are not considered necessary. Therefore, the temporary maintenance impacts from ground gases are considered to be negligible. For maintenance workers (high sensitivity), this would result in a **negligible** effect which would be not significant.

### **Changes to groundwater levels and/or recharge rates from the introduction of impermeable surfaces**

- 5.9.26 Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surface is changed. There are only relatively small areas of new hard standing anticipated to be required for the Proposed Project at the proposed Minster Converter Station and Substation, and these will be designed to meet the current drainage standards as described in **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**.

- 5.9.27 Hard standing at the new pylon bases is anticipated to be limited to very small areas, which means that there are not likely to be any noticeable changes on infiltration and recharge in these areas.
- 5.9.28 Therefore, the permanent operational impacts from the introduction of impermeable surfaces are considered to be negligible. For groundwater and groundwater receptors (high sensitivity) this would result in a **negligible** effect which would be not significant.

## Decommissioning Phase

- 5.9.29 The decommissioning impacts and effects are considered to be similar (or less significant) to the construction phase because the activities required to complete decommissioning are of a similar nature (e.g. ground disturbance extents and depths).. In addition, all decommissioning activities would be expected to take place in accordance with UK environmental legislation, good practice control and management measures and the relevant environmental permitting regime (if appropriate) current at the time.
- 5.9.30 Therefore, the likely significant effects relating to the construction phase are applicable, on a conservative basis, to the decommissioning phase.

## 5.10 Additional Mitigation

- 5.10.1 The assessment has concluded that there are no likely significant effects in relation to geology and hydrogeology receptors, therefore no additional mitigation measures are required for geology and hydrogeology beyond the good practice measures and commitments set out in **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**.

## 5.11 Residual Effects and Conclusions

- 5.11.1 The geology and hydrogeology assessment has considered the potential impacts that construction, operation and decommissioning of the Kent Onshore Scheme may have on existing geological and hydrogeological receptors. This includes an assessment of the potential for existing contamination and pollutant linkages, in relation to sensitive receptors such as human health and groundwater.
- 5.11.2 Geology and hydrogeology effects have been avoided through design, by avoiding, where practicable, known sources of significant potential contamination (e.g. landfills) and receptors such as high sensitivity hydrogeological features. Further supporting assessment has also been undertaken and included within the relevant appendices to this chapter, such as **Application Document 6.3.3.5.A Appendix 3.5.A Preliminary Contamination Risk Assessment** and **Application Document 6.3.3.5.B Appendix 3.5.B Qualitative Groundwater Risk Assessment**. In addition, good practice measures and commitments have been outlined within **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** to support the assessment.
- 5.11.3 The assessment has concluded, as described in Section 5.9, that with the measures outlined above, there are no likely significant residual effects in relation to geology and hydrogeology receptors during construction, operation and maintenance and decommissioning of the Kent Onshore Scheme.

## 5.12 Sensitivity Testing

- 5.12.1 Under the terms of the DCO, construction could commence in any year up to five years from the granting of the DCO which is assumed to be 2026. It is considered that if the works were to commence in any year up to year five this will not change the assessment of effects in relation to geology and hydrogeology.

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