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Land, Geology and Hydrogeology

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9. Contaminated Land, Geology and Hydrogeology

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) (Volume 6 of the Development Consent Order (DCO) application) details the assessment of the potential residual effects of Norwich to Tilbury ('the Project') on Contaminated Land, Geology and Hydrogeology. This chapter covers the following, during construction and operation (and maintenance):

- Contaminated land and the receptors that could be affected by existing contaminants within the soil
- Geology including designated geological sites and minerals
- Hydrogeology including groundwater quality, levels, and flow.

9.1.2 There are interrelationships related to the likely residual effects on Contaminated Land, Geology and Hydrogeology and other environmental topics. Therefore, please also refer to the following chapters:

- Chapter 6: Agriculture and Soils (document reference 6.6)
- Chapter 8: Ecology and Biodiversity (document reference 6.8)
- Chapter 10: Health and Wellbeing (document reference 6.10)
- Chapter 11: Historic Environment (document reference 6.11)
- Chapter 12: Hydrology and Land Drainage (document reference 6.12).

9.1.3 This chapter is supported by the following figures and appendices:

- Figure 9.1: Superficial Geology (document reference 6.9.F1)
- Figure 9.2: Bedrock Geology (document reference 6.9.F2)
- Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3)
- Figure 9.4: Geologically Designated Sites (document reference 6.9.F4)
- Figure 9.5: Hydrogeology and Hydrogeological Receptors (document reference 6.9.F5)
- Figure 9.6: Sites with a Moderate or Above Risk Classification for existing contamination (document reference 6.9.F6)
- Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1)
- Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2)

- Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3)
- Appendix 9.4: Hydrogeological Risk Assessment (document reference 6.9.A4).

9.2 Regulatory and Planning Policy Context

National Policy Statement (NPS)

- 9.2.1 Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2) sets out the key overarching policy relevant to the Project. The Overarching National Policy Statement for Energy (EN-1) (NPS EN-1) (Department for Energy Security and Net Zero (DESNZ), 2024a) is the key overarching policy relevant to the Project. This is supported by the National Policy Statement for Electricity Networks Infrastructure (EN-5) (NPS EN-5) (DESNZ, 2024b).
- 9.2.2 Full consideration of the relevant NPSs for the Project can be found in the Policy Compliance Document (document reference 5.7).

Overarching NPS for Energy (EN-1)

- 9.2.3 NPS EN-1 (DESNZ, 2024a) contains the following paragraphs relating to the Contaminated Land, Geology and Hydrogeology which have been considered in this chapter.
- 9.2.4 Paragraph 5.4.19 of NPS EN-1 states *‘The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests’*. Paragraph 5.4.42 of NPS EN-1 states *‘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 [...] Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought’*. Sites designated for their geological importance are identified in Section 9.5 and the potential effects are discussed in Section 9.7.
- 9.2.5 Paragraph 5.11.17 states *‘Applicants should ensure that a site is suitable for its proposed use, taking account of ground conditions and any risks arising from land instability and contamination’*. A Preliminary Contamination Risk Assessment is presented within Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1) and the potential effects are discussed in Section 9.7. Commitments regarding land instability are included in Section 9.6.
- 9.2.6 Paragraph 5.11.8 of NPS EN-1 states *‘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’*. Paragraph 5.11.18 goes on to state that *‘For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination, and where contamination is present, applicants should consider opportunities for remediation where possible’*. A Preliminary Contamination Risk Assessment is presented within Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1) and the potential effects are discussed in Section 9.7.

- 9.2.7 Paragraph 5.11.19 of NPS EN-1 states ‘*Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place*’. Paragraph 5.11.28 also states ‘*Where a proposed development has an impact upon a Mineral Safeguarding Area [...] the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources*’. A preliminary qualitative minerals assessment is presented in Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2) which identifies mineral resources that are crossed by the Order Limits and the potential effects are discussed in Section 9.7.
- 9.2.8 Paragraph 5.16.7 of NPS EN-1 states that the ES should describe ‘*any impacts of the proposed project on [...] source protection zones (SPZs) around potable groundwater abstractions*’. Groundwater and groundwater receptors, including source protection zones crossed by the Order Limits are described in Section 9.5 and Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) and the potential effects are discussed in Section 9.7.

NPS for Electricity Networks Infrastructure (EN-5)

- 9.2.9 Paragraph 2.9.25 of NPS EN-5 (Department for Energy Security and Net Zero, 2024b) references undergrounding and states ‘the Secretary of State should only grant development consent for underground or subsea sections of a proposed line over an overhead alternative if they are satisfied that the benefits accruing from the former proposal clearly outweigh any extra economic, social, or environmental impacts that it presents, the mitigation hierarchy has been followed, and that any technical obstacles associated with it are surmountable’. The paragraph notes that undergrounding can have potentially very disruptive effects on a range of receptors, including geology.
- 9.2.10 Full consideration of the relevant NPSs for the Project and this chapter can be found in the Policy Compliance Document (document reference 5.7).

Other National Legislation and Policy

- 9.2.11 Although the Project will be tested in line with national policy stated above, the assessment has also been undertaken in accordance with, and with reference to, the following national legislation and policy:
- National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2025 and accompanying planning practice guidance)
 - Environmental Protection Act 1990; and associated Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Department for Environment, Food and Rural Affairs (Defra), 2012)
 - Environment Act 2021
 - The Contaminated Land (England) Regulations 2006, as amended by The Contaminated Land (England) (Amendments) Regulations 2012
 - The Environmental Damage (Prevention and Remediation) Regulations 2015
 - The Environmental Permitting (England and Wales) (Amendments) (England) Regulations 2023

- Water Resources Act 1991
- The Water Environment (Water Framework Directive) Regulations 2017
- The Water Supply (Water Quality) Regulations 2016
- Environment Agency's approach to Groundwater Protection (Environment Agency, 2018).

Regional and Local Policy

- 9.2.12 Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2), the Planning Statement (document reference 5.6) and Policy Compliance Document (document reference 5.7) set out the relevant regional and local policy.
- 9.2.13 Key regional and local policy relevant to Contaminated Land, Geology and Hydrogeology, that has informed the assessment within this ES (Volume 6 of the DCO application), comprises:
- Norfolk Minerals and Waste Development Framework: Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2026 (Norfolk County Council, 2011)
 - Norfolk Minerals and Waste Development Framework: Minerals Site Specific Allocations Development Plan Document (Norfolk County Council, 2017), adopted in 2013, amendments adopted December 2017
 - Norfolk Minerals and Waste Local Plan Publication (Norfolk County Council, 2022), emerging plan Suffolk Minerals and Waste Local Plan (Suffolk County Council, 2020), adopted July 2020
 - Essex Minerals Local Plan (Essex County Council, 2014), adopted July 2014
 - Draft Replacement Essex Minerals Local Plan 2025 to 2040 (Essex County Council, 2024), emerging plan
 - Thurrock Local Development Framework - Core Strategy and Policies for Management of Development (as amended) (Thurrock Council, 2015), adopted in January 2015, with specific reference to Policy CSTP32 and PMD1
 - Greater Norwich Local Plan (Broadland District, South Norfolk, Norwich City Council and Norfolk County Council, 2024), adopted March 2024, with specific reference to policy 2, point 7
 - South Norfolk Local Plan, Development Management Policies Document (South Norfolk Council, 2015), adopted October 2015, with specific reference to policies DM 2.9 and DM 3.14
 - Babergh and Mid Suffolk Joint Local Plan - Part 1 (Babergh District Council and Mid Suffolk District Council, 2023), adopted November 2023, with specific reference to Policy LP15 and LP16
 - Local Plan Colchester Borough, Local Plan 2017 – 2033, Section 2 (Colchester Borough Council, 2022), adopted July 2022, with specific reference to Policy ENV1 and ENV5
 - Tendring District Local Plan 2013-2033 and Beyond - Section 2 (Tendring District Council, 2022), adopted January 2022, with specific reference to Policy PPL 4 and SPL 3

- The Braintree District Local Plan 2013-2033 (Braintree District Council, 2022), adopted July 2022, with specific reference to Policy LLP 63 and LPP 70
- Chelmsford Local Plan (Chelmsford City Council, 2020), adopted May 2020, with specific reference to Policy DM30
- Brentwood Local Plan 2016 - 2033 (Brentwood Borough Council, 2022), adopted March 2022, with specific reference to Policy NE10.

Guidance

- 9.2.14 Relevant guidance specific to Contaminated Land, Geology and Hydrogeology, that has informed this ES (Volume 6 of the DCO application), comprises:
- Land Contamination: Risk Management (LCRM) (Environment Agency, 2023a)
 - CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice (CIRIA, 2001)
 - BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of Practice (British Standards Institution, 2017)
 - Design Manual for Roads and Bridges (DMRB) LA 109: Geology and soils (National Highways, 2019)
 - DMRB LA 113: Road drainage and the water environment (National Highways, 2020)
 - Hydrogeological impact appraisal for dewatering abstractions (Environment Agency, 2007).

9.3 Scope of the Assessment

- 9.3.1 The scope of the assessment has been informed by the Environmental Impact Assessment (EIA) Scoping Report (document reference 6.19) and EIA Scoping Opinion (document reference 6.20) provided by the Planning Inspectorate in 2022 on behalf of the Secretary of State. The scope has also been informed through consultation and engagement with relevant consultees. A summary of the scope of the Contaminated Land, Geology and Hydrogeology assessment is provided in Appendix 5.2: Scope of the Assessment (document reference 6.5.A2).
- 9.3.2 In addition, the EIA Scoping Opinion, together with a response from National Grid against each point raised by the Planning Inspectorate relevant to Contaminated Land, Geology and Hydrogeology, is provided in Appendix 5.1: National Grid's response to the EIA Scoping Opinion (document reference 6.5.A1).

Project Engagement and Consultation

- 9.3.3 Consultation and engagement with relevant stakeholders has informed the assessment presented in this chapter. Responses to representations received during the statutory consultation in summer 2024 and subsequent consultations in 2025 are provided in Appendix K and Appendix M of the Consultation Report (document reference 5.1).
- 9.3.4 A summary of discussions and how these have influenced the Project, scope and the approach to the assessment in this chapter are provided in Table 9.1.

Table 9.1 Engagement undertaken relevant to Contaminated Land, Geology and Hydrogeology

Reference	Comment	National Grid's Response
Thematic Meeting, Environment Agency, July 2022	Discussions were held regarding the proposed methodology including a tiered risk-based approach for contaminated land assessment. The Environment Agency noted that this is a reasonable approach.	The methodology presented in this ES chapter accords with the approach presented during the thematic meeting, and the subsequent Scoping Opinion required the agreement of the Environment Agency on the methodology.
Affinity Water, November 2023	Initial discussions were held with Affinity Water to discuss feasibility of a single crossing of the River Stour through a groundwater Source Protection Zone (SPZ1) ¹ . Affinity Water confirmed that they had no objections to a single crossing option through the SPZ1 in principle, subject to further appropriate assessment.	Further assessment of the crossing has been undertaken as discussed with Affinity Water and is presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) and also Appendix 9.4: Hydrogeological Risk Assessment (document reference 6.9.A4) which has been undertaken specifically for the River Stour. The Order Limits have been widened at the crossing of the River Stour to allow for either eastern and western options or only one (eastern only or western only), subject to detailed design of the trenchless crossing methods. However, the intrusive works of the trenchless crossings have been adjusted to be outside of the SPZ1.
Environment Agency, February 2024	Initial discussions were held with the Environment Agency to discuss the feasibility of a potential single crossing of the River Stour through a SPZ1. The Environment Agency confirmed that they would have no objection to a single crossing option through the SPZ1 in principle. However, this would need to be subject to further assessment.	Further assessment of the crossing has been undertaken, as discussed with the Environment Agency, and is presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) and also Appendix 9.4: Hydrogeological Risk Assessment (document reference 6.9.A4) which has been undertaken specifically for the River Stour The Order Limits have been widened at the crossing of the River Stour to allow for either eastern and western options or only one (eastern only or western only), subject to detailed design of the trenchless crossing methods. However, the intrusive works of the trenchless crossings have been adjusted to be outside of the SPZ1.

¹ 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.

9.4 EIA Approach and Methods

- 9.4.1 This section describes the methodology used to establish the existing and future baseline together with the methodology / approach used to undertake the assessment on Contaminated Land, Geology and Hydrogeology. The overarching approach is also described in Chapter 5: EIA Approach and Method (document reference 6.5).

Data Sources

- 9.4.2 The baseline has been informed by a desk study which has drawn on the following key information sources:
- British Geological Survey (BGS) 1:50,000 scale geological mapping, solid and drift editions (BGS, 2025a)
 - BGS GeoIndex Viewer (BGS, 2025b)
 - BGS Lexicon of Named Rock Units (BGS, 2025c) Georeferenced historical Ordnance Survey maps for the United Kingdom (National Library of Scotland, 2025), historical Ordnance Survey maps from Envirocheck reporting (Landmark Information Group, 2022 and 2023) for parts of the route, Google aerial imagery and historical aerial photography
 - Natural England, Designated Sites View (Natural England, 2025)
 - Multi-Agency Geographic Information for the Countryside (MAGIC) interactive map (Defra, 2025) for groundwater SPZ, aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites
 - Environment Agency, Catchment Data Explorer (Environment Agency, 2025a)
 - Environment Agency Report SC040016/R, New Groundwater Vulnerability Mapping Methodology in England, and Wales (Environment Agency, 2017)
 - Information from the Environment Agency regarding groundwater abstractions, deregulated groundwater abstractions, discharge consents
 - Environment Agency datasets for the locations for historical landfills and permitted landfill and waste sites, and category 1 and 2 pollution incidents (Environment Agency, 2025b)
 - Local Minerals Plans for mineral reserves/mineral safeguarded areas
 - Information from Local Planning Authorities (LPAs) regarding mineral resources and minerals infrastructure
 - Information from South Norfolk, Basildon District Council, Colchester City Council, Braintree District Council, Tendring District Council, Chelmsford City Council and Babergh and Mid Suffolk District Council regarding private water supplies
 - Information from South Norfolk Council, Mid Suffolk District Council, Babergh District Council, Colchester City Council, Basildon Borough Council, Thurrock Council, Tendring District Council, Chelmsford City Council and Braintree District Council regarding potentially contaminated land

- Information from Colchester City Council, Braintree District Council, Basildon Borough Council, Babergh and Mid Suffolk District Council, South Norfolk Council, Chelmsford City Council and Tendring District Council regarding Local Geological Sites.

Study Area

- 9.4.3 The Study Area for Contaminated Land, Geology and Hydrogeology comprises the area directly affected by the Project, as defined by the Order Limits plus a 250 m buffer for geology and contaminated land and up to 500 m for hydrogeology to provide environmental context and identify potential receptors. This is considered an appropriate Study Area based on professional judgement, knowledge of similar projects and DMRB LA 109 Geology and Soils (National Highways, 2019) and DMRB LA 113 Road drainage and the water environment (National Highways, 2020). This Study Area is in accordance with that presented within the EIA Scoping Report (document reference 6.19) and agreed within the EIA Scoping Opinion (document reference 6.20).
- 9.4.4 The Study Area for contaminated land and geology (250 m) is shown on Figure 9.1: Superficial Geology (document reference 6.9.F1) and the Study Area for hydrogeology (500 m) is shown on Figure 9.5: Hydrogeology and Hydrogeological Receptors (document reference 6.9.F5).

Site Survey

- 9.4.5 Intrusive site surveys have not been undertaken for this assessment at this time (in accordance with the tiered approach outlined in LCRM), as described within the methodology proposed in the EIA Scoping Report (document reference 6.19). Preliminary ground investigation is currently being undertaken for the Project and will continue to be undertaken to support the detailed design of the Project and appropriate risk assessments in accordance with the commitments included within the Outline Code of Construction Practice (CoCP) (document reference 7.2).

Assessment Methodology

- 9.4.6 This section sets out the methodology used for assessing the effects on Contaminated Land, Geology and Hydrogeology for those aspects scoped into the assessment, as set out within the EIA Scoping Report (document reference 6.19) and agreed within the EIA Scoping Opinion (document reference 6.20). The scope of the Contaminated Land, Geology and Hydrogeology assessment is provided in Appendix 5.2: Scope of the Assessment (document reference 6.5.A2).
- 9.4.7 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.

Contaminated Land

- 9.4.8 The assessment methodology that has been used for assessing contaminated land and for developing the baseline is presented in Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1). This provides a Tier 1 Preliminary Risk Assessment (PRA) and identifies locations where

there is potential for significant sources of existing contamination to be present, in accordance with the method identified within LCRM (Environment Agency, 2023a). 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.

- 9.4.9 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

- 9.4.10 A qualitative Minerals Resource and Infrastructure Assessment (MRIA) is presented within Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2). This appendix has been prepared to inform the baseline and the assessment in relation to minerals and minerals infrastructure and with regard for Minerals Safeguarding Practice Guidance (Minerals Production Association, 2019).
- 9.4.11 A desk study has been undertaken to identify 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 for impacts relating to geology (e.g. geo-conservation). For consistency, a similar approach has been adopted as for the contamination assessment, to assess these effects (i.e. combination of receptor identification and associated sensitivity and magnitude of potential impacts).

Hydrogeology

- 9.4.12 The baseline assessment is informed by a desk-based study of available information and publicly available data such as abstractions and private water supply data.
- 9.4.13 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.
- 9.4.14 The assessment methodology which has been used for assessing hydrogeology risks is presented within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3). The risk approach presented in this methodology is transposed into EIA classification in the same way as the contaminated land methodology.

Assessment Criteria

- 9.4.15 The assessment criteria for Contaminated Land, Geology and Hydrogeology are based on guidance (described above), professional judgement, and previous experience together with additional guidance set out in DMRB LA 109 Geology and Soils (National Highways, 2019) and DMRB LA 113 Road drainage and the water environment (National Highways, 2020).

- 9.4.16 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 considers the sensitivity of the identified receptors to change.
- 9.4.17 The assessment in this chapter assumes that all mitigation – embedded (design measures), standard, and any additional mitigation measures where required (as defined in Chapter 4: Project Description (document reference 6.4) are in place before assessing the effects. This is in accordance with guidance from IEMA as part of preparing a proportional assessment (IEMA, 2024) and the EIA Scoping Report (document reference 6.19).

Value/Sensitivity

- 9.4.18 The criteria for assigning the value/sensitivity of Contaminated Land, Geology and Hydrogeology receptors are shown in Table 9.2.

Table 9.2 Value / sensitivity criteria

Value/Sensitivity	General Criteria
Very High	<p>Very high importance and rarity. International scale and limited potential for substitution.</p> <p>Geology:</p> <p>Very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSIs and Geological Conservation Review (GCR) sites, where citations indicate features of international importance). Geology meeting international designation criteria which is not designated as such.</p> <p>Minerals:</p> <p>Existing mineral sites.</p> <p>Contamination:</p> <p>1) Human health: very high sensitivity land use such as residential or allotments</p> <p>2) Surface water: Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and $Q95 \geq 1.0 \text{ m}^3/\text{s}$. Site protected/designated under EC or UK legislation (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), SSSIs, Ramsar Sites)</p> <p>3) Groundwater: Principal Aquifer providing a regionally important resource and regionally important public water supplies, SPZ1.</p> <p>Hydrogeology:</p> <p>Principal Aquifer providing a regionally important source and regionally important public water supplies. Groundwater quality associated with SPZ1 associated with licensed abstractions.</p> <p>Water supplying Groundwater Dependent Terrestrial Ecosystems (GWDTEs) with a high groundwater dependence, with a high environmental importance and international or national value, such as Ramsar Sites, SACs, SPAs and SSSIs.</p>

Value/Sensitivity	General Criteria
High	<p>High importance and rarity. National scale and limited potential for substitution.</p> <p>Geology: Rare and of national importance with little potential for replacement (e.g. geological SSSI, National Nature Reserves (NNR)). Geology meeting national designation criteria which is not designated as such.</p> <p>Minerals: Mineral preferred areas (MPA)</p> <p>Contamination: 1) Human health: high sensitivity land use such as public open space, and construction workers 2) Surface water: Watercourse having a WFD classification shown in a RBMP and Q95 <1.0 m³/s 3) Groundwater: Principal Aquifer providing locally important resource or supporting a river ecosystem, SPZ2.</p> <p>Hydrogeology: Principal Aquifer providing a locally important source and locally important public water supplies, SPZ2. 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 supplying GWDTEs with a high groundwater dependency 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>Geology: 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>Minerals: Mineral Safeguarding Area (MSA) and Mineral Consultation Area (MCA).</p> <p>Contamination: 1) Human health: medium sensitivity land use such as commercial or industrial 2) Surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001 m³/s 3) Groundwater: Secondary A Aquifers. Extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming/animal estates), SPZ3.</p> <p>Hydrogeology: 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 SPZ3 associated with licensed abstractions. Residential and commercial properties.</p>

Value/Sensitivity	General Criteria
	<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 supplying GWDTEs with a moderate groundwater dependency with a national non-statutory UK BAP priority.</p>
Low	<p>Low or medium importance and rarity, local scale.</p> <p>Geology: Local importance/interest with potential for replacement (e.g. non-designated geological exposures, former quarries/mining sites).</p> <p>Minerals: Mineral present but outside of any MPA/MSA/MCA.</p> <p>Contamination: 1) Human health: low sensitivity land use such as highways and rail 2) Surface water: Watercourses not having a WFD classification shown in a RBMP and $Q95 \leq 0.001 \text{ m}^3/\text{s}$ 3) Groundwater: Secondary B or Secondary Undifferentiated Aquifer. Small scale private water abstractions (i.e. supplying fewer than ten properties).</p> <p>Hydrogeology: 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). 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 GWDTEs with a high or moderate groundwater dependency with no conservation designation.</p>
Negligible	<p>Very low importance and rarity, local scale.</p> <p>Geology: No geological exposures, little/no local interest.</p> <p>Mineral: No mineral identified.</p> <p>Contamination: 1) Human health: undeveloped surplus land/no sensitive land use proposed 2) Surface water: not present 3) Groundwater: Unproductive strata.</p> <p>Hydrogeology: Very poor groundwater quality and/or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply. Water supplying GWDTEs with a low groundwater dependency with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.</p>

Impact Magnitude

- 9.4.19 The criteria used to determine the magnitude of change/impact for Contaminated Land, Geology and Hydrogeology are set out in Table 9.3.

Table 9.3 Magnitude criteria

Magnitude	General Criteria
Large	<p>Geology Adverse: Permanent loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p>Contamination Adverse: Significant contamination identified, and contamination level significantly exceeds human health and environmental assessment criteria with the potential for significant harm to be caused. Contamination heavily restricts future use of land.</p> <p>Contamination Beneficial: Substantial betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p>Hydrogeology Adverse: 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>Hydrogeology Beneficial: 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>Geology Adverse: partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p>Contamination Adverse: Contamination levels marginally exceed human health and environmental assessment criteria. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use.</p> <p>Contamination Beneficial: Moderate betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p>Hydrogeology Adverse: 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. 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</p>

Magnitude	General Criteria
	<p>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>Hydrogeology Beneficial: 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>Geology Adverse: 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>Contamination Adverse: Contamination levels below human health and environmental assessment criteria and remediation is not required. Significant contamination is unlikely. Best practice measures can be required to minimise risks to human health.</p> <p>Contamination Beneficial: Slight betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.</p> <p>Hydrogeology Adverse: Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the 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>Hydrogeology Beneficial: 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>
Very Small	<p>Geology: Very minor change to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected.</p> <p>Contamination: Contamination levels substantially below human health and environmental 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> <p>Hydrogeology: Very slight change from groundwater baseline conditions, approximating to 'no change' conditions. Dewatering effects create no or no noticeable effects.</p>
No change	No change from baseline conditions

Significance

- 9.4.20 The sensitivity of a receptor and the magnitude of impact are combined to give an overall significance of effect. The significance has been derived using the matrix set out in Chapter 5: EIA Approach and Method (document reference 6.5). This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significance effects, in the context of The Infrastructure Planning (Environmental Impact Assessment Regulations 2017, (EIA Regulations), are effects of moderate or greater significance.

Limitations of Assessment

- 9.4.21 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.
- 9.4.22 As with all types of assessment of geology and hydrogeology effects, the assessment depends on the accuracy of data provided by third parties, for example information regarding private water supplies and abstractions supplied by the relevant LPAs. However, the completeness and accuracy of this information is limited to that of the source records received. Historical maps and aerial photographs provide a snapshot in time and cannot be relied upon as indicators of events or activities that may have taken place at other times. It has therefore been assumed that the data provided by third parties are accurate.
- 9.4.23 There may be ground conditions at the site that have not been disclosed by the information reviewed and such undisclosed conditions cannot be taken into account in any analysis and reporting.
- 9.4.24 It is considered that sufficient baseline data are available to generally characterise the ground conditions and identify potentially sensitive receptors. Ground investigation and appropriate risk assessment will be undertaken (where necessary) in due course to support the detailed design and in accordance with commitment GH01 in the Outline CoCP (document reference 7.2).

Key Parameters for Assessment and Assumptions

- 9.4.25 This section describes the key parameters and assumptions that have been used/made when undertaking the assessment presented within this chapter. The assumptions this chapter is based on are listed below:
- Piling assumptions: Piling may be required at some pylon locations and for the foundations of the Cable Sealing End (CSE) compounds and substations, depending on ground conditions. The assessment set out in this chapter assumes that piling is required at all pylon locations, at the CSE compounds and substations (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 Project, nor during operation (and maintenance) of the Project
 - Discharges: Small-scale discharges of water from open cut trenches and pylon bases to remove rainwater and minor groundwater seepages (if required) would

be made to ground, following filtration through silt traps. In addition, where water is encountered it would be pumped out using an appropriate pump and a sump made in the subsoil using the excavator. At deeper excavations, such as the pits for the trenchless crossings, it is assumed that discharges would be subject to treatment to settle sediments, prior to discharge. Discharges, if required, would be made in compliance with relevant consents

- Trenchless crossings: It is assumed for the assessment that trenchless crossings would reach a maximum depth of 12 m below ground level (bgl), and that the depth of the launch/reception pits potentially required for Horizontal Directional Drilling (HDD) and direct pipe construction methods, would be approximately 1.2 mbgl. These methods do not require dewatering themselves, however dewatering of the pits may be required. The pipe jacking method requires the sinking of shafts, and it is assumed for this assessment that these would be constructed to avoid the need for large-scale dewatering to actively lower the groundwater level. Instead, it is assumed that construction would utilise sheet piles or similar (to inhibit groundwater entry), and that any groundwater would then be pumped out from the centre, to create a dry working environment for the tunnel boring machine.

9.5 Baseline Conditions

Existing Baseline

- 9.5.1 Baseline conditions have been gathered from desk-based information (see Section 9.4) and presented with reference to the section of the Project in which they are located.

Potentially Contaminative Land Uses

- 9.5.2 The majority of the Order Limits and the 250 m Study Area appears to have remained as undeveloped/agricultural land since the earliest reviewed historical mapping in the late 1800s and based on other data sources as described earlier. In these areas, it is considered that there is a very low risk of significant sources of potential contamination.
- 9.5.3 However, there are discrete areas within the Study Area that have a history of potentially contaminative land use or where the current land use is 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. This assessment is presented in Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1).
- 9.5.4 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, and in accordance with LCRM (Environment Agency, 2023a). These site-specific further risk assessments are also presented in Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1).

9.5.5 Based on the assessment presented in Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1), the following sites are assessed as presenting a potential moderate or above risk to sensitive receptors from existing contamination. The locations of these sites are shown on Figure 9.6: Sites with a Moderate or Above Risk Classification (document reference 6.9.F6):

- PSC B1 – Rookery Farm, Lion Road – Historical landfill (Section B)
- PSC B5 – Bramford Substation (Section B)
- PSC C3 – Former Royal Air Force (RAF) Raydon (Section C)
- PSC D1 – Former RAF Boxted (Section D).

Geology

Published Geology – Superficial Deposits

9.5.6 The superficial deposits that are anticipated to be present within the Study Area for the Project are shown on Figure 9.1: Superficial Geology (document reference 6.9.F1) and summarised in the paragraphs that follow. Further detailed information on the anticipated superficial geology within the Study Area is contained within Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1).

9.5.7 The superficial geology beneath the Study Area within Sections A, B, D, E and F generally comprises the Lowestoft Formation (Diamicton). Where river valleys cross the Order Limits these areas comprise the Lowestoft Formation (Sand and Gravel), Alluvium, River Terrace Deposits, Head Deposits and Kesgrave Catchment Subgroup.

9.5.8 The superficial geology beneath the Study Area within Section C comprises the river valley deposits described above and large areas of Cover Sands.

9.5.9 The superficial geology beneath the Study Area within Section G and Section H is recorded to be largely absent within parts of these sections and where present is dominated by the river valley deposits of Alluvium, River Terrace Deposits and Head Deposits.

Published Geology – Bedrock

9.5.10 The bedrock geology that is anticipated to be present within the Study Area for the Project is shown on Figure 9.2: Bedrock Geology (document reference 6.9.F2) and summarised in the paragraphs that follow. Further detailed information on the bedrock geology anticipated within the Study Area is contained within Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1).

- In Section A the bedrock comprises the White Chalk Subgroup
- In Section B the bedrock comprises the White Chalk Subgroup, Newhaven Chalk Formation and Crag Group
- In Section C the bedrock comprises the Thames Group, Thanet Formation and Lambeth Group (Undifferentiated) and Red Crag

- In Sections D, E, F and G the bedrock comprises the London Clay Formation, with the Claygate Member and Bagshot Formation also outcropping within Section F and Section G
- In Section H the bedrock comprises the London Clay Formation, Harwich Formation, Lambeth Group, Thanet Formation, and the White Chalk Subgroup.

Minerals

- 9.5.11 The information in the paragraphs that follow provides a brief overview of the mineral resources, adopted sites, allocated sites and minerals infrastructure crossed by the Order Limits and Study Area. Further details on minerals are provided within Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2), and shown on Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3).

Norfolk County Council

- 9.5.12 The Norfolk County Council Minerals and Waste Development Framework (NMWDF) (Norfolk County Council, 2011) covers Section A. The NMWDF was adopted in September 2011 and covers the period from 2010 to 2026. The plan is currently under review and Norfolk County Council are planning to adopt a new Norfolk Minerals and Waste Local Plan to update the policies and extend the plan period to the end of 2038, with a current pre-submission publication of the Norfolk Minerals and Waste Local Plan dated May 2022 (Norfolk County Council, 2022). The draft Norfolk Minerals and Waste Local Plan was submitted to the Planning Inspectorate for examination in December 2023, and the Planning Inspectorate's report was published in March 2025.
- 9.5.13 Policy CS16 of the adopted NMWDF identifies MSAs for areas of silica sand, carstone, and sand and gravel with the pre-submission Norfolk Minerals and Waste Local Plan containing similarly worded policies around minerals safeguarding.
- 9.5.14 Information received from Norfolk County Council has provided the locations of safeguarded minerals, safeguarded minerals infrastructure and/or allocated sites for mineral extraction and the information is shown on Figure 9.3 (document reference 6.9.F3). The dataset indicates that the northern part of the Study Area and Order Limits crosses the safeguarded areas for the following active (and Safeguarded) sites: Swardeston Quarry, Mangreen Recycling Centre and Mangreen Quarry.
- 9.5.15 The Study Area and Order Limits also cross three Adopted Sites (MIN79, MIN80 and MIN81) based on the information provided by Norfolk County Council. MIN81 has been 'deleted' from the draft NMWLP as the site received planning permission in 2015 and has been implemented. Sites MIN79 and MIN80 have also been 'deleted' from the draft NMWLP.

Suffolk County Council

- 9.5.16 The Suffolk Minerals and Waste Local Plan (SMWLP) (Suffolk County Council, 2020) was adopted in July 2020, and covers Section B and the northern half of Section C. The policies map within the adopted Minerals Local Plan identifies that '*Sand and gravel resources are located throughout the County*'. The adopted plan indicates that parts of the Study Area are located within the Suffolk MCA, as shown on Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3).

- 9.5.17 Policy MP10 of the adopted SMWLP (Suffolk County Council, 2020) defines MSAs and MCAs within the plan area. A map appended to the SMWLP shows that the Study Area within Suffolk crosses through several MCAs for sand and gravel as shown on Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3).
- 9.5.18 The Study Area also interacts with an existing concrete batching plant (Poundfield Products Section B), as shown on Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3). Policy MP9 of the SMWLP deals with the safeguarding of concrete manufacture and states that the County Council should be consulted where there is likely to be the loss of or the compromise of a facility. However, the Order Limits only interact with the concrete batching plant site because the Project is proposing to use the existing access roads, and the proposed pylons within this area would be positioned outside of the facility. Therefore, the Project would not cause the loss of, or compromise the works of the facility, and therefore the site is not considered further.

Essex County Council

- 9.5.19 The current Essex Minerals Local Plan (Essex County Council, 2014) was adopted in July 2014 and covers the southern half of the route (Sections C to G). The Essex Minerals Local Plan is currently under review, and a Draft Replacement Minerals Local Plan (Essex County Council, 2024) was published for consultation in February 2024 to extend the plan end date to 2040. The consultation on the document closed in July 2024. During the review of the Essex Minerals Local Plan a call for sites exercise was undertaken to support development up to 2040 and the sites are now being considered by Essex County Council for their potential inclusion in the new Plan.
- 9.5.20 The Essex Minerals Local Plan defines sand and gravel MSA as being all areas of glacial, glaciofluvial and river terrace deposits of sand and gravel identified on the BGS mapping (and other supplementary sources of evidence). Brick Clay MSA are defined by BGS mapping and are localised.
- 9.5.21 The policies map within the adopted Essex Minerals Local Plan (Essex County Council, 2014) confirms that parts of the Study Area are located within an MSA for sand and gravel and brickclay. The Study Area also interacts with some existing minerals sites and the associated MCAs, as shown on Figure 9.3: Mineral Safeguarding Areas, Mineral Consultation Areas, and Minerals Infrastructure (document reference 6.9.F3).
- 9.5.22 Information obtained from Essex County Council has provided the locations of the following safeguarded existing minerals infrastructure sites that the Order Limits and Study Area interact with:
- Crown Quarry (Section C) – located inside the Order Limits
 - Blixes Farm (Section E) and the corresponding MCA are located within the Study Area, and a small part of the Order Limits also cross the MCA for this site. However, this part of the Project proposes only utilisation of an existing access road and the proposed Project infrastructure will be outside of the site's boundary
 - Bradwell Quarry (Section E) – The information received from Essex County Council regarding the current minerals local plan, does not identify Bradwell Quarry within the Order Limits, however a review of planning applications for the site and consultation information provided by Essex County Council, indicates the quarry expansion areas are within the Order Limits

- Sheepcotes (Section F), located north-east of Little Waltham – is within the Order Limits, however the parts of the Sheepcotes site that are within the Order Limits only comprise existing access roads and the proposed infrastructure for the Project will be outside the site's boundary and not within the operational part of the site
- Roxwell Quarry, Chignall St James (Section F) – is located inside the Order Limits, however proposed pylons within this section of the Order Limits are to be placed outside of the working boundary of Roxwell Quarry.

9.5.23 In addition to these existing minerals sites, the Order Limits and Study Area also cross the following candidate sites identified during the call for sites, which was undertaken to support the review of the Essex Minerals Local Plan (Essex County Council, 2014). However, these sites are currently not allocated within the Minerals Local Plan and therefore have a lower sensitivity (currently) compared to the existing sites detailed above:

- A85 and A86 Martells (Section C) – located inside the Order Limits
- A79 and A80 Crown Quarry (Section C) – located inside the Order Limits
- A47 Bradwell Monks Farm (Section E) – located inside the Order Limits
- A59 Lowleys Farm (Section F) – located inside the Order Limits.

9.5.24 Further details on how the Project interacts with these sites is given in Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2).

Thurrock Council

9.5.25 The development plan for minerals in Thurrock comprises the adopted Core Strategy and Policies for Management of Development (Thurrock Council, 2015) and the Minerals Local Plan Adopted First Review (Essex County Council, 1996) and covers Section H.

9.5.26 The Thurrock Council Local Development Framework was adopted in January 2015 and forms the Core Strategy of Thurrock's Development Plan. The framework contains information relating to minerals planning policy in CSTP31 and CSTP32. Policy CSTP32 of the Core Strategy states that MSA in Thurrock are '*based on the work undertaken for the ECS*' (Environmental Capacity Statement).

9.5.27 Thurrock Council's Environmental Capacity Statement: Designation of Mineral Safeguarding Area (SKM Enviro, 2010) states that an MSA '*identifies and raises awareness to developers of the possible presence of workable mineral deposits. The potential for extracting these deposits must then be taken into account when submitting and determining planning applications for non-mineral related development. This ensures valuable mineral resources are not needlessly sterilised*'.

9.5.28 Figure 11 of the ECS indicates that sections of the Order Limits are within an MSA for sand and gravel.

9.5.29 The following safeguarded existing minerals infrastructure sites are indicated to interact with the Order Limits and Study Area:

- Burrows Farm, Brentwood Road, Bulphan (Section H) – designated by Thurrock Council as an aggregate recycling site – located approximately 150 m north-west of the Order Limits, therefore the Project infrastructure will be outside of the site's boundary

- Orsett Quarry (Section H) – current permitted minerals site, with a pending application for an extension to the east of the existing quarry – located within the Order Limits, however intrusive works are not proposed within the site boundary
- Rainbow Shaw Quarry (Section H) – which is designated by Thurrock Council as an aggregate recycling site – located within the Order Limits, however the Project is proposing only to utilise the existing access road and the proposed infrastructure for the Project would be outside the site's boundary
- Mill House Farm (Section H) – designated as a permitted minerals site which is located inside the Order Limits. However, intrusive works are not proposed within the site boundary
- Dansand Quarry, Stanford Road (Section H) – designated by Thurrock Council as an operational sand and gravel quarry and is located directly adjacent to the west side of the Order Limits where the Project is proposing only to utilise the existing road network.

Geo-Conservation

- 9.5.30 Geo-Conservation covers SSSIs that are currently designated for geological purposes, which are statutory designated sites. Geo-conservation also covers non-statutory designated sites such as Local Geological Sites (LGSs), RIGSs and County Geodiversity Sites (CGSs).

Norfolk County Council

- 9.5.31 The websites of the Norfolk Geodiversity Partnership and the Norfolk Biodiversity Information Service (Norfolk Geodiversity Partnership, 2025) provide records of CGS (the equivalent in Norfolk of RIGS) and covers Section A.
- 9.5.32 A review of these records indicates that there are five designated CGS in South Norfolk, but that none of them are located within the Study Area.

Suffolk County Council

- 9.5.33 The GeoSuffolk (2025) website provides details of CGS (the equivalent in Suffolk of RIGS) and covers Section B, and the northern approximately two-thirds of Section C. A review of these records indicates that there are 29 CGS within Suffolk but that none of them are located within the Study Area.
- 9.5.34 Hascot Hill Pit is designated as a geological SSSI and is also identified as a Geological Conservation Review site as it contains the only known exposure of the beach facies of the Red Crag. The site is located outside the Order Limits, approximately 200 m to the west, at approximate NGR 606100E, 253800N within Section B. The location of Hascot Hill Pit is shown on Figure 9.4: Geologically Designated Sites (document reference 6.9.F4). This SSSI is located some distance from proposed intrusive activities (approximately 270 m) and ground disturbance at the site is not anticipated. It is considered that impacts on the SSSI are unlikely, and therefore this site is not considered further.

Essex County Council and Thurrock Council

- 9.5.35 The GeoEssex (2025) and Essex Field Club (2025) websites provide details of the LGS, the equivalent of RIGS in Essex, and covers the southern third of Sections C, D, E, F, G and H.
- 9.5.36 A review of these records indicates that one site is located within the Study Area at White Notley, within Section E, and relates to an example of the White Notley Puddingstone. The example is a boulder of the Hertfordshire puddingstone beside a cottage gate. The site is located approximately 70 m to the north-west boundary of the Order Limits and is shown on Figure 9.4: Geologically Designated Sites (document reference 6.9.F4). No further records are located within the Study Area. The Project Order Limits that are located closest to the White Notley LGS comprise existing road infrastructure that the Project proposes to utilise.
- 9.5.37 Two geological SSSIs have been identified within the Study Area, within the county of Essex. A description of the two sites are presented below, and the locations shown on Figure 9.4: Geologically Designated Sites (document reference 6.9.F4):
- Marks Tey Brickpit: is designated as a SSSI and a geological conservation review site and is located within Section D at approximate NGR 591100E, 224300N. The site is located just outside of the Order Limits. The nearest part of the Project to the site proposes the construction of permanent access.
 - River Ter: a stretch of the River Ter is designated as a SSSI and a geological conservation review site and is located within Section F at approximate NGR 573561E, 215848N. The site is located outside of the Order Limits approximately 15 m to the south-east. The nearest part of the Project to the site proposes overhead line mitigation works.
- 9.5.38 Both of the identified geological SSSIs are located near to but outside of the Order Limits where the Project is proposing to undertake limited intrusive works and therefore ground disturbance is not anticipated and impacts on the SSSIs are unlikely, therefore these sites are not considered further.

Hydrogeology

- 9.5.39 The hydrogeology baseline information is presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (application document 6.9.A3) and a summary is presented below.

Aquifer Designation

- 9.5.40 A review of the aquifer designations provided on Defra's MAGIC online map viewer (Defra, 2025) indicates that the superficial deposits anticipated to be present within the Study Area of the Project are classified as follows:
- **Secondary A Aquifers:** Alluvium, Sheringham Cliffs Formation, Happisburgh Glacigenic Formation, Lowestoft Formation – Sand and Gravel, River Terrace Deposits, Ingham Sand and Gravel Formation, Croxton Sand and Gravel Member Glaciofluvial Deposits, Kesgrave Catchment Subgroup, Taplow Gravel, Boynhill Gravel Member and Stanmore Gravel Formation
 - **Secondary B Aquifers:** Cover Sands
 - **Secondary Undifferentiated Aquifer:** Lowestoft Formation – Diamicton and Head Deposits
 - **Unproductive Strata:** Peat and Interglacial Lacustrine Deposits.

9.5.41 A review of the aquifer designations provided on Defra's MAGIC online map viewer (Defra, 2025) indicates that the bedrock deposits anticipated to be present within the Study Area of the Project are classified as follows:

- **Principal Aquifers:** White Chalk Subgroup, Crag Group, Newhaven Chalk Formation, Red Crag Formation and Chillesford Church Sand Member
- **Secondary A Aquifers:** Undifferentiated Thanet Formation, Lambeth Group, Claygate Member, Bagshot Formation and Harwich Formation
- **Unproductive Strata:** Thames Group and London Clay Formation.

Groundwater Source Protection Zones

9.5.42 Defra's MAGIC map (Defra, 2025) indicates that large parts of the Study Area within Sections A, B, C, D, E and H are within a groundwater SPZ3, however, there are also parts of these sections which are indicated to be outside of any SPZ.

9.5.43 In addition to the SPZ3, a number of SPZ2 and SPZ1 are crossed by the Order Limits and Study Area, which are described in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) and presented on Figure 9.5: Hydrogeology and Hydrogeological Receptors (document reference 6.9.F5).

9.5.44 Defra's MAGIC map (Defra, 2025) also indicates that a small part of the Order Limits in the north of Section A is located within a groundwater Drinking Water Safeguarded Zone which is presented on Figure 9.5: Hydrogeology and Hydrogeological Receptors (document reference 6.9.F5).

Groundwater Abstractions

Licences and Deregulated Groundwater Abstractions

9.5.45 A total of 47 licensed groundwater abstractions and 73 deregulated groundwater abstractions have been identified within the Study Area, of which four licensed groundwater abstractions and one deregulated abstraction are located within the Order Limits.

9.5.46 Further details on these licensed and deregulated abstractions are presented within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) and shown on Figure 9.5: Hydrogeology and Hydrogeological Receptors (document reference 6.9.F5).

Private Water Supplies

9.5.47 Data describing private water supplies have been requested from all the relevant LPAs and data have been received from all LPAs (South Norfolk, Babergh and Mid Suffolk District Council, Tendring District Council, Colchester City Council, Braintree District Council, Chelmsford City Council, Basildon Borough Council and Thurrock Council). Basildon Borough Council (part of Section G), Brentwood Borough Council (part of Section F and G) and Thurrock Council (Section H) have confirmed that there are no private water supplies within their district.

- 9.5.48 A list of the information currently received is presented within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3). The information currently received indicates that there are no private water supplies within the Order Limits.

British Geological Survey Water Wells

- 9.5.49 The BGS water well dataset has been obtained. Where a BGS water well point has been identified that does not already appear on the lists of licensed groundwater supplies, deregulated groundwater supplies and private water supplies, this is presented within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3).

Identified Receptors

- 9.5.50 The following receptors have been identified within the Study Area, and are relevant to the potential impacts scoped into the Contaminated Land, Geology and Hydrogeology assessment. The sensitivity of the receptor is also given based on the descriptions in Table 9.2.
- Construction and maintenance workers – high sensitivity
 - Minerals resources (medium), existing minerals infrastructure (very high) and potential minerals infrastructure (medium)
 - Geologically designated sites – very high for SSSI and GCR sites and medium for RIGS
 - Groundwater and groundwater receptors (e.g. groundwater abstractions, ecological receptors, surface water that is groundwater fed) – very high to low sensitivity.

Future Baseline

- 9.5.51 The future baseline relates to known or anticipated changes to the current baseline in the future which should be assessed as part of the Project in the ES (Volume 6 of the DCO application).
- 9.5.52 There are no foreseeable significant changes anticipated in relation to Contaminated Land, Geology and Hydrogeology either prior to, or during the construction and operation (and maintenance) phases of the Project. It is assumed that any manufactured changes (i.e., new developments or extensions) would be appropriately permitted/controlled and operated in accordance with current legislation to prevent or limit adverse effects to ground conditions or controlled waters from contamination.
- 9.5.53 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 effect on soil erosion, groundwater levels, slope stability and indirectly (through groundwater level changes) – in relation to the potential for mobilisation of contamination.
- 9.5.54 In the context of slope stability, 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 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 Project, it is not considered that climate change would have a significant impact on the significance of effects for contamination.

9.6 Proposed Mitigation

- 9.6.1 The approach to mitigation including a description of the mitigation hierarchy is set out in Chapter 5: EIA Approach and Method (document reference 6.5). Three types of mitigation have been incorporated into the Project and assessment: embedded, standard and additional environmental mitigation.

Embedded Mitigation

- 9.6.2 Environmental appraisal has been an integral part of the Project design from the outset, which has meant that the Project has been able to avoid environmentally sensitive features as far as reasonably practicable.
- 9.6.3 National Grid has also embedded measures into the design of the Project to avoid or reduce significant effects that may otherwise be experienced during construction and operation (and maintenance) of the Project.
- 9.6.4 Embedded measures are those that are intrinsic to and built into the design of the Project, which are presented in Table 4.2 of Chapter 4: Project Description (document reference 6.4). Embedded measures relevant to Contaminated Land, Geology and Hydrogeology include:
- Avoiding sensitive features/receptors, as far as is practicable, such as groundwater SPZ1, landfills, and geological SSSIs, through the routeing and siting stages
 - Incorporating suitable consideration of the ground conditions in the design based on data from site-specific ground investigation and assessment, and therefore that any risks from ground instability, chemical aggressivity of the ground, UXO/UXB, ground gases and radon reports would be considered within the engineering design of the new infrastructure in accordance with good practice.

Standard Mitigation

- 9.6.5 Standard mitigation measures, comprising management activities and techniques, would be implemented during construction of the Project to limit effects through adherence to good site practices and achieving legal compliance.
- 9.6.6 The Outline CoCP (document reference 7.2) contains relevant standard mitigation measures relating to Contaminated Land, Geology and Hydrogeology. Note that measures have been assigned references, for example (GG01). For ease of cross-reference, these align with the references provided in Table 6.1 of the Outline CoCP (document reference 7.2). These measures include but are not limited to:
- GH01: Intrusive ground investigations will be undertaken prior to construction, including the measurement and monitoring of groundwater levels and geotechnical and geoenvironmental sampling and testing as appropriate. The information will inform geoenvironmental assessment, where required, and appropriate geotechnical design in relation to the site/structure specific ground conditions including ground instability/adverse ground conditions/ ground gas
 - GH02: A Foundation Works Risk Assessment (FWRA) will be undertaken by the Main Works Contractor(s) at locations of pylons, CSE compounds, and substations (where the use of piled foundations are anticipated prior to construction). The Main Works Contractor(s) will use 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 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination' (CL:AIRE, 2025)

- 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 potential contamination
- GH04: Appropriate training of construction and maintenance workers in the handling and use of potentially hazardous substances and the associated risks
- GH05: All use and storage of chemicals and fuels are to be undertaken in accordance with Environment Agency guidance and the Control of Pollution (Oil Storage) Regulations 2001. The use and storage of chemicals and fuels will also be controlled and monitored under the CoCP which will include, for example, 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), collection of process water from the washout/cleaning of ready-mix concrete vehicles and equipment for treatment/disposal
- GH06: The control of earthworks or materials movement (including any re-use of materials) will be carried out under appropriate Environmental Permits, exemptions, or The Definition of Waste: The Development Industry Code of Practice (CL:AIRE, 2011)
- GH07: Any temporary dewatering activities during construction will be undertaken in accordance with Environment Agency guidance (Environment Agency, 2023b. Environment Agency, 2022. Environment Agency, 2021a, Environment Agency 2021b) including appropriate assessment undertaken as required by the guidance (Environment Agency, 2007), and if required, an Abstraction Licence and Environmental Permit (for the discharge) will be obtained, and the works will be limited to the depth and time required to facilitate construction activities
- GH08: A protocol for dealing within any unexpected contamination will be developed by the Main Works Contractor(s) and include:
 - Details of a watching brief and toolbox talks to be implemented throughout the construction phase
 - Details regarding how any affected area will be delineated, protected, investigated and assessed
 - The qualifications and competencies of the person appointed to oversee the works
 - The preparation of a method statement for how the contamination will be dealt with or remediated (as appropriate)
 - An escalation policy describing when and how any notifications and approvals will be agreed with the LPA
 - Details of verification procedures for any mitigation or remediation works.

- GH09: Restrictions will be applied for any work within Groundwater Source Protection Zones (SPZs) 1 and 2 and discussed with the Environment Agency. Restrictions may include:
 - Construction vehicle parking, fuel storage, de-icer storage, rock salt storage, and washout/ cleaning of ready-mix concrete vehicles and equipment will be sited outside SPZ1 and where practicable outside SPZ2 designations
 - Application of salt grit (for example, to prevent access tracks freezing) to comply with recommended rates in CIRIA 648 (2006) with control of runoff during any application in SPZs
- GH10: Where specific sites within the Order Limits have been assessed in the ES as presenting a moderate (or above) risk to sensitive receptors from potential existing contamination, as shown on Figure 9.6: Sites with a Moderate or Above Risk Classification (S-P-R linkage) from existing contamination (document reference 6.9.F6), and there is potential for ground disturbance at the sites during the construction of the Project, these sites will be individually investigated and assessed (in accordance with guidance described within Land Contamination Risk Management (LCRM) (Environment Agency, 2023a)) prior to construction. This will inform the assessment of the risks to receptors, and good practice measures and working methods to control those risks will be developed. The results will be discussed, and the nature and scope of any mitigation or remediation will be agreed with the Environment Agency and LPA (as appropriate). Made ground and materials known to be or strongly suspected of being contaminated will be segregated from natural and inert materials; and ground arisings determined as unsuitable for reuse within the Project will be disposed of appropriately, for example to a soil treatment centre or landfill
- GH11: At trenchless crossings, and where otherwise indicated in the ES, within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3), a Hydrogeological Risk Assessment will be undertaken to assess the specific risks to groundwater and groundwater receptors (including the risk of breakout of drilling fluids and turbidity, where appropriate) 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
- GH12: The provision of a drilling fluid breakout method statement, where horizontal directional drilling is proposed at trenchless locations, will be developed by the Main Works Contractor(s), and will be informed by sufficient appropriate ground investigation and will include:
 - Detailed and appropriate design of all trenchless crossings including demonstration of a suitable drilling profile and depth to mitigate the risk of breakout
 - Description of drilling procedure and demonstration of suitability, including removal of borehole cuttings during drilling
 - Annular pressure monitoring
 - Regular walkovers of the drill path to check for visible evidence of breakouts
 - Measures to limit the volume of the drilling fluid loss

- Measures to contain the lost drilling fluid
- Measures to remove the lost drilling fluid
- Measures to seal the area of the breakout
- Measures to provide any remediation, if appropriate.

9.6.7 The Outline CoCP (document reference 7.2) is secured by Requirement 4 in the draft DCO (document reference 3.1) which requires the Main Works Contractor(s) to prepare the CoCP to discharge the Requirement.

Additional Mitigation

9.6.8 Additional mitigation comprises measures over and above any embedded and standard mitigation measures, for which assessment within this Contaminated Land, Geology and Hydrogeology assessment has identified a requirement to further reduce significant environmental effects.

9.6.9 No additional mitigation measures, beyond the embedded and standard measures identified above, are required.

9.7 Residual Effects

9.7.1 The likely significant effects of the Project have been assessed using current available data relating to both the construction and operation (and maintenance) phases of the Project. The residual effects are outlined below. As previously stated, this section assumes that all mitigation – embedded (design measures) and standard practice - are in place before assessing the effects. This is in accordance with guidance from IEMA as part of preparing a proportional assessment (IEMA, 2024). No additional measures have been identified as required at this stage.

Construction

Contaminated Land

Disturbance and Mobilisation of Existing Contamination

9.7.2 Where significant sources of potential contamination exist within the Order Limits, there is a risk of exposure of sensitive receptors to contamination, if disturbed (e.g., excavations), or mobilised through the creation of new pathways (e.g., piling).

9.7.3 A baseline assessment and contamination preliminary risk assessment (PRA) has been undertaken in accordance with the process of contamination risk assessment defined within LCRM (Environment Agency, 2023a) and is presented within Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1). The PRA has identified a generally ‘very low/low risk’ of significant existing contamination to be present within most of the Order Limits. A worst case ‘very high’ risk has been identified within small discrete sections of the Order Limits.

9.7.4 Where specific sites within the Order Limits have been assessed in the PRA as presenting a moderate (or above) risk to sensitive receptors from potential contamination, further assessment of these sites has been undertaken to determine

the likelihood of the Project interacting with these sites and causing ground disturbance.

- 9.7.5 The following sites have been identified as presenting a moderate and above risk that requires additional assessment, and the locations of these sites are shown on Figure 9.6: Sites with a Moderate or Above Risk Classification (document reference 6.9.F6):
- PSC B1 – Rookery Farm – Historical landfill (Section B)
 - PSC B5 – Bramford Substation (Section B)
 - PSC C3 – Former RAF Raydon (Section C)
 - PSC D1 – Former RAF Boxted (Section D).
- 9.7.6 In accordance with the requirements of commitment GH10, included within the Outline CoCP (document reference 7.2), prior to construction, each site listed above will be individually investigated and assessed in accordance with LCRM (Environment Agency, 2023a) to determine any additional mitigation measures or remediation requirements. The nature and scope of any mitigation or remediation would be agreed with the Environment Agency and LPA (as appropriate).
- 9.7.7 In addition, the PRA will be reviewed once the detailed design of the Project is available to ensure that the assumptions made within the risk assessment are still valid. If they are not still valid, and additional sites are identified, they will be required to be investigated in accordance with commitment GH10 to determine any additional mitigation measures or remediation requirements.
- 9.7.8 There are also standard mitigation measures within the Outline CoCP (document reference 7.2) that relate to the use of appropriate PPE (commitment GH03), appropriate training for construction workers (commitment GH04) and a protocol for dealing with unexpected contamination (commitment GH08). In addition, a FWRA (commitment GH02) would be undertaken at areas where piled foundations are proposed to ensure that new pathways for any contamination present will not be created.
- 9.7.9 Therefore, with the measures contained within the Outline CoCP (document reference 7.2) the potential temporary construction impacts from existing contamination are considered to be very small and it is considered that for groundwater receptors (**very high to negligible sensitivity**) and construction workers (high sensitivity), this would result in an overall **negligible effect**, which would be **not significant**.
- [Introduction of New Contamination at Trenchless Crossings](#)
- 9.7.10 Pollution releases and the introduction of new sources of contamination into the environment (for example uncontrolled leaks and spills from machinery) during construction of the Project have the potential to affect sensitive receptors. To mitigate this risk, standard mitigation and control measures are included within the Outline CoCP (document reference 7.2) (such as commitments GG24, GG25, GG26, GG32 and GG36) and will be implemented for the Project during the construction phase.
- 9.7.11 Commitment GH11 secures the requirement for Hydrogeological Risk Assessment to be undertaken at trenchless crossings, to assess the specific risks to groundwater and groundwater receptors, following detailed design. This will be supported by ground investigation and appropriate risk assessment secured by commitment GH01.

Commitment GH12 secures the requirement for a drilling fluid breakout method statement to be developed by the Main Works Contractor(s) in areas where HDD is proposed at trenchless crossings, which will be informed by the Hydrogeological Risk Assessment. Therefore, the risk to groundwater and groundwater receptors from the introduction of new contamination at trenchless crossings is considered to be low.

- 9.7.12 During construction of trenchless crossings there is also the potential to generate turbidity within any aquifers the crossings interact with. The risk to identified groundwater receptors such as abstractions from turbidity is generally considered to be low in the majority of the crossings. The Hydrogeological Risk Assessment for the River Stour trenchless crossings has identified a moderate/low risk at the northern River Stour crossing, due to the proximity of the SPZ1. However, with the implementation of commitments GH01, GH11 and GH12 within the Outline CoCP (document reference 7.2) the risks to groundwater and groundwater receptors can be reduced to low and very low.
- 9.7.13 Therefore, with the measures contained within the Outline CoCP (document reference 7.2), the potential temporary construction impacts from the introduction of new contamination (including breakout of drilling fluids) are considered to be very small. It is considered that for groundwater receptors (**very high to negligible sensitivity**), this would result in an overall **negligible effect**, which would be **not significant**.

Geology

Sites of Geological Importance

- 9.7.14 Sites of Geological Importance have not been identified within the Order Limits where construction activities are proposed to take place. While Sites of Geological Importance have been identified within the Study Area, construction activities (and therefore physical ground disturbance) are not anticipated within the boundary of the Sites of Geological Importance, and therefore there is no potential for damage to or loss of these sites.
- 9.7.15 Therefore, there would be no change from the baseline conditions on Sites of Geological Importance (**very high and medium sensitivity**), which would result in **no effect**, which would be **not significant**.

Minerals

- 9.7.16 The Order Limits have been identified to cross a limited number of existing mineral extraction sites (with a very high sensitivity). However, the Project has sought to avoid direct interactions with existing minerals sites, where practicable, as described within Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2). In addition, discussions with the existing minerals operators are ongoing to agree appropriate mitigation for any potential impacts on these sites.
- 9.7.17 Therefore, the temporary construction impacts on existing minerals infrastructure (**very high sensitivity**) would be very small. This would result in a **minor effect** which would be **not significant**.
- 9.7.18 A number of candidate minerals sites are also located within the Study Area and National Grid has and will continue to engage with the mineral proposers to discuss potential mitigations if appropriate. In addition, a number of alternatives have been

identified, as described in Chapter 4: Project Description (document reference 6.4) and Section 9.9 below, to enable flexibility within the Project if candidate sites do become allocated within a future minerals plan. The Project design and evolution has sought to reduce potential impacts on the silica sand site near Ardleigh as far as practicable.

- 9.7.19 Therefore, the temporary construction impacts on candidate minerals sites (**medium sensitivity**) are considered to be very small, which would result in a **negligible effect** on candidate minerals sites which is considered **not significant**.
- 9.7.20 The effects from the sterilisation of minerals within the wider MSA and MCA is described in the operation (and maintenance) section below to avoid double counting of effects.

Hydrogeology

Changes to Groundwater Levels and Flow from Dewatering

- 9.7.21 Dewatering during construction could affect groundwater due to potential changes in groundwater levels and flows, which could have a potential impact on surrounding sensitive receptors, such as groundwater abstractions, and result in significant effects.
- 9.7.22 The groundwater risk assessment presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) has assessed the potential impacts from dewatering and informs the impact assessment presented in this section.
- 9.7.23 The groundwater risk assessment concluded that for large areas of new overhead line, groundwater is anticipated to be below the base of the excavations required to construct the pylon bases. Therefore, in conjunction with the relatively small footprint of such excavations, large-scale dewatering (where groundwater is actively lowered below a specific pre-planned level) is not anticipated to be required and consequently changes to groundwater levels and flows is not anticipated. Following completion of ground investigation and the detailed design of the Project, if dewatering is proposed for any locations of new overhead line, then a Hydrogeological Risk Assessment in accordance with commitment GH11 within the Outline CoCP (document reference 7.2) will be undertaken. Therefore, within areas of overhead line, the temporary construction impacts on groundwater and groundwater receptors (**very high to negligible sensitivity**) would be very small. This would result in a **negligible effect** which would be **not significant**.
- 9.7.24 The groundwater risk assessment concluded that for the majority of the open cut trenches, groundwater is anticipated to be below the base of the relatively shallow excavations required. Therefore, large-scale dewatering (where groundwater is actively lowered below a specific pre-planned level) is not anticipated to be required within open cut sections and consequently changes to groundwater levels and flows are not anticipated. Following completion of ground investigation and the detailed design of the Project, if dewatering is proposed for any locations within open cut trenches, then a Hydrogeological Risk Assessment in accordance with commitment GH11 within the Outline CoCP (document reference 7.2) will be undertaken. Therefore, within areas of open cut trenches, with the implementation of the commitments outlined above, the temporary construction impacts on groundwater

and groundwater receptors (**very high to negligible sensitivity**) would be very small. This would result in a **negligible effect** which would be **not significant**.

9.7.25 The risk assessment concluded that at trenchless crossing locations, for HDD or the direct pipe method of installation, either groundwater is unlikely to be intercepted by the relatively shallow launch/receptor pits or there are no groundwater receptors within the radius of influence of any potential drawdown from dewatering and therefore impacts on sensitive groundwater abstractions are not anticipated. In relation to the pipe jacking method of installation, dewatering that actively lowers the groundwater table is unlikely to be required, therefore there is unlikely to be an impact on sensitive groundwater receptors. In accordance with commitment GH01 within the Outline CoCP (document reference 7.2) ground investigation, including groundwater monitoring, will be undertaken for the Project, to support the detailed design. Commitment GH11 also requires a Hydrogeological Risk Assessment to be undertaken for each trenchless crossing following detailed design. Therefore, within the areas of trenchless crossing, the temporary construction impacts on groundwater and groundwater receptors (**very high to negligible sensitivity**) would be very small. This would result in a **negligible effect** which would be **not significant**.

9.7.26 The following locations/receptors have already been identified as requiring Hydrogeological Risk Assessment, in accordance with commitment GH11 within the Outline CoCP (document reference 7.2), following ground investigation, in accordance with commitment GH01 within the Outline CoCP, and the detailed design of the Project:

- Abbotsfield, Ardeigh - Licensed Groundwater Abstraction (Licence number: 8/37/25/*G/0336)
- Two wells located at Sutton Hall Farm – Licensed Groundwater Abstraction (Licence number 8/37/25/*G/0236)
- Six Wellpoints – Rivenhall – Licensed Groundwater Abstraction (Licence number: 8/37/31/*G/0187)
- Bore at Palgrave Farm, Stowupland – Deregulated Groundwater Abstraction (Licence number: 7/35/08/*G/0086)
- Well at Gibbon's Farm, Battisford – Deregulated Groundwater Abstraction (Licence number: 7/35/08/*G/0042)
- Malting Farm, Ardeigh – Deregulated Groundwater Abstraction (Licence number: 8/37/25/*G/0104) and Malting Farm Private Water Supply
- Borehole at Glebe Cottage – Deregulated Groundwater Abstraction (Licence number: 8/37/25/*G/0306)
- No 2 Private Water Supply in South Norfolk
- Friesian Bungalow, 2 Wick Cottages and 1 Wick Cottages Private Water Supply in Tendring
- Fountains Farm, Ardeigh BGS Water Well Data set.

9.7.27 With the implementation of the commitments outlined above, the temporary construction impacts on groundwater and groundwater receptors (**high to low sensitivity**) would be very small. This would result in a **negligible effect** which would be **not significant**.

Creation of New Groundwater Flow Pathways and Connection of Aquifers

- 9.7.28 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced by piling or through permeable backfill material, allowing movement of existing contamination or mixing of aquifers.
- 9.7.29 The groundwater risk assessment presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) has assessed the potential impacts from the creation of new flow pathways and informs the impact assessment presented in this section.
- 9.7.30 Appendix 9.1: Baseline Information and Preliminary Contamination Risk Assessment (document reference 6.9.A1) has identified a generally very low/low risk of significant existing contamination being present within the majority of the Order Limits.
- 9.7.31 Where the potential for contamination has been identified in a small number of discrete sites, these areas will be investigated and assessed in accordance with the requirements of commitment GH10, within the Outline CoCP (document reference 7.2) prior to construction, to determine any additional mitigation measures or remediation requirements.
- 9.7.32 In addition, commitment GH02 in the Outline CoCP (document reference 7.2) requires the selection of appropriate piling techniques (to minimise the risk of the creation of new flow pathways) and requires a FWRA to be undertaken at all locations where piling is proposed. Therefore, risks associated with the creation of new flow/contamination pathways are expected to be very low.
- 9.7.33 The groundwater risk assessment presented in Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) also concludes that the open cut trenches are unlikely to connect two aquifer units due to the shallow depth of the excavations required and the anticipated depth of the groundwater (below the base of the excavations). The assessment also concluded that trenchless crossings are unlikely to connect aquifer units that were previously unconnected as the crossings either predominantly cross through a single stratum or between strata with a significant permeability difference which would inhibit groundwater movement between the two.
- 9.7.34 Therefore, the temporary construction impacts on groundwater and groundwater receptors (**very high to negligible sensitivity**) are considered to be very small, which would result in a **negligible** effect, which would be **not significant**.

Operation (and Maintenance)

Geology

Sites of Geological Importance

- 9.7.35 Sites of Geological Importance have not been identified within the Order Limits. While Sites of Geological Importance have been identified within the Study Area, activities related to operation (and maintenance) of the Project are not anticipated within the sites identified, and therefore there is no potential for physical damage to or loss of these sites.

- 9.7.36 Therefore, there would be no change from the baseline conditions on Sites of Geological Importance (**very high and medium sensitivity**), which would result in **no effect**, which would be **not significant**.

Minerals

- 9.7.37 The MRIA presented in Appendix 9.2: Qualitative Minerals Resource and Infrastructure Assessment (document reference 6.9.A2) identifies that the Order Limits cross through a number of MSA and MCA for sand and gravel and/or brick clay.
- 9.7.38 The MSA and MCA both extend beyond the Order Limits, across substantial areas of Norfolk, Suffolk, and Greater Essex. The MRIA concludes that even if the full extent of the Order Limits within an MSA/MCA were to sterilise minerals of sufficient quality and extent to be economically valuable, the extent of the sterilised area is very small in comparison to the extent of the MSAs/MCAs (<1.5%). The actual areas where built development aspects of the Project would effectively sterilise any valuable mineral are significantly smaller still. In consideration of this, and the constraints surrounding prior or incidental extraction (as described in the MRIA), it is considered that the quantity of mineral likely to be sterilised by the Project is not significant.
- 9.7.39 In addition, whilst there are sand and gravel deposits safeguarded within the Order Limits, the existence, extent, and quality of such are not proven and are anticipated to be highly variable. Therefore, not all the safeguarded areas may contain mineral, or mineral of sufficient quality or economic value.
- 9.7.40 Further, any potential mineral sterilisation can be considered to be temporary, as although during the operational lifetime of the Project some areas of the mineral could not be feasibly extracted (beneath the built elements), on decommissioning, the infrastructure could be removed and access to the underlying mineral restored.
- 9.7.41 Therefore, the operation (and maintenance) impacts on minerals are considered to be very small, based on the assessment presented within the MRIA. For safeguarded minerals resources (**medium sensitivity**), this would result in a **negligible effect** which is considered **not significant**.

9.8 Monitoring

- 9.8.1 No monitoring requirements have been identified as no likely significant effects on Contaminated Land, Geology and Hydrogeology receptors have been reported.

9.9 Sensitivity Testing

- 9.9.1 Sensitivity testing has been undertaken as described in Chapter 5: EIA Approach and Method (document reference 6.5) to determine if delays or an extension to the construction programme, changes to the design within the Limits of Deviation (LoD) or if any of the design scenarios presented in Table 4.4 in Chapter 4: Project Description (document reference 6.4) would affect the assessment.

Flexibility in Construction Programme

- 9.9.2 This chapter assumes the base construction schedule described in Chapter 4: Project Description (document reference 6.4) for the purposes of the assessment. Sensitivity testing considering alternative Project phasing, such as a later

construction start date, has shown that there would be no new or different significant effects to those identified in the baseline scenario.

Flexibility in Design

Flexibility within the Limits of Deviation

- 9.9.3 The assessment presented within Section 9.7 has assumed the alignment as shown on Figure 4.1 Proposed Project Design (document reference 6.4.F1) and Figure 4.2: Proposed Project Design - Permanent Features (document reference 6.4.F2) and has assessed the associated Limits of Deviation (LoD) of the Project.
- 9.9.4 It should be noted that as described in Chapter 4: Project Description (document reference 6.4), the Proposed Alignment is not fixed and could be subject to change within the defined LoD shown on the Works Plans (document reference 2.3).
- 9.9.5 Sensitivity testing considering alternative pylon locations and underground cable routes within the proposed LoD, indicates that there would be no new or different likely significant effects as a result of the pylons or underground cables being placed in a different location, assuming they remain outside of areas assessed as having a moderate or above risk of contamination. If design changes subsequently require pylon locations or underground cable route through areas assessed as having a moderate or above risk of contamination, then further risk assessment would need to be undertaken in accordance with the mitigation measures within the Outline CoCP (document reference 7.2). If additional areas of undergrounding or trenchless crossings are required, investigation and risk assessment in accordance with commitments GH01, GH11 and GH12 (as appropriate) will need to be undertaken for each location.

Flexibility within the Order Limits

- 9.9.6 There are 19 locations where design scenarios have been identified within Chapter 4: Project Description (document reference 6.4). The effects of the design scenarios that would result in different effects on contaminated land, geology and hydrogeology receptors in comparison with the Project have been addressed below. The remaining scenarios have either been considered in the assessment already undertaken, such as the minerals sites or would have no effect on the assessment presented.

River Stour crossing west of Stratford St Mary (Section C)

- 9.9.7 The current assessment has assumed a double crossing of the River Stour. The design scenario of a single crossing to the east would not change the impacts presented within Section 9.7. However, a single crossing to the west would mean that the crossing would interact with the SPZ1 and bring the crossing closer to the groundwater abstraction point, although it is assumed that all intrusive works will remain outside of the SPZ1. The assessment presented within Appendix 9.3: Groundwater Baseline and Qualitative Groundwater Risk Assessment (document reference 6.9.A3) still remains valid and the significance of the effects identified are unlikely to change assuming all mitigation measures and commitments that are included within the Outline CoCP (document reference 7.2) are followed.

Abbreviations

Abbreviation	Full Reference
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BS	British Standard
CGS	County Geodiversity Site
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CoCP	Code of Construction Practice
CSE	Cable Sealing End
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DMRB	Design Manual for Roads and Bridges
EC	European Commission
ECS	Environmental Capacity Statement
EIA	Environmental Impact Assessment
ES	Environmental Statement
FWRA	Foundation Works Risk Assessment
GCR	Geological Conservation Review
GPLC	Guiding Principles for Managing and Reducing Land Contamination
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HDD	Horizontal Directional Drilling
IEMA	Institute of Environmental Management and Assessment
LCRM	Land Contamination Risk Management
LGS	Local Geological Site
LoD	Limits of Deviation
LPA	Local Planning Authority
MAGIC	Multi-Agency Geographic Information for the Countryside
MCA	Mineral Consultation Area

Abbreviation	Full Reference
MPA	Mineral Preferred Area
MRIA	Minerals Resource and Infrastructure Assessment
MSA	Mineral Safeguarding Area
NMWDF	Norfolk Minerals and Waste Development Framework
NNR	National Nature Reserve
NPS	National Policy Statement
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
PSC	Potential Source Contamination
RAF	Royal Air Force
RBMP	River Basin Management Plan
RIGS	Regionally Important Geological Site
SAC	Special Area of Conservation
SMWLP	Suffolk Minerals and Waste Local Plan
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
WFD	Water Framework Directive

Glossary

Term	Definition
Aquifer	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Bedrock geology	Solid rock formations underlying superficial deposits
Break out / Frac out	Unplanned losses of drilling fluids
British Geological Survey	A public sector organisation responsible for advising the UK government on all aspects of geoscience as well as providing impartial geological advice to industry, academia and the public.
Contaminated Land	As defined under Part 2a of the Environmental Protection Act 1990, ' <i>land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that – (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused</i> '.
Drinking Water Safeguard Zone	Area established around public water supplies where additional pollution control measures are needed to reduce and prevent pollution of water abstracted for drinking water supplies.
Dewatering	The removal of groundwater (e.g. by pumping) to keep a below-ground works area dry. This can be used during construction of the underground cable sections.
Environmental Statement (ES)	The main output from the Environmental Impact Assessment (EIA) process, an ES is the report required to accompany an application for development consent (under the EIA Regulations) to inform public and stakeholder consultation and the decision on whether a project should be allowed to proceed. The EIA Regulations set out specific requirements for the contents of an ES for Nationally Significant Infrastructure Projects.
Groundwater	Water that is in the ground. This usually refers to water in the saturated zone below the water table.
Historical Landfill	Locations where there are records of waste being received to be buried but which are now closed. This information is collated from data held by Local Authorities, the former Department of the Environment, British Geological Survey and the Environment Agency suspended authorised landfill licences.
Land contamination	As defined by Land Contamination Risk Management (LCRM) (Environment Agency, 2023a) ' <i>all land affected by contamination which may or may not meet the statutory definition of Contamination Land</i> '.

Term	Definition
Local Geological Sites	A non-statutory designation for regionally important geological and geomorphological sites that have been identified as being of importance locally.
National Planning Policy Framework	The National Planning Policy Framework sets out the government's planning policies for England and how these should be applied. The Planning Practice Guidance to support the framework is published online and regularly updated.
Hydrogeology	The properties of groundwater in superficial and bedrock geology.
Order Limits	The maximum extent of land within which the Project may take place.
Overhead line	Conductor (wire) carrying electric current, strung from pylon to pylon.
Pylons	Structures that support the overhead line (conductors). There are two types of pylons: suspension (line), where the conductors are simply suspended from the pylon, and tension (angle).
Principal Aquifer	Rock layers that provide significant quantities of drinking water, and water for business needs. They also support rivers, lakes and wetland.
Receptor	The physical resource or user group that would respond to an effect, e.g. somebody or something adversely affected by a pollutant.
Secondary A Aquifer	Permeable layers that can support local water supplies and may form an important source of base flow to rivers.
Secondary B Aquifer	Mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks and openings or eroded layers.
Secondary Undifferentiated Aquifer	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.
Source Protection Zone	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.
Source Protection Zone 1	The inner zone from which it takes groundwater fifty days to travel to a groundwater abstraction point.
Source Protection Zone 2	The outer zone from which it takes 400 days for groundwater to travel to a groundwater abstraction point.
Source Protection Zone 3	The total catchment, which is the area around an abstraction point within which all the groundwater ends up at the abstraction.
Substation	Substations are used to control the flow of power through the electricity system. They are also used to change (or transform) the voltage from a higher to lower voltage to allow it to be transmitted to local homes and businesses.

Term	Definition
Superficial geology	Uncemented sediments, such as alluvium, immediately beneath the soil and above the bedrock.
Trenchless crossing	A crossing installation method that has limited above ground disturbance which is used to avoid a sensitive feature such as a environmental feature (e.g. road or river).
Underground cabling	An insulated conductor carrying electric current designed for underground installation. Underground cables link together two Cable Sealing End compounds.
Unproductive Strata	Geological strata that is largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.

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National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com