



**NORTH FALLS**

*Offshore Wind Farm*

# **PRELIMINARY ENVIRONMENTAL INFORMATION REPORT**

## **Chapter 19 Ground Conditions and Contamination**

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*Date: May 2023*

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## Glossary of Acronyms

BGS	British Geological Survey
CDM	Construction Design Management
CEA	Cumulative Effects Assessment
CLR11	Contaminated Land Report 11
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazard Sites
COSHH	Control of Substances Hazardous to Health
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ERP	Emergency Response Plan
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
GPCL	Guiding Principles for Contaminated Land
HDD	Horizontal Directional Drilling
HRA	Habitats Regulation Assessment
HVAC	High Voltage Alternative Current
LNR	Local Nature Reserve
LoGS	Local Geological Sites
LoWS	Local Wildlife Sites
MCA	Mineral Consultation Area
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MIIA	Mineral Infrastructure Impact Assessment
MLP	Minerals Local Plan
MPS	Minerals Policy Statement
MRA	Minerals Resource Assessment
MSA	Mineral Safeguarding Area
MWPA	Minerals and Waste Planning Authority
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NVZ	Nitrate Vulnerable Zone
PAH	Polycyclic Aromatic Hydrocarbon

PCB	Polychlorinated Biphenyl
PCOC	Potential Contaminants of Concern
PEIR	Preliminary Environmental Information Report
PFA	Perfluoroalkyl and Polyfluoroalkyl Substances
PINS	Planning Inspectorate
PPE	Personal Protective Equipment
PPG	Planning Practice Guidance
PRA	Preliminary Risk Assessment
PRoW	Public Rights of Way
RAMS	Recreational disturbance Avoidance and Mitigation Strategy
RoFRaS	Risks of Flooding from Rivers and Sea
SAC	Special Area of Conservation
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
UK	United Kingdom
WCA	Waste Consultation Area
WFD	Water Framework Directive

## Glossary of Terminology

Cable construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway.
Haul road	The track along the onshore cable route used by construction traffic to access different sections of the onshore cable route.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Jointing bay	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The location where the offshore cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the onshore export cables housing low voltage electrical earthing links.
Onshore cable corridor(s)	Onshore corridor(s) within which the onshore export cables and associated infrastructure will be located. A final onshore cable route for which consent will be sought will be selected from within these corridor(s).
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore project area	The boundary in which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and National Grid substation extension), as considered within the PEIR.
Onshore scoping area	The boundary in which all onshore infrastructure required for the Project will be located, as considered within the North Falls EIA Scoping Report.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
Onshore substation zone	Area within which the onshore substation will be located.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition joint bay	Underground structures that house the joints between the offshore export cables and the onshore export cables
Trenchless crossing compound	Areas within the cable corridor(s) which will house and facilitate trenchless crossing (e.g. HDD) entry or exit points.
Principal Aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.



Secondary A Aquifer	These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifer	These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Unproductive Strata	These are predominantly rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Source Protection Zone 1 (SPZ1)	Inner protection zone - defined as the 50-day travel time from any point below the water table to the abstraction source. This zone has a minimum radius of 50 metres.
Source Protection Zone 2 (SPZ2)	Outer protection zone - defined by a 400-day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the abstraction source, depending on the size of the abstraction.
Source Protection Zone 3 (SPZ3)	Source catchment protection zone - defined as the area around an abstraction source within which all groundwater recharge is presumed to be discharged at the abstraction source.
Mean High Water Springs	Mean High Water Springs is the average height throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest (Spring tides).

## 19 Ground Conditions and Contamination

### 19.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the likely significant effects of the North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') on ground conditions and contamination. The chapter provides an overview of the existing environment for the proposed onshore project area, followed by a preliminary assessment of likely significant effects for the construction, operation, and decommissioning phases of the Project.
2. This chapter has been written by Royal HaskoningDHV, with the assessment undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effect Assessment (CEA) are presented in Section 19.4.
3. The assessment should be read in conjunction with following linked chapters (Volume I):
  - Chapter 21 Water Resources and Flood Risk;
  - Chapter 22 Land Use and Agriculture;
  - Chapter 23 Onshore Ecology; and
  - Chapter 28 Human Health.
4. Additional information to support the ground conditions and contamination assessment includes:
  - Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (Volume III).

### 19.2 Consultation

5. Consultation with regard to ground conditions and contamination has been undertaken in line with the general process described in Chapter 6 EIA Methodology (Volume I). The key elements to date have included scoping and the ongoing technical consultation via the Water Resources, Flood Risk, Land Quality and Geology Expert Topic Group (ETG). The feedback received has been considered in preparing the PEIR. Table 19.1 provides a summary of how the consultation responses received to date have influenced the approach that has been taken.
6. This chapter will be updated following the consultation on the PEIR in order to produce the final assessment, which will be presented in an Environmental Statement (ES) that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report as part of the DCO application.

**Table 19.1 Consultation responses**

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
Affinity Water Ltd	29/07/2021 Scoping Opinion	At this stage, no comments. Concern will only be at the point of landfall and associated development in terms of connections to existing grid infrastructure; in those instances, Affinity Water will want to ensure there are no potential contamination issues.	It is acknowledged that there are potable water supply pipes operated by Affinity Water within and surrounding the onshore project area. A review of the existing environment, including identification of potential sources of contamination, is discussed within Table 19.10 and Table 19.11 of this chapter. Further details on these parameters are provided within Appendix 19.1 (Volume III).  Impacts, including the potential to introduce contaminants to the onshore project area and mitigation measures to reduce the significance of effect to the surrounding environment, are set out in Table 19.3 and Sections 19.6.1 and 19.6.2.
Environment Agency	16/08/2021 Scoping Opinion	We are pleased to see that the report has scoped in Ground Conditions and Contamination. We agree with the proposals to establish baseline conditions and undertake a PRA. This will assist in determining the need for intrusive investigation and subsequently, remediation.	The existing environment is discussed within Table 19.10 of this chapter and within Appendix 19.1 (Volume III). Embedded mitigation measures are discussed in Table 19.3. Impacts, including potential additional mitigation measures, are set out in Sections 19.6.1 and 19.6.2.
Essex County Council	20/08/2021 Scoping Opinion	Whilst we note that non-statutory designated sites have not been requested at this stage, we highlight that details of Local Geological Sites (LoGS) should be requested from GeoEssex for the onshore geology assessment in addition to onshore ecology chapter needing details of Local Wildlife Sites (LoWS).  Please add GeoEssex to the list of stakeholders to be consulted and onshore geology added to the ES scope for assessment.	A review of LoGS, recorded on the GeoEssex website, within the onshore project area has been undertaken as part of the preparation of this chapter (Table 19.10, see also Figure 19.4 (Volume II) which illustrates the location of LoGS in relation to the onshore project area).
		[Essex County Council (ECC)] is the host Minerals and Waste Planning Authority in the two tier administrative area of Essex. The Essex Minerals Local Plan - Adopted July 2014 concerns the administrative area of Essex, and seeks to ensure a local supply of aggregates for the County is retained for as planned growth.  The Essex and Southend on Sea Waste Local Plan - Adopted October 2017 concerns the administrative area of Essex and Southend on Sea only.  Both the above are Adopted material planning considerations.	The existing environment, including the identification of Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA), is discussed in Table 19.10. Potential impacts to these areas during the construction, operational and decommissioning phases of North Falls are discussed within Section 19.6.
		The onshore 'project area' forms the basis for the minerals and waste safeguarding assessment set out below. It is recognised that the 'project area' takes the form of a large	Engagement with the Essex Minerals and Waste Planning Authority would be undertaken to aid in

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		<p>Area of Search within which it is intended to locate onshore equipment associated with the offshore windfarm and that there is no intention to develop anything approaching the full extent of the area.</p> <p><b>Safeguarding Mineral Resources</b></p> <p>Within the Area of Search, there lies approximately 6819.7ha of land which is designated as a Mineral Safeguarding Area (MSA) for sand and gravel. Depending on the final location and land-take of the on-shore element of the proposal, the application may trigger Policy S8 of the Essex Minerals Local Plan 2014 (MLP). The MLP can be viewed on the County Council's website via the following link: <a href="https://www.essex.gov.uk/minerals-waste-planning-policy/minerals-local-plan">https://www.essex.gov.uk/minerals-waste-planning-policy/minerals-local-plan</a></p> <p>Policy S8 of the MLP requires that a non-mineral proposal located within an MSA which exceeds defined thresholds must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a mineral resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that mineral to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (Paragraph 210). The NPPF requires policies that encourage the prior extraction of mineral where it is practical and environmentally feasible.</p> <p>The threshold set out in Policy S8 of the MLP for sand and gravel is 5ha, and the policy therefore applies if the proposed non-mineral development covers 5ha or more of land covered by a MSA designation. Policy S8 states that "... Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development or Preferred Mineral site allocation shall be opposed."</p> <p>Where non-mineral development proposals are made which intersect with 5ha or more of sand and gravel, a Minerals Resource Assessment (MRA) is required as part of the planning application to establish the practicality and environmental feasibility of the prior extraction of mineral such that the resource is not sterilised where this can be avoided. If found to be practical and environmentally feasible, prior extraction is expected to take place ahead of sterilisation by non-mineral development.</p> <p>The relationship between the sand and gravel MSA and the project area is shown in Appendix One.</p> <p>The scope and level of detail of a Minerals Resource Assessment will be influenced by the specific characteristics of the site's location, its geology, and the nature of the development being applied for. However, a number of key requirements can be identified which are likely to satisfy the MWPA that the practicality and environmental feasibility of prior extraction have been suitably assessed in the MRA. The detail to be provided should be in</p>	<p>identifying potential mitigation measures during the construction and operational phases of North Falls. Potential mitigation measures include undertaking Minerals Resource Assessments and Mineral Infrastructure Impact Assessment. These potential measures are discussed within Section 19.6.</p>

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		<p>proportion to the nature of the proposed application. The MWPA welcomes early engagement to clarify the requirements of MRA.</p> <p>To ensure that a comprehensive assessment of the mineral resource at risk of sterilisation is undertaken, it is recommended that:</p> <ul style="list-style-type: none"> <li>- Any questions regarding the scope of an MRA are discussed with the MWPA as early as possible;</li> <li>- a draft borehole location plan is agreed prior to commencement, and preferably as part of pre- application;</li> <li>- the borehole depths should be sufficient to prove the depth of the safeguarded deposit;</li> <li>- borehole analysis must note the depth of the water table;</li> <li>- a non-stratified sampling technique is applied. An initial spacing of approximately 100m-150m centre to centre should be considered, with additional locations if required to determine the extent of deposits on site; and</li> <li>- The MRA provides documented evidence confirming any commercial interest in working the resource at risk of sterilisation based on its quality, quantity, and viability of prior extraction.</li> </ul> <p>The MRA should be prepared using the Pan-European Standard for Reporting of Exploration Results, Mineral Resources and Reserves (PERC) Standard, which was revised and published on 23 May 2013.</p> <p>Any application, through a MRA or otherwise, is required to be submitted with sufficient information such that the issues raised through Policy S8 of the MLP can be appropriately considered.</p> <p>The project area passes through a number of Mineral Consultation Areas as shown in Appendix One and listed in Appendix Two. With regard to Mineral Consultation Areas, Policy S8 of the MLP seeks to ensure that existing and allocated mineral sites and infrastructure are protected from inappropriate neighbouring developments that may prejudice their continuing efficient operation or ability to carry out their allocated function in the future. Policy S8 of the MLP defines Mineral Consultation Areas as extending up to 250m from the boundary of an infrastructure site or allocation for the same.</p> <p>Due to the proposed project passing through a Mineral Consultation Area, a Mineral Infrastructure Impact Assessment (MIIA) is required as part of the planning application. The MWPA has designed a generic schedule of information requirements that should be addressed as relevant through an MIIA. The detail to be provided should be in proportion to the nature of the proposed application.</p>	

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		<p>A MIIA is expected to be evidence based and informed by quantified information. It is recognised that the requirements of an MIIA may be addressed through other evidence base documents, such as those addressing transport, odour and noise issues. In these instances, it would be acceptable for the MIIA to signpost to the relevant section of complementary evidence supporting the planning application. The MWPA welcomes early engagement to clarify the requirements of MIIA.</p>	
		<p>The project area passes through a number of Waste Consultation Areas shown in Appendix One. Its location within these Waste Consultation Areas means that the application is subject to Policy 2 of the Essex and Southend-on-Sea Waste Local Plan 2017 (WLP). The WLP can be viewed on the County Council's website via the following link: <a href="https://www.essex.gov.uk/minerals-waste-planning-policy/waste-local-plan">https://www.essex.gov.uk/minerals-waste-planning-policy/waste-local-plan</a></p>	<p>A waste assessment for the construction phase of North Falls will be completed and submitted as part of the final ES. The assessment will form an appendix to this chapter.</p>
		<p>Policy 2 of the WLP seeks to ensure that existing and allocated waste sites and infrastructure are protected from inappropriate neighbouring developments that may prejudice their continuing efficient operation or ability to carry out their allocated function in the future. Policy 2 defines Waste Consultation Areas as extending up to 250m from the boundary of existing or allocated waste infrastructure, unless they are Water Recycling Centres, where the distance increases to 400m.</p>	
		<p>Due to the proposed project passing through a Waste Consultation Area, a Waste Infrastructure Impact Assessment (WIIA) is required as part of the planning application. In order to satisfy the provisions of Policy 2, the MWPA has designed a generic schedule of information requirements that should be addressed as relevant within the supporting evidence of any application which falls within a Waste Consultation Area. The detail to be provided should be in proportion to the nature of the proposed application.</p>	
		<p>A WIIA is expected to be evidence based and informed by quantified information. It is recognised that the requirements of a WIIA may be addressed through other evidence base documents, such as those addressing transport, odour and noise issues. In these instances, it would be acceptable for the WIIA to signpost to the relevant section of complementary evidence supporting the planning application. The MWPA welcomes early engagement to clarify the requirements of WIIA.</p>	
		<p>This response deals with mineral policy matters and waste policy matters in turn. A spatial representation of the project area and the matters discussed can be found in Appendix One. A list of relevant designations and specific facilities which would potentially be affected are listed, with their most recent planning application reference where relevant, in Appendix Two.</p>	

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
Public Health England	13/08/2021 Scoping Opinion	<p>Land quality</p> <p>We would expect the applicant to provide details of any hazardous contamination present on site (including ground gas) as part of a site condition report and associated risk assessment.</p> <p>Emissions to and from the ground should be considered in terms of the previous history of the site and the potential of the site, during construction and once operational, to give rise to issues. Public health impacts associated with ground contamination and / or the migration of material off-site should be assessed in accordance with the Environment Agency publication Land Contamination: risk management and the potential impact on nearby receptors; control and mitigation measures should be outlined.</p>	<p>A review of the existing environment, including identification of potential sources of contamination, is discussed within Table 19.10 and Table 19.11 of this chapter. Further details on these parameters are provided within Appendix 19.1 (Volume III) which has been completed in line with the Environment Agency Land Contamination Risk Management guidance (Environment Agency, 2021), as well as other relevant land contamination guidance.</p> <p>Potential impacts during the construction and operation of North Falls are set out in Sections 19.6.1 and 19.6.2 of this chapter. The assessment methodology, including the legislation, guidance and policy, followed as part of the impact assessment can be found in Section 19.4.</p>
		<p>Waste</p> <p>The applicant should demonstrate compliance with the waste hierarchy (e.g. with respect to re-use, recycling or recovery and disposal).</p> <p>For wastes arising from the development the ES should assess:</p> <ul style="list-style-type: none"> <li>the implications and wider environmental and public health impacts of different waste disposal options</li> <li>disposal route(s) and transport method(s) and how potential impacts on public health will be mitigated</li> </ul> <p>If the development includes wastes delivered to the installation:</p> <ul style="list-style-type: none"> <li>Consider issues associated with waste delivery and acceptance procedures (including delivery of prohibited wastes) and should assess potential off-site impacts and describe their mitigation</li> </ul>	<p>A waste assessment for the construction phase of North Falls will be completed and submitted as part of the final ES. The assessment will form an appendix to this chapter.</p>
Planning Inspectorate	26/08/2021 Scoping Opinion	<p>Physical impacts on geological designated sites (SSSIs) during operation.</p> <p>Limited information is presented in the Scoping Report as a justification for scoping this matter out of the ES. The Inspectorate also notes that the Scoping Report identifies the potential for direct impacts to the Ardleigh Gravel Pit SSSI (designated for its geological interest) from construction activities including cable laying, which it is considered could potentially also result in permanent physical works within the SSSI.</p>	<p>A review of the existing environment, including the identification of designated sites, is discussed in Table 19.10 with further detail provided in Appendix 19.1 (Volume III). The review identified that there were no geological designated sites, nationally or locally, located within the onshore project area or the 250m buffer zone. Figure 19.4</p>



Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		<p>In addition, there is no consideration within the Scoping Report as to whether there could be indirect impacts to SSSIs designated for geological interest during operation, e.g. as a result of altered hydrogeology, for example paragraph 474 of the Scoping Report notes that subsurface flow patterns could be altered.</p> <p>The Inspectorate therefore does not agree to scope this matter out of the ES and considers that impacts to the Ardleigh Gravel Pit SSSI should be scoped into the ES.</p> <p>Section 3.5 of the Scoping Report also identifies a number of other SSSIs designated for the geological interest within proximity to the scoping boundary, including Holland on Sea Cliff (0.3km), Wivenhoe Gravel Pit (1.3km), St Osyth Pit (2.5km), Clacton Cliffs and Foreshore (2.7km) and The Naze (3.6km). These are not referenced as part of the description of the baseline within section 3.1 of the Scoping Report. Where there is potential for likely significant effects to occur during operation at these designated sites, they should also be scoped into the ES.</p>	<p>(Volume II) illustrates the locations of geological designated sites relative the onshore project area which has been refined since the production of the scoping report.</p> <p>As there are no geological designated sites located within the onshore project area, or within 250m, an assessment of the potential impacts during the operational phase of North Falls has not been included within this chapter.</p>
		<p>Loss, damage or sterilisation of mineral resources during decommissioning.</p> <p>Limited information is presented in the Scoping Report as a justification for scoping this matter out of the ES and no information is presented about the methods of decommissioning to be used, and whether these would result in any further loss, damage or sterilisation of mineral resources as compared to construction activity, which is scoped into the ES. As such the Inspectorate does not have sufficient information on which to conclude that significant effects are not likely and this matter should be scoped into the ES.</p>	<p>The potential effects associated with the loss, damage or sterilisation of mineral resources have been assessed for the construction and operational phases of North Falls in Section 19.6</p> <p>In relation to potential effects during the decommissioning phase, no decision has been made regarding the final decommissioning policy for North Falls as it is recognised that industry best practice, rules and legislation change over time. It is however, anticipated that the potential effects would be similar or less than those during construction.</p>
		<p>The ES should specify and describe the habitats / receptors that have been considered in the assessment of impacts to groundwater and surface water quality from contamination. The selection of receptors should be based on the potential for contamination pathways and likely significant effects to occur. This should include consideration of receptors beyond the scoping boundary where an impact pathway is identified, for example Hamford Water SPA, Ramsar and SAC and Stour and Orwell Estuaries SPA.</p>	<p>The existing environment, including environmentally sensitive areas / receptors, is discussed in Table 19.10. Impacts to the ecologically designated sites are set out in Section 19.6.1 and 19.6.2 with further detail provided in Chapter 23 Onshore Ecology (Volume I).</p>
		<p>The Scoping Report does not present a defined study area for assessment, but states that it will comprise the area within the DCO application boundary, plus a buffer of 250m for potential sources of contamination and a further 1km buffer for historical maps and groundwater and surface water abstraction points.</p>	<p>The onshore project area includes land located landward of Mean High Water Springs (MHWS). The study area for this chapter includes the land located both within the onshore project area (landward of MHWS) and a 250m buffer zone</p>



Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		In line with the Inspectorate's comments at ID 5.1.1 and 5.1.3, the study area used for the purposes of the assessment of this aspect should also be informed by an understanding of the likely contamination / impact pathways that exist. The study area should include the nearshore area and be of sufficient extent to enable an assessment of all likely significant effects arising from ground conditions and contamination, including where this extends into the offshore area."	(extending to 1km in relation to Control of Major Accident Hazard sites (COMAH)). An explanation of the study area, and justification, is provided within Section 19.3.1.
		The Scoping Report indicates that it is not proposed to undertake any intrusive site investigation to inform the assessment, relying instead on desk-based sources. The Inspectorate notes the potential presence of a range of contamination sources within the onshore scoping area and considers that limiting the approach to desk study only may not provide sufficient baseline information to inform the assessment. The Applicant should not rule out intrusive investigation and should instead seek to agree the approach to establishing baseline conditions with relevant consultation bodies, undertaking intrusive site investigation where it is deemed necessary to inform a robust assessment of significant effects.	Potential mitigation measures, including the undertaking of targeted ground investigations in areas of potential contamination, are discussed within Table 19.3 and Section 19.6. Any ground investigations that may be required to determine extent and source of contamination would be completed post consent, prior to the commencement of the construction phase. Following the completion of targeted ground investigations (if required), a generic quantitative risk assessment would be undertaken with recommendations included for further works should they be deemed necessary.
		The Inspectorate notes that loss, damage or sterilisation of mineral resources is scoped into the ES; however, limited information is presented as to the scope of the assessment and how effects would be determined. The assessment should take into account factors such as; the nature of the mineral resource, the constraints and opportunities that exist for extraction.	Potential impacts to these areas during the construction, operational and decommissioning phases of North Falls are discussed within Section 19.6.  Engagement with the Essex Minerals and Waste Planning Authority would be undertaken to aid in identifying potential mitigation measures during the construction and operational phases of North Falls. Potential mitigation measures to reduce the significance of effect are discussed within Section 19.3.3 of this chapter.
		The Inspectorate notes that the onshore scoping area passes through a mineral consultation area (MCA) and a waste consultation area (WCA); the baseline scenario should include relevant information about the features and emissions of any facilities associated with the MCA and WCA, e.g. noise, dust, odour, traffic, and lighting.	Details of the mineral resources present within the onshore project area are outlined in Table 19.10 (with additional detail provided in Appendix 19.1, Volume III). Potential impacts to identified resources during construction and operation are provided in 19.6.1.4 and 19.6.2.3 respectively.

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
			With regards to the WCA, a waste assessment for the construction phase of North Falls will be completed and submitted as part of the final ES.
		<p>Figure 1.3 Table 2.4 Designated sites.</p> <p>The Inspectorate notes the presence of Holland on Sea Cliff SSSI within the Scoping Study Area that has been designated for its geological interest. The ES should therefore identify the location of any other relevant statutory or non-statutory sites protected for their geological interest as part of the baseline studies. The ES should assess any likely significant effects on the Holland on Sea Cliff SSSI, alongside any other sites that are identified.</p>	<p>A review of the existing environment, including the identification of designated sites, is discussed in Table 19.10 with further detail provided in Appendix 19.1 (Volume III). The review identified that there were no geological designated sites, nationally or locally, located within the onshore project area or the 250m buffer zone. Figure 19.4 (Volume II) illustrates the locations of geological designated sites relative the onshore project area which has been refined since the production of the scoping report.</p> <p>As there are no geological designated sites located within the onshore project area, or within 250m, an assessment of the potential impacts during the operational phase of North Falls has not been included within this chapter.</p>
		<p>Section 3.1.4 Assessment methodology</p> <p>The Scoping Report states that guidance listed at paragraph 437 will be used to inform the assessment, together with the outcome of further liaison with stakeholders. No detailed assessment methodology is presented, nor is any criteria presented to identify how significance of effect will be determined in relation to this aspect. No cross reference is made to the generic methodology presented in section 1.8 of the Scoping Report. The ES should be clear on how the assessment has been undertaken, using an aspect specific methodology where this is relevant.</p>	<p>The assessment methodology relevant to the assessment of impacts associated with ground conditions and contamination is outlined in Section 19.4.3. Table 19.6 discusses the sensitivity of potential ground conditions and contamination receptors. Table 19.7 discusses the magnitude of impact on identified receptors relevant to this chapter.</p>
		<p>Table 3.3 Mineral resources.</p> <p>The Inspectorate notes that loss, damage or sterilisation of mineral resources is scoped into the ES; however, limited information is presented as to the scope of the assessment and how effects would be determined. The assessment should take into account factors such as; the nature of the mineral resource, the constraints and opportunities that exist for extraction.</p>	<p>Details of the mineral resources present within the onshore project area are outlined in Table 19.10 (with additional detail provided in Appendix 19.1, Volume III). Potential impacts to identified resources during construction and operation are provided in Sections 19.6.1.4 and 19.6.2.3 respectively</p>

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		The ES should include details regarding the location of groundwater and surface water abstraction points presented on a figure.	Information relating to groundwater and surface water abstractions has been requested from the EA, the information relevant to this chapter is included within Table 19.10. The information indicates that there are no potable abstractions located on or within 250m of the onshore project area and so these have not been considered within the impact assessment. A request for information in relation to private abstractions will be made to the local authority with the data included and assessed, should potable abstractions be present, in the ES.
Essex County Council	29/06/2021 Onshore Water Resources and Flood Risk, Land Quality and Geology Expert Topic Group Minutes	MW [Mark Woodger] would like dialogue if working over [a mineral] safeguarding area. ECC would object to any development in principle but noted that it could be mitigated.  MW stated a materials management plan would be absolutely necessary (post-consent) if crossing these areas.	Engagement with the Essex Minerals and Waste Planning Authority would be undertaken to aid in identifying potential mitigation measures during the construction and operational phases of North Falls. Potential mitigation measures are discussed within Section 19.6.  The Materials Management Plan (MMP) would form part of the final Code of Construction Practice (CoCP) post-consent.
Environment Agency	29/06/2021 Onshore Water Resources and Flood Risk, Land Quality and Geology Expert Topic Group Minutes	AS [Anna Sharpin] assumed there would be a risk assessment for HDD, and hydrogeological risk assessments also provided at this stage.	The requirements in relation to risk assessments for HDD, including hydrogeological risk assessments, would form part of the Outline CoCP to be submitted as part of the DCO application and included within the final CoCP post-consent.

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
Environment Agency	29/06/2021 Onshore Water Resources and Flood Risk, Land Quality and Geology Expert Topic Group Minutes	LH [Liz Hesp] was pleased to see NFOW were intending to undertake a Preliminary Risk Assessment (PRA) as a first step and wanted to advise that historic landfills should be avoided.	<p>The PRA for the onshore project area is provided as Appendix 19.1 (Volume III). A summary of the identified features, and potential sources of contamination are provided in Table 19.10 and Table 19.11 respectively, and are presented in Figure 19.2 (Volume II).</p> <p>Details of site selection are provided in Chapter 4 Site Selection and Assessment of Alternatives (Volume I).</p>

## 19.3 Scope

### 19.3.1 Study area

7. The study area for ground conditions and contamination has been defined on the basis of the distance over which impacts may occur and by the location of any receptors that may be affected by those potential impacts. This has been established using professional judgement and is supported by the evidence presented in Appendix 19.1 (Volume III). The study area for this assessment includes a 250m buffer around the onshore project area as illustrated on Figure 19.1 (Volume II). The study area is extended to 1km for assessing the presence of Control of Major Accident Hazard (COMAH) sites, groundwater abstraction wells and Source Protection Zones (SPZs). This is due to the higher risk posed by COMAH sites and the sensitivity of groundwater abstraction wells and SPZs.

### 19.3.2 Realistic worst case scenario

8. The final design of North Falls will be confirmed through detailed engineering design studies that would be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all other scenarios within the design envelope would have less impact. Further details are provided in Chapter 6 EIA Methodology (Volume I).
9. The realistic worst case scenarios for the likely significant effects scoped into the EIA for the ground conditions and contamination assessment are summarised in Table 19.2. These are based on North Falls parameters described in Chapter 5 Project Description (Volume I), which provides further details regarding specific activities and their durations.

**Table 19.2 Realistic worst case scenarios**

Impact	Parameter	Notes
<b>Construction</b>		
Impacts relating to landfall	Landfall HDD (temporary works) physical parameters: HDD temporary works area (4 circuits) = 100 x 200m Transition joint bay size = 4 x 15m No. of transition joint bays = 4 Maximum HDD depth = 20m Maximum number of HDD = 5	These parameters represent the maximum footprint and duration of disturbance within the onshore project area, in which has the potential to impact on ground conditions and contamination receptors. The potential impacts identified are discussed in Section 19.6.1.
	Duration: 13 months (of which HDD = 6 months) HDD to include 24 hour / 7 days working where required	
Impacts relating to the onshore cable corridor(s)	Cable corridor(s) construction physical parameters: Working width = 60m open trench, 82m at shallow HDD crossings, 122m at deeper HDD crossings Corridor length = 24km Cable trench width (max.) = 3.75m No. of trenches = 4 Maximum cable burial depth = 2m Minimum cable burial depth at = 0.9m Haul road width = 6m Jointing bays = 80 - 192 (approximately every 500m) buried below ground Jointing bay construction footprint (per bay) = 13 x 5m Jointing bay depth = 2m Temporary construction compound footprint = 150 x 150m (general cable construction compounds) to 100 x 100m (small cable construction compounds). No. of compounds (est.) = 7	
	Trenchless crossings physical parameters: Maximum width of buried cable = 110m Maximum trenchless crossing depth = 20m	

Impact	Parameter	Notes
	Trenchless crossing compound dimensions (major HDD compounds) = 80 x 120m Trenchless crossing compound dimensions (minor HDD compounds) = 40 x 120m	
	Durations: Overall duration = 18 – 24 months Cable installation = 12 months Major HDD (each location) = 8 months (of which HDD = 4 months) Minor HDD crossings = 2 months Major HDD to include 24 hour / 7 days working where required.	
	Impacts relating to the onshore substation	
	Onshore substation (temporary works) physical parameters: Permanent substation footprint = 267 x 300m Construction compound footprint = 150 x 250m	
	Durations: Construction duration = 6 months preparation, 24 months construction	
Operation		
Impacts relating to the onshore cable route	Cable corridor(s) operational physical parameters: No. of link boxes = up to 196 Link box footprint (per box) = 1.5m <sup>2</sup> Cross-sectional area of cement-bound sand = 0.6m <sup>2</sup>	These parameters represent the maximum footprint of North Falls that would interact with the baseline environment. Potential impacts to ground conditions and contamination receptors during the operational phase of North Falls are discussed in Section 19.6.2.
Impacts relating to the onshore substation	Onshore substation physical parameters: Permanent substation footprint = 267 x 300m	
Decommissioning		
No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable corridor(s) and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, would be removed, reused, or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and would be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts would be no greater than those identified for the construction phase.		

### 19.3.3 Summary of mitigation embedded in the design

10. This section outlines the embedded mitigation relevant to the ground conditions and contamination assessment, which has been incorporated into the design of North Falls (Table 19.3). Where other mitigation measures are proposed, these are detailed in the impact assessment (Section 19.6).

**Table 19.3 Embedded mitigation measures**

Parameter	Mitigation measures embedded into North Falls design
<b>Contaminated land and groundwater</b>	
Cable crossings beneath watercourses	Trenchless crossing techniques (e.g. HDD) have been committed to where the cable corridor(s) cross Main Rivers. This would minimise the potential for contamination (if present) from excavation works by limiting the potential for contaminated materials to enter surface waters via surface run off.
All onshore elements of North Falls	<p>The development of, and adherence to, a Code of Construction Practice (CoCP). The CoCP would be regularly reviewed and updated post consent, prior to and during the construction period. The CoCP would be informed by the findings of any pre-construction ground investigation and include an assessment of the potential risks to human health and controlled waters receptors posed by the construction of North Falls. Based on that risk assessment, appropriate working methods would be developed to avoid, minimise, or mitigate impacts relating to construction. The risk mitigation strategies incorporated into the CoCP would include:</p> <ul style="list-style-type: none"> <li>• Use of appropriate Personal Protective Equipment (PPE);</li> <li>• Provision of welfare facilities;</li> <li>• Monitoring of works including air quality and odour; and</li> <li>• Implementation of relevant good working practices including stockpile management and dust suppression activities to reduce the risk relating to the creation and inhalation of wind-blown dusts.</li> </ul> <p>The CoCP would incorporate legislation requirements including the Construction Design Management (CDM) Regulations (2015), Health and Safety at Work Act (1974) and Control of Substances Hazardous to Health (COSHH) Regulations.</p> <p>In addition, a plan for dealing with unexpected contamination would be developed as part of the CoCP. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention which have been withdrawn from use but still provide a useful best practice guide and include:</p> <ul style="list-style-type: none"> <li>• Environment Agency Pollution Prevention Guidance (PPG) 01 - Understanding your environmental responsibilities;</li> <li>• Environment Agency PPG 05 - Works and maintenance near water;</li> <li>• Environment Agency PPG 06 - Working at construction and demolition: preventing pollution guidance;</li> <li>• Environment Agency PPG 08 - Safe storage and disposal of used oils;</li> <li>• Environment Agency PPG 21 - Pollution incident response planning; and</li> <li>• Environment Agency PPG 22 –Dealing with spills.</li> </ul> <p>In areas that have been identified as potential areas of contamination within the PRA or encountered during construction works, perched waters within Made Ground or groundwater from dewatering activities would be collected within a tank or lagoon prior to any treatment or discharge. This wastewater shall either be:</p> <ul style="list-style-type: none"> <li>• Discharged to foul sewer under a trade effluent consent agreed with the local water company / supplier; and / or,</li> <li>• Discharged to surface water under an environmental permit issued by the Environment Agency.</li> </ul> <p>On site treatment plant may be required to treat the wastewater prior to disposal in order to meet discharge limits set by either the Environment Agency or local water company.</p> <p>Adoption of a CL:AIRE Industry Code of Practice to manage the re-use and disposal of excavated soils within the onshore project area would also be incorporated as an additional mitigation measure in the CoCP, this would aid in maximising sustainability and provide an audit trail to demonstrate the appropriate use of materials. A MMP</p>



Parameter	Mitigation measures embedded into North Falls design
	<p>would be drafted in advance of any construction works, this would include chemical screening criteria in order to ensure that imported and / or reused materials are chemically suitable for use. If materials identified as containing asbestos are identified, then a specialist contractor would be employed to aid in its removal from onshore project area, in line with current legislation.</p> <p>The MMP would form part of the final CoCP to be submitted post consent.</p> <p>A Site Waste Management Plan will be developed post-consent to ensure the proper handling and protocols are in place to deal with any generated wastes.</p>
<b>Groundwater quality and abstractions for public water supply</b>	
Cable routing	<p>The onshore cable corridor(s) have been developed to avoid interaction with Groundwater SPZ 1, and thereby minimising the potential impact on abstractions for public water supply.</p> <p>Ground investigations and a hydrogeological risk assessment meeting the requirements of the Environment Agency's approach to groundwater protection (Environment Agency, 2018), would be undertaken at each HDD crossing location.</p>
All onshore elements of North Falls	<p>The CoCP discussed above would include specific measures that are protective of controlled waters in relation to the storage of fuels, oils, lubricants, wastewater, and other chemicals during the works. This would include:</p> <ul style="list-style-type: none"> <li>• Storing all fuels, oils, lubricants, wastewater, and other chemicals in impermeable bunds with at least 110% of the stored capacity, with any damaged containers being removed from onshore project area.</li> <li>• Refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils to be used where possible.</li> <li>• Ensuring that spill kits are available on site at all times as well as sandbags and stop logs for deployment in case of emergency spillages.</li> </ul>

## 19.4 Assessment methodology

### 19.4.1 Legislation, guidance and policy

#### 19.4.1.1 National Policy Statements

11. The assessment of likely significant effects upon ground conditions and contamination has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the Project are:
  - Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
  - NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b);
  - NPS for Electricity Networks Infrastructure (EN-5) (DECC 2011c);
  - Draft Overarching NPS for Energy (EN-1) (Department for Business, Energy and Industrial Strategy (BEIS) 2021a);
  - Draft NPS for Renewable Energy Infrastructure (EN-3) (BEIS 2021b); and
  - Draft NPS for Electricity Networks Infrastructure (EN-5) (BEIS 2021c).
12. The UK Government announced a review of the existing NPSs within its December 2020 Energy White Paper (HM Government, 2020) and issued a draft version of Overarching NPS for Energy EN-1, NPS for Renewable Energy Infrastructure EN-3 and NPS for Electricity Networks Infrastructure EN-5 for

consultation on 6th September 2021 (BEIS 2021a; BEIS 2021b; BEIS 2021c). At the time of writing this PEIR chapter, final versions of the revised NPSs are not available.

13. The specific assessment requirements for ground conditions and contamination, as detailed in the NPS, are summarised in Table 19.4 together with an indication of the section of the PEIR chapter where each is addressed.

**Table 19.4 NPS assessment requirements**

NPS Requirement	NPS Reference	PEIR Reference
<b>Overarching NPS for Energy (EN-1)</b>		
Where the development is subject to EIA [Environmental Impact Assessment] the applicant should ensure that the ES [Environmental Statement] clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the [Secretary of State] consider thoroughly the potential effects of a proposed project.	Paragraph 5.3.3	<p>A review of geologically designated sites, including those listed on the GeoEssex website in relation to LoGS, within the onshore project area has been undertaken as part of the preparation of this chapter (Table 19.10, see also Figure 19.4 (Volume II) which illustrates the location of LoGS in relation to the onshore project area, and Appendix 19.1 (Volume III)). The review identified that there were not any nationally or locally geological designated sites located within the onshore project area or the 250m buffer zone.</p> <p>As there no geological designated sites located within the onshore project area, or within 250m, an assessment of the potential impacts to these features has not been undertaken.</p> <p>Ecologically designated sites are also discussed within Table 19.10, with additional details in Appendix 19.1 (Volume III). Impacts to the ecologically designated sites are set out in Section 19.6.1 and 19.6.2 with further detail provided in Chapter 23 Onshore Ecology (Volume I).</p>
The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	Paragraph 5.3.4	The existing environment is discussed in Section 19.5. Potential impacts are set out in Section 19.6. Potential impacts on ecological Sites of Special Scientific Interest (SSSI) are discussed in Chapter 23 Onshore Ecology (Volume I).
In having regard to the aim of the Government's biodiversity strategy the [Secretary of State] should take account of the context of the challenge of climate change: failure to address this challenge will result in significant adverse impacts to biodiversity. The policy set out in the following sections recognises the need to protect the most important biodiversity and geological conservation interests. The benefits to nationally significant low carbon energy infrastructure development may include benefits may outweigh harm to these interests. The [Secretary of State] may take account of any such net benefit in cases where it can be demonstrated.	Paragraph 5.3.6	<p>Geological designated sites and impacts relating to climate change are discussed in Table 19.10 and Section 19.5.2 respectively. No geologically designated sites, or LoGS, have been identified within the onshore project area (see Figure 19.4, Volume II) and so an assessment of potential impacts to these features has not been undertaken.</p> <p>Impacts to the ecologically designated sites are set out in Section 19.6.1 and 19.6.2 with further detail provided in Chapter 23 Onshore Ecology (Volume I).</p>
[The] development should aim to avoid significant harm to biodiversity and geological	Paragraph 5.3.7	Geological designated sites are discussed in Table 19.10. No geologically designated sites, or LoGS, have been identified within the onshore

NPS Requirement	NPS Reference	PEIR Reference
conservation interests, including through mitigation and consideration of reasonable alternatives; where significant harm cannot be avoided, then appropriate compensation measures should be sought.		project area (see Figure 19.4, Volume II) and so an assessment of potential impacts to these features has not been undertaken.  Impacts to the ecologically designated sites are set out in Section 19.6.1 and 19.6.2 with further detail provided in Chapter 23 Onshore Ecology (Volume I).
In taking decisions, the [Secretary of State] should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment.	Paragraph 5.3.8	Geological designated sites are discussed in Table 19.10. No geologically designated sites, or LoGS, have been identified within the onshore project area (see Figure 19.4, Volume II) and so an assessment of potential impacts to these features has not been undertaken.  Impacts to the ecologically designated sites are set out in Section 19.6.1 and 19.6.2 with further detail provided in Chapter 23 Onshore Ecology (Volume I).
Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place.	Paragraph 5.10.9	Mineral Safeguarding Areas are discussed in Table 19.10. Potential impacts to these areas during the construction, operational and decommissioning phases of North Falls are discussed within Section 19.6.
<b>NPS for Renewable Energy Infrastructure (EN-3)</b>		
A review of NPS EN-3 (2011b) did not identify requirements relating to ground conditions and contamination (landward of MHWS) and are therefore not considered relevant to this chapter.		
<b>NPS for Electricity Networks Infrastructure (EN-5)</b>		
A review of NPS EN-5 (2011c) did not identify requirements relating to ground conditions and contamination (landward of MHWS) and are therefore not considered relevant to this chapter.		
<b>Draft NPS for Energy (EN-1)</b>		
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. Applicants are encouraged to develop and implement a Soil Management Plan which could help minimise potential land contamination.	Paragraph 5.11.8	Risks posed by potential land contamination has been identified and assessed as part of a Preliminary Risk Assessment (PRA) (Appendix 19.1, Volume III). Potential impacts associated with contamination to identified receptors are discussed in Sections 19.6.1 and 19.6.2.
<b>Draft NPS for Renewable Energy Infrastructure (EN-3)</b>		
A review of draft NPS EN-3 (2021b) did not identify requirements relating to ground conditions and contamination (landward of MHWS) and are therefore not considered relevant to this chapter.		
<b>Draft NPS for Electricity Networks Infrastructure (EN-5)</b>		
A review of draft NPS EN-5 (2021c) did not identify requirements relating to ground conditions and contamination (landward of MHWS) and are therefore not considered relevant to this chapter.		

#### 19.4.1.2 Other legislation, policy and guidance

14. In addition to the NPS, there are a number of overarching pieces of legislation, policy and guidance applicable to the assessment of ground conditions and contamination. These include:

##### 19.4.1.2.1 National Planning Policy Framework

15. The specific assessment requirements for ground conditions and contamination, as detailed in the National Planning Policy Framework Guidance (NPPF) (Ministry of Housing, Communities and Local Government, updated 2021) are detailed in Table 19.5.

**Table 19.5 National Planning Policy Framework guidance relevant to ground conditions and contamination**

NPPF Requirement	NPPF Reference	PEIR Reference
<p>Planning policies and decisions should contribute to and enhance the natural local environment by:</p> <ul style="list-style-type: none"> <li>protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);</li> <li>preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and</li> <li>remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.</li> </ul>	NPPF15-174	<p>In relation to ground conditions and contamination, the existing environment is discussed in Section 19.5. Table 19.10, summarises the baseline environment within the onshore project area. Potential impacts and mitigation measures aimed at minimising the potential impacts to the receptors identified, including remediation, are set out in Table 19.3 and Section 19.6.</p> <p>Potential impacts in relation to air, water, biodiversity and noise are discussed in:</p> <ul style="list-style-type: none"> <li>Chapter 20 Onshore Air Quality (Volume I);</li> <li>Chapter 21 Water Resources and Flood Risk (Volume I);</li> <li>Chapter 23 Onshore Ecology (Volume I); and</li> <li>Chapter 26 Noise and Vibration (Volume I).</li> </ul>
<p>Planning policies and decisions should ensure that:</p> <ul style="list-style-type: none"> <li>a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);</li> <li>after remediation, as a minimum, land should not be</li> </ul>	NPPF15-183	<p>The existing ground conditions and potential sources of contamination are discussed in Section 19.5. Potential impacts of North Falls, and mitigation measures (including ground investigation works) are set out in Table 19.3 and Section 19.6.</p> <p>Any ground investigations that may be required would be completed post consent, prior to the commencement of the construction phase.</p> <p>Following the completion of targeted ground investigations (if required), a generic quantitative risk assessment would be undertaken with recommendations included for further works should they be deemed necessary.</p>

NPPF Requirement	NPPF Reference	PEIR Reference
<p>capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and</p> <ul style="list-style-type: none"> <li>adequate site investigation information, prepared by a competent person, is available to inform these assessments.</li> </ul>		
<p>Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and / or landowner.</p> <p>Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.</p>	NPPF15-184 and NPPF15-185	<p>A summary of the existing ground conditions and potential sources of contamination within the onshore project area are provided in Table 19.10 and Table 19.11 respectively. Further details are provided within Appendix 19.1 (Volume III).</p> <p>An assessment of the potential impacts associated with the construction and operation of North Falls is provided within Section 19.6. Potential mitigation measures, for example targeted ground investigations in areas of concern, are discussed within Table 19.3 and Section 19.6.</p> <p>Potential interactions and inter-relationships between each of the identified impacts are discussed in Sections 19.9 and 19.10 respectively.</p>
<p>The focus of planning policies and decisions should be whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.</p>	NPPF15-188	<p>The existing environment is discussed in Section 19.5. Potential impacts, including mitigation measures to reduce the significance of effect, are set out in Table 19.3 and Section 19.6.</p>
<p>It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation.</p> <p>Planning policies should:</p> <ul style="list-style-type: none"> <li>safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption</li> </ul>	NPPF17-209 and NPPF17-210	<p>Mineral Safeguarding Areas are discussed in Table 19.10. Potential impacts to these areas during the construction, operational and decommissioning phases of North Falls are discussed within Section 19.6.</p> <p>Engagement with the Essex Minerals and Waste Planning Authority would be undertaken to aid in identifying potential mitigation measures during the construction and operational phases of North Falls. Potential mitigation measures are discussed within Section 19.6.</p>

NPPF Requirement	NPPF Reference	PEIR Reference
<p>that the resources defined will be worked);</p> <ul style="list-style-type: none"> <li>• set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place.</li> </ul>		

#### 19.4.1.2.2 Tendring District Council Local Plan 2013-2033 and beyond, Section 2 (2022)

16. The Tendring District Council Local Plan has been reviewed and the following policies and objectives are considered relevant to ground conditions and contamination.
17. Policy SPL 3: Sustainable Design, Part C Impacts and Compatibility states that:
 

*“New development (including changes of use) should be compatible with surrounding uses and minimise any adverse environmental impacts. The following criteria must be met:*

  - a) *The development will not have a materially damaging impact on the privacy, daylight or other amenities of occupiers of nearby properties;*
  - b) *The development, including any additional road traffic arising, will not have unacceptable levels of pollution on: air, land, water (including ground water), amenity, health or safety through noise, smell, dust, light, heat, vibration, fumes or other forms of pollution or nuisance;*
  - c) *The health, safety or amenity of any occupants or users of the proposed development will not be materially harmed by any pollution from an existing or committed use;*
  - d) *All new development should have regard to the most up to date adopted Essex Mineral Local Plan; and*
  - e) *During the construction phase, developers must comply with a ‘considerate constructors’ scheme’ which employs reasonable measures and techniques to minimise and mitigate impacts and disturbance to neighbours and the existing wider community and any damage to public and private property.”*
18. Policy PPL 4: Biodiversity and Geodiversity states that:
  - *“Sites designated for their international, European and national importance to nature conservation: including Ramsar sites; Special Protection Areas (SPAs); Special Areas of Conservation (SACs); Marine Conservation Zones (MCZs); National Nature Reserves (NNRs); and Sites of Special Scientific Interest (SSSIs) will be protected from development likely to have an adverse effect on their integrity”; and*
  - *“Proposals for new development should be supported by an appropriate ecological assessment. Where new development would harm biodiversity or geodiversity, planning permission will only be granted in exceptional*



*circumstances, where the benefits of the development demonstrably outweigh the harm caused and where adequate mitigation or, as a last resort, compensation measures are included, to ensure a net gain, in biodiversity.”*

19. Strategic Objective 8 (biodiversity) of the Local Plan is “*to provide a network of interconnected multi-functional natural green and blue spaces which secures a net gain in biodiversity and geodiversity; promotes healthy lifestyles; and enhances the quality of the natural and built environment.*”

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

20. The Environmental Protection Act 1990 makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Act provides the statutory definition of contaminated land: “*Contaminated Land is any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reasons of substances in, on or under the land that:*

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Significant pollution of controlled waters is being or is likely to be caused”.*

21. The Act also provides the regulatory basis for the identification, designation and remediation of contaminated land. The onshore project area could be located on land potentially affected by contamination. This requires assessment to ensure that the land is suitable for use following the construction of North Falls, and that the land cannot be determined as contaminated land under Part 2A of the Act.

#### 19.4.1.2.4 Environmental Permitting (England and Wales) Regulations 2016

22. The 2016 Regulations (as amended) set out an environmental permitting and compliance regime that applies to various activities and industries. The environmental permitting regime is a common framework for applying for, receiving, varying or transferring and surrendering permits, along with compliance, enforcement and appeals arrangements. It rationalises the previous permitting and compliance regimes into a common framework that is easier to understand and simpler to use. The framework introduces different levels of control, based on risk:

- Exclusions (lower risk activities which may be undertaken without any permit), standard rules permit (standard requirements and conditions for the relevant activities are set out so applicants can determine in advance where the permit is applicable to their proposals) and bespoke permits (permits written specifically for activities which are unique or higher risk).

#### 19.4.1.2.5 Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

23. The aim of the directive is for all water bodies to achieve Good Status by 2027 (which is comprised of scoring of both Ecological and Chemical Status) and to ensure no deterioration from current status. This legislation is relevant to ground conditions and contamination as it assists in determining the sensitivity of water bodies within the onshore project area. Water quality is assessed in Chapter 21 Water Resources and Flood Risk (Volume I).

#### 19.4.1.2.6 Groundwater (Water Framework Directive) (England) Direction 2016

24. The aim of the direction is to set out instructions and obligations for the Environment Agency to protect groundwater, including monitoring and setting threshold values for both existing and new pollutants in groundwater. This legislation is relevant to ground conditions and contamination as it assists in determining the sensitivity of groundwater resources within the onshore project area.

#### 19.4.1.2.7 The Water Resources Act (1991)

25. The Act provides the definition of and regulatory controls for the protection of water resources including the quality standards expected for controlled waters. This legislation is relevant to ground conditions and contamination as it assists in determining the sensitivity of controlled waters within the onshore project area, particularly when assessing the effects during construction and operational activities.

#### 19.4.1.2.8 Environment Act 1995

26. The Act established the Environment Agency and gave it responsibility for environmental protection of controlled waters. This legislation is relevant to ground conditions and contamination as it helps to assess the sensitivity and potential effects of the construction and operational phases of North Falls. It also aids the identification of suitable mitigation measures to provide protection to the controlled waters present.

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

27. The regulations transpose into domestic law the EU Directive 2004/35/EC on environmental liability with regards to the prevention and remedying of environmental damage. This legislation is relevant to ground conditions and contamination as it aids the identification of suitable preventative measures and mitigation techniques for the construction and operational phases of North Falls.

#### 19.4.1.2.10 Construction (Design and Management) Regulations 2015

28. The regulations are the main set of regulations used to manage the health, safety and welfare of construction projects. The legislation is relevant to ground conditions and contamination as it ensures the safety of human receptors involved in the construction phase.

#### 19.4.1.2.11 Land Contamination Risk Management Framework 2021

29. The Environment Agency guidance provides an update to the former Environment Agency Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11). The guidance aims to help those assessing potentially contaminated sites to identify and assess the risks posed to sensitive receptors from potentially contaminated sites, make appropriate decisions in relation to the outcome of the assessment and identify the required actions necessary e.g., implement remediation if deemed necessary.

#### 19.4.1.2.12 Guiding Principles for Contaminated Land

30. The Guiding Principles for Contaminated Land (GPCL) comprise three documents produced by the Environment Agency. The documents include GPCL 1 – Introduction, GPCL 2 – Frequently Asked Questions, technical information, detailed advice and references, and GPCL 3 – reporting checklist. The aims of these documents are to provide guidance to those who are involved



with contaminated land, encourage good practice, promote compliance with regulatory requirements and to provide reference to applicable guidance.

#### 19.4.1.2.13 The Environment Agency's Approach to Groundwater Protection Position Statements 2018

31. These position statements provide information relating to the Environment Agency's approach to managing and protecting groundwater. They detail how the Environment Agency delivers government policy for groundwater and adopts a risk-based approach where legislation allows. The primary aim of all of the position statements is the prevention of pollution of groundwater and protection of it as a resource.

#### 19.4.1.2.14 Minerals Policy Statement 1: Planning and Minerals (MPS1)

32. MPS1 aims to secure adequate and steady supplies of the minerals needed by society and the economy. This publication has been withdrawn; however, it is still deemed relevant in the context of this assessment.

#### 19.4.1.2.15 Essex County Council: Essex Minerals Local Plan, July 2014

33. The Essex County Council minerals plan has been reviewed and the following policy is considered relevant to ground conditions and contamination.
34. Policy S8: Safeguarding Mineral Resources and Mineral Reserves of the Essex Minerals Local Plan states that:

*"By applying Mineral Safeguarding Areas (MSAs) and / or Mineral Consultation Areas (MCAs), the Mineral Planning Authority will safeguard mineral resources of national and local importance from surface development that would sterilise a significant economic resource or prejudice the effective working of a permitted mineral reserve, Preferred or Reserve Site allocation within the Minerals Local Plan. The Minerals Planning Authority shall be consulted, and its views taken into account, on proposed developments within MSAs and MCAs except for the excluded development identified in Appendix 5.*

##### **Mineral Safeguarding Areas**

*Mineral Safeguarding Areas are designated for mineral deposits of sand and gravel, silica sand, chalk, brickearth and brick clay considered to be of national and local importance, as defined on the Policies Map.*

*The Mineral Planning Authority shall be consulted on:*

- a) All planning applications for development on a site located within an MSA that is 5ha or more for sand and gravel, 3ha or more for chalk and greater than 1 dwelling for brickearth or brick clay; and*
- b) Any land-use policy, proposal or allocation relating to land within an MSA being considered by the Local Planning Authority for possible development as part of preparing a Local Plan (with regard to the above thresholds).*

*Non-mineral proposals that exceed these thresholds shall be supported by a minerals resource assessment to establish the existence or otherwise of a mineral resource of economic importance. If, in the opinion of the Local Planning Authority, surface development should be permitted, consideration shall be given to the prior extraction of existing minerals.*

##### **Mineral Consultation Areas**

*MCAs are designated within and up to an area of 250 metres from each safeguarded permitted minerals development and Preferred and Reserve Site allocation as shown on the Policies Map and defined on the maps in Appendix 6. The Mineral Planning Authority shall be consulted on:*

- a) Any planning application for development on a site located within an MCA except for the excluded development identified in Appendix 5,*
- b) Any land-use policy, proposal or allocation relating to land within an MCA that is being considered as part of preparing a Local Plan*

*Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development, Preferred or Reserve Mineral Site allocation shall be opposed."*

#### 19.4.2 Data sources

##### 19.4.2.1 Site specific

35. To provide site specific and up to date information on which to base the impact assessment, a site characterisation study was conducted which consisted of reviewing available desk-based information related to ground conditions and contamination. The assessment is provided in the Geo-Environmental Desk Study and Preliminary Risk Assessment report (PRA) (Appendix 19.1, Volume III). The PRA provides an assessment of ground conditions for North Falls and follows a risk-based approach including consideration of potential sources, pathways and receptors to identify potential pollutant linkages that may result in unacceptable risks to receptors from ground contamination.
36. The data sources used to inform the PRA include:
  - Groundsure GIS data comprising environmental sensitivity data and permitting records within the onshore project area;
  - British Geological Survey (BGS) Onshore Geoindex web portal (accessed October 2022);
  - BGS Geological Map for Colchester and Brightlingsea, Bedrock and Drift (Sheet numbers 224 and 242), 2010, 1:50,000;
  - BGS Hydrogeological Map of Southern East Anglia (Sheet number 5), 1981, 1:125,000;
  - Google Earth, accessed October 2022;
  - Multi Agency Government Information for the Countryside (MAGIC) map application (accessed October 2022);
  - UK Health Security Agency UK maps of Radon; and
  - Zetica UXO Unexploded Bomb (UXB) Risk Map accessed September 2022.

#### 19.4.3 Impact assessment methodology

37. Chapter 6 EIA Methodology (Volume I) explains the general impact assessment methodology applied to North Falls. The following sections confirm the methodology used to assess the potential impacts on ground conditions and contamination.

### 19.4.3.1 Definitions

38. For each potential impact, the assessment identifies receptors within the study area which are sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the ground conditions and contamination assessment are provided in Table 19.6 and Table 19.7.

#### 19.4.3.1.1 Sensitivity

39. Receptor sensitivity has been defined with reference to the adaptability, tolerance, recoverability, and value of individual receptors. Table 19.6 provides an example of the criteria for appraisal of sensitivity for identified ground conditions and contamination receptors. Sensitivity for each receptor has been determined using professional judgement, based on these criteria.
40. Receptor sensitivity considers, for example, whether the receptor:
- Is rare;
  - Has protected or threatened status;
  - Has importance at a local, regional or national scale; or
  - Has a key role in ecosystem function (in the case of biological receptors).
41. Generic receptor sensitivity examples based on the above criteria are presented below in Table 19.6.

**Table 19.6 Receptor sensitivity criteria**

Sensitivity	Examples
<b>High</b> – has very limited or no capacity to accommodate physical or chemical changes.	<b>General</b> <ul style="list-style-type: none"> <li>• Receptor is internationally or nationally important / rare with limited potential for offsetting / compensation.</li> </ul>
	<b>Land quality – human health</b> <ul style="list-style-type: none"> <li>• Construction workers involved in below ground construction works / ground breaking activities;</li> <li>• Public and local residents / children (on and offsite within 50m); and</li> <li>• Future end users (residential or allotment end use).</li> </ul>
	<b>Land quality – controlled waters and ecology</b> <ul style="list-style-type: none"> <li>• Groundwater SPZ 1;</li> <li>• Public water supplies / licensed surface water and groundwater abstractions for potable use;</li> <li>• Private water supplies for potable use, automatic 50m SPZ1 applied (on and off-site within 50m);</li> <li>• Supports habitats or species that are highly sensitive to change in surface hydrology or water quality; and</li> <li>• Surface and groundwaters supporting internationally designated sites (e.g. Special Areas of Conservation (SAC) or Ramsar sites).</li> </ul>
	<b>Land quality – geological sites and mineral resources</b> <ul style="list-style-type: none"> <li>• MSA or MCA – nationally important resource; and</li> <li>• Designated geological sites of international importance.</li> </ul>
	<b>Built environment</b> <ul style="list-style-type: none"> <li>• Sites of international importance, World Heritage Sites and Scheduled Monuments.</li> </ul>
<b>Medium</b> – has limited capacity to accommodate	<b>General</b> <ul style="list-style-type: none"> <li>• Receptor is regionally important / rare with limited potential for offsetting / compensation.</li> </ul>

Sensitivity	Examples
physical or chemical changes.	<p><b>Land quality – human health</b></p> <ul style="list-style-type: none"> <li>• Future end users (commercial / industrial end use / open space / farmers and workers on agricultural land);</li> <li>• Public and local residents / children (off-site at distances &gt;50m but &lt;250m);</li> <li>• Commercial / industrial workers (off-site within 50m); and</li> <li>• Construction workers (above ground).</li> </ul> <p><b>Land quality – controlled waters and ecology</b></p> <ul style="list-style-type: none"> <li>• Groundwater SPZ 2 and SPZ 3;</li> <li>• Principal Aquifers;</li> <li>• Secondary A and B Aquifers with private potable groundwater abstractions;</li> <li>• Private water supplies for potable groundwater abstraction (off-site within 250m); and</li> <li>• Surface and groundwaters supporting nationally designated sites (SSSI).</li> </ul> <p><b>Land quality – geological sites and mineral resources</b></p> <ul style="list-style-type: none"> <li>• MSA or MCA – regionally important resources; and</li> <li>• Designated geological site of national importance e.g. SSSI.</li> </ul> <p><b>Built environment</b></p> <ul style="list-style-type: none"> <li>• Commercial or residential buildings.</li> </ul>
<b>Low</b> – has moderate capacity to accommodate physical or chemical changes.	<p><b>General</b></p> <ul style="list-style-type: none"> <li>• Receptor is locally important / rare.</li> </ul> <p><b>Land quality – human health</b></p> <ul style="list-style-type: none"> <li>• Future end users (transport end use such as car parks or highways);</li> <li>• Public and local residents / children (off-site &gt;250m); and</li> <li>• Commercial / industrial workers (off-site at distances &gt;50m but &lt;250m).</li> </ul> <p><b>Land quality – controlled waters and ecology</b></p> <ul style="list-style-type: none"> <li>• Secondary A and B Aquifers without groundwater abstractions; and</li> <li>• Groundwater or surface waters supporting locally important sites (e.g. Local Nature Reserves (LNR)).</li> </ul> <p><b>Land quality – geological sites and mineral resources</b></p> <ul style="list-style-type: none"> <li>• Adjacent to an MSA or MCA; and</li> <li>• Low economically viable mineral resource.</li> </ul> <p><b>Built environment</b></p> <ul style="list-style-type: none"> <li>• Car parks, highways, transport infrastructure and utilities.</li> </ul>
<b>Negligible</b> – is generally tolerant of physical or chemical changes.	<p><b>General</b></p> <ul style="list-style-type: none"> <li>• Receptor is not considered to be particularly important / rare.</li> </ul> <p><b>Land quality – human health</b></p> <ul style="list-style-type: none"> <li>• Commercial / industrial workers (off-site &gt;250m).</li> </ul> <p><b>Land quality – controlled waters and ecology</b></p> <ul style="list-style-type: none"> <li>• Unproductive strata; and</li> <li>• Supports or contributes to habitats that are not sensitive to changes in surface hydrology or water quality.</li> </ul> <p><b>Land quality – geological sites and mineral resources</b></p> <ul style="list-style-type: none"> <li>• No economically viable minerals.</li> </ul> <p><b>Built environment</b></p> <ul style="list-style-type: none"> <li>• Locally important roads and footpaths.</li> </ul>

#### 19.4.3.1.2 Magnitude

42. Potential effects may be adverse, beneficial or neutral. The magnitude is assessed qualitatively, according to the criteria set out in Table 19.7.

43. For impacts related to human health, magnitude reflects the likely increase or decrease in exposure risk for a receptor. For controlled waters, magnitude represents the likely impact that an activity would have on resource availability or value, at the receptor. Magnitude is therefore affected by the distance and connectivity between an impact source and the receptor.

**Table 19.7 Definition of magnitude for a ground conditions and contamination receptors**

Magnitude	Definition
<b>High</b> – permanent or large-scale change affecting usability, risk or, value over a wide area, or certain to affect regulatory compliance.	<b>Land quality – human health</b> <ul style="list-style-type: none"> <li>Permanent or major change to existing risk exposure (adverse / beneficial);</li> <li>Unacceptable risks / severe harm to one or more receptors with a long-term or permanent effect (adverse); or</li> <li>Remediation and complete source removal (beneficial).</li> </ul>
	<b>Land quality – controlled waters</b> <ul style="list-style-type: none"> <li>Permanent, long-term or wide scale effects on water quality or availability (adverse / beneficial);</li> <li>Permanent loss or long-term derogation of a water supply source resulting in prosecution (adverse);</li> <li>Change in Water Framework Directive (WFD) water body status / potential or its ability to achieve WFD objectives in the future (adverse / beneficial);</li> <li>Permanent habitat creation or complete loss (adverse / beneficial); or</li> <li>Measurable habitat changes that are sustainable / recoverable over the long-term (adverse / beneficial).</li> </ul>
	<b>Land quality – geological sites and mineral resources</b> <ul style="list-style-type: none"> <li>Complete loss of designated sites; or</li> <li>Complete sterilisation of mineral resources.</li> </ul>
	<b>Built environment</b> <ul style="list-style-type: none"> <li>Catastrophic damage to buildings or structures.</li> </ul>
<b>Medium</b> – reversible change affecting usability, value, or risk over the medium-term or local area; possibly affecting regulatory compliance.	<b>Land quality – human health</b> <ul style="list-style-type: none"> <li>Medium-term or moderate change to existing risk of exposure (adverse / beneficial); or</li> <li>Unacceptable risks to one or more of the receptors with a medium-term effect (adverse).</li> </ul>
	<b>Land quality – controlled waters</b> <ul style="list-style-type: none"> <li>Medium-term or local scale effects on water quality or availability (adverse / beneficial);</li> <li>Medium-term derogation of a water supply source, possibly resulting in prosecution (adverse);</li> <li>Observable habitat changes that are sustainable / recoverable over the medium-term (adverse / beneficial); or</li> <li>Temporary change in status / potential of a WFD water body or its ability to meet objectives (adverse / beneficial).</li> </ul>
	<b>Land quality – geological sites and mineral resources</b> <ul style="list-style-type: none"> <li>Partial loss of designated geological sites; or</li> <li>Medium-term or local scale loss of mineral resources.</li> </ul>
	<b>Built environment</b> <ul style="list-style-type: none"> <li>Damage to buildings or structures.</li> </ul>
<b>Low</b> – temporary change affecting usability, risk, or value over the short-term or within the study area; measurable permanent change with minimal effect,	<b>Land quality – human health</b> <ul style="list-style-type: none"> <li>Short-term temporary or minor change to existing risk exposure (adverse / beneficial); or</li> <li>Unacceptable risks to one or more receptors with a short-term effect (adverse).</li> </ul>
	<b>Land quality – controlled waters</b> <ul style="list-style-type: none"> <li>Short-term or very localised effects on water quality or availability (adverse / beneficial);</li> </ul>

Magnitude	Definition
usability, risk, or value; no effect on regulatory compliance.	<ul style="list-style-type: none"> <li>• Short-term derogation of a water supply source (adverse);</li> <li>• Measurable permanent effects on a water supply source that does not impact on its operations (adverse);</li> <li>• Observable habitat changes that are sustainable/recoverable over the short-term (adverse / beneficial); or</li> <li>• No change in status / potential of a WFD water body or its ability to meet objectives (neutral).</li> </ul>
	<b>Land quality – geological sites and mineral resources</b> <ul style="list-style-type: none"> <li>• Temporary change in status of designated geological sites; or</li> <li>• Short-term or very localised effects on mineral resources.</li> </ul>
	<b>Built environment</b> <ul style="list-style-type: none"> <li>• Easily repairable damage to buildings or structures.</li> </ul>
<b>Negligible</b> – minor permanent or temporary change, indiscernible over the medium to long-term. Short-term, with no effect on usability.	<b>Land quality – human health</b> <ul style="list-style-type: none"> <li>• Negligible change to existing risk exposure; or</li> <li>• Activity is unlikely to result in unacceptable risks to receptors (neutral).</li> </ul>
	<b>Land quality – controlled waters</b> <ul style="list-style-type: none"> <li>• Very minor or intermittent impact on local water quality or availability (adverse / beneficial);</li> <li>• Usability of a water supply source would be unaffected (neutral);</li> <li>• Very slight local changes that have no observable impact on dependent receptors (neutral); or</li> <li>• No change in status / potential of a WFD water body or its ability to meet objectives (neutral).</li> </ul>
	<b>Land quality – geological sites and mineral resources</b> <ul style="list-style-type: none"> <li>• No change in status of designated geological site; or</li> <li>• Very minor impact on mineral resources.</li> </ul>
	<b>Built environment</b> <ul style="list-style-type: none"> <li>• Very slight, non-structural damage or cosmetic harm to buildings or structures.</li> </ul>

#### 19.4.3.2 Significance of effect

44. The assessment of significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact (see Chapter 6 EIA Methodology (Volume I) for further details). The determination of significance is guided by the use of a significance of effect matrix, as shown in Table 19.8. Definitions of each level of significance are provided in Table 19.9.
45. Likely significant effects identified within the assessment as major or moderate are regarded within this chapter as significant. Appropriate mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall significance of effect to determine a residual effect upon a given receptor.



**Table 19.8 Significance of effect matrix**

		Adverse magnitude			Beneficial magnitude				
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Negligible	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

**Table 19.9 Definition of effect significance**

Significance	Definition
<b>Major</b>	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.
<b>Moderate</b>	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
<b>Minor</b>	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
<b>Negligible</b>	No discernible change in receptor condition.
<b>No change</b>	No impact, therefore, no change in receptor condition.

#### 19.4.4 Cumulative effects assessment methodology

46. The cumulative effects assessment (CEA) considers other plans, projects and activities that may result in cumulation with North Falls. Chapter 6 EIA Methodology (Volume I) provides further details of the general framework and approach to the CEA.
47. For ground conditions and contamination, these activities include the onshore elements of other offshore wind farm projects, construction projects (commercial, residential and transport developments) and remediation projects.

#### 19.4.5 Assumptions and limitations

48. The desk-based PRA (Appendix 19.1, Volume III) is based on a range of publicly available information. No ground investigation data from within the onshore project area has been used to inform the PRA or the impact assessment presented in this chapter. The assessments therefore adopt a precautionary approach i.e., if a potential pollutant linkage has been identified it is assumed to be present until further site-specific information is available to clarify whether the linkage exists.
49. The impact assessment presented in this chapter is therefore limited by the finite data on which it is based. There is a level of uncertainty associated with the extrapolation of site-specific data or non-site data to other locations within the onshore project area.

## 19.5 Existing environment

### 19.5.1 Baseline environment

50. The baseline environment for the onshore project area is discussed below in Table 19.10, with potential sources of contamination discussed in Table 19.11. Full details are provided within Appendix 19.1 (Volume III).

**Table 19.10 Summary of baseline environment**

Parameter	Landfall search area	Onshore cable corridor(s)	Onshore substation zone
Geology	<p>Made Ground is located within the south of the onshore cable corridor(s) and is likely to be associated with historical quarrying activities. Although not identified on British Geological Survey (BGS) mapping, localised areas of Made Ground associated with historical land uses may be present within the onshore project area.</p> <p>Superficial deposits are present within the onshore project area, however there are isolated areas where these deposits are absent. Alluvium (clays and silts) is present in the south of the landfall search area, as well as in isolated areas along the onshore cable corridor(s). Head Deposits (gravels, sand and clays) are present within the landfall search area only. Cover Sand (clays, silts and sands) are present in isolated areas of the onshore cable corridor(s) and onshore substation zone. Kesgrave Catchment Subgroup (sand and gravels) superficial deposits are also located in isolated areas along the onshore cable corridor(s).</p> <p>Bedrock of the Red Crag Formation (coarse grained sand) is located in an isolated area in the north of the onshore cable corridor(s). Bedrock of the Thames Group (clays, silts and sands) is located widely within the onshore project area.</p>		
Hydrogeology	<p>The superficial deposits of Alluvium, Head Deposits and Kesgrave Catchment Subgroup are designated as Secondary A Aquifers. The superficial Cover Sand deposits are designated as a Secondary B Aquifer. The bedrock of the Red Crag Formation is designated as a Principal Aquifer. The Thames Group Formation is designated as Unproductive Strata.</p> <p>The area of the onshore cable corridor(s) to the north of Tendring Green up to and including the onshore substation zone is located within a SPZ 3 (see Figure 19.6, Volume II).</p> <p>The Essex Gravels WFD groundwater body is located in the north of the landfall search area, in isolated areas to the south of the onshore cable corridor(s), the northern section of the onshore cable corridor(s) and the onshore substation zone.</p> <p>Two groundwater abstractions are located within the onshore project area, one within the landfall area and another within the onshore substation zone. Both abstractions are for the purpose of spray irrigation for agriculture. There are no licensed potable groundwater abstractions abstracting &gt;20m<sup>3</sup> per day recorded within 250m of the onshore project area. It should however be noted that the groundwater abstraction data has been obtained from the Environment Agency. A request for information in relation to private abstractions, including information in relation to abstractions from wells, will be made to Tendring District Council with the information will be reviewed and potential impacts assessed. The assessment will be included within the ES.</p>		
Hydrology and surface drainage (Additional details on the hydrology of the onshore project area are provided in Chapter 21 Water Resources and Flood Risk).	<p>Streams and ponds associated with Holland Marshes are located in the south of the landfall search area. In addition to these surface water features, three reservoirs and ponds are located within the northern part of the landfall search area.</p> <p>The WFD surface water body catchment of Holland Brook is present across the landfall search area.</p>	<p>Six reservoirs and ponds are located within the onshore cable corridor(s).</p> <p>The WFD surface water body catchments of Holland Brook, Wrabness Brook and Tenpenny Brook are present within the onshore cable corridor(s). A coastal catchment associated with Hamford West is also located within the onshore cable corridor(s).</p>	<p>There are no surface water features recorded within the onshore substation zone.</p> <p>The WFD surface water body catchment of Tenpenny Brook is present within the onshore substation zone.</p>



Parameter	Landfall search area	Onshore cable corridor(s)	Onshore substation zone
	<p>The southern part of the landfall search area is located within a low to high risk area in relation to Risks of Flooding from Rivers and Sea (RoFRaS), a Flood Zone 2 and 3.</p>	<p>The Holland Brook WFD surface water body (river) is also located within the onshore cable corridor(s).</p> <p>The onshore cable corridor(s) are located within a very low to high risk area in relation to RoFRaS (associated with river crossings). Isolated areas within the onshore cable corridor(s) are also located within Flood Zone 2 and 3 areas.</p>	
	<p>There is one record for a surface water abstraction located within the onshore cable corridor(s), the abstraction relates to spray irrigation for agricultural purposes. There are no potable surface water abstractions within 250m of the onshore project area. A request for information in relation to private abstractions will be made to Tendring District Council with the information will be reviewed and potential impacts assessed. The assessment will be included within the ES.</p>		
Sensitive land use <sup>1</sup>	<p>Holland Haven Marshes SSSI and Holland Haven Local Nature Reserve (LNR) are located within the landfall search area.</p> <p>The landfall search area is also located within a Priority Habitat Inventory area. The main habitat type within this area consists of lowland fens, coastal and floodplain grazing marsh, good quality semi-improved grassland (see Figure 19.3 &amp; 19.4, Volume II).</p> <p>For more detailed information on ecologically sensitive areas please refer to Chapter 23 Onshore Ecology (Volume I).</p>	<p>There are five isolated areas within the onshore cable corridor(s) that are located within Priority Habitat Inventory areas. The main habitat for each of these areas are deciduous woodlands.</p> <p>Although there are no statutory designated geological sites within the onshore cable corridor(s) (including Local Geological Sites – LoGS), Great Holland Pits Nature Reserve is present adjacent to the junction of Little Clacton Road and Mill Lane. The site has been highlighted as a potential area to promote geology due to the presence of Cooks Green Gravel and a number of cobbles / boulders remaining at the site following the cessation of quarrying operations (see Figure 19.3 &amp; 19.4).</p> <p>For more detailed information on ecologically sensitive areas please refer to Chapter 23</p>	<p>There are no SSSIs, LNRs or LoGS located within the onshore substation zone (see Figure 19.3 &amp; 19.4, Volume II).</p>

<sup>1</sup> There are no direct overlaps between the study area and any designated geological sites (inclusive of LoGs). As such, no impacts to designated geological sites are anticipated as a result of North Falls and are not considered further in the impact assessment.

Parameter	Landfall search area	Onshore cable corridor(s)	Onshore substation zone
		Onshore Ecology (Volume I).	
	The Sandlings and Chelmsford Nitrate Vulnerable Zone (NVZ) for groundwater is present throughout the study area.		
Mineral Safeguarding Areas	<p>Land within the study area is designated as being located within a MSA. The minerals associated with the designation are sands and gravels. The safeguarded areas are not present as continuous features, but as localised areas throughout the landfall search area, onshore cable corridor(s) and onshore substation zone.</p> <p>A MCA is also present within the onshore cable corridor(s), located to the west of the settlement of Great Holland.</p>		
Human health	<p>The Project's onshore infrastructure comprises landfall works, onshore cable corridor(s) and onshore substation as set out in Chapter 5 Project Description (Volume I). Haul and access roads would also be required during the construction period as would construction compounds.</p> <p>During the installation of onshore infrastructure, the critical human health receptors would be those involved with construction activities, adjacent off-site residents, nearby workers (e.g. agricultural workers) and visitors (e.g. where Public Rights of Way (PRoW) might be in use). During the operational phase of North Falls, the human health receptors would be site users and workers at the onshore substation.</p>		
Potentially contaminative historical land uses	<p>Unspecified heaps and disused gun emplacements have historically been located within the southern part of the landfall search area. Located within 250m of the landfall search area, historical features including an unspecified pit, sewage pumping stations. Disused gun emplacements and a corn mill have been recorded (see Figure 19.5, Volume II).</p>	<p>A sand and gravel pit, cuttings (including railway cuttings), a refuse heap and an unspecified heap have historically been located within the onshore cable corridor(s). Located within 250m of the onshore cable corridor(s), historical features including nurseries, unspecified quarry and heaps, unspecified workhouse, a smithy and a graveyard have been recorded (see Figure 19.5, Volume II).</p>	<p>An electricity substation (Lawford substation) has been recorded within 250m of the onshore substations zone (see Figure 19.5, Volume II).</p>
	<p>There are no recorded historical (or active) landfills located within the onshore project area. There are however, two records of historical landfills located within 250m of the onshore project area (see Figure 19.2, Volume II). The first is located adjacent to the onshore cable corridor(s) (first recorded input 1952, the last recorded input is not reported within the reviewed data), the second is located 160m west of the onshore cable corridor(s) (first input recorded in 1978, the last input is recorded as 1991).</p>		

**Table 19.11 Potential sources of contamination (✓ present, X absent)**

Parameter	Potential contaminant of concern	Landfall search area	Onshore cable corridor(s)	Onshore substation zone
<b>Onsite</b>				
General Made Ground associated with historical and current site uses including active waste exemptions, historical storage tanks, unspecified heaps and disused gun emplacements.	Metals, cyanides, sulphates, phenols, polycyclic aromatic hydrocarbons (PAHs), hydrocarbons, asbestos, explosive residue (associated with historic gun emplacements) and ground gas.	✓	✓	X
Potentially infilled ground associated with identified sand and gravel quarries and historical cuttings.	Metals, cyanides, sulphates, phenols, PAHs, hydrocarbons, asbestos, polychlorinated biphenyls (PCBs), perfluoroalkyl and polyfluoroalkyl substances (PFAS) and ground gas.	X	✓	X
Present and historical agricultural land activities.	Pesticides and herbicides.	✓	✓	✓
<b>Offsite</b>				
General Made Ground associated with historical and current site uses including adjacent substation, sewage pumping stations, historical industrial uses and historical landfill.	Metals, cyanides, sulphates, phenols, PAHs, hydrocarbons, asbestos, PCBs, PFAS and ground gas.	✓	✓	✓
Present and historical agricultural land activities.	Pesticides and herbicides.	✓	✓	✓

### 19.5.2 Future trends in baseline conditions

51. In the event that the Project is not developed, a description of the anticipated changes in future baseline conditions for ground conditions and contamination has been carried out and is described within this section.
52. The onshore project area is located within an area identified as containing sand and gravel resources. Should extraction of these materials take place, the baseline conditions for the area would be altered. The potential changes not only relate to the geology of the area, but also the hydrogeology and hydrology. Removal of the superficial deposits has the potential to impact on groundwater flow patterns, for example by removing more permeable strata, and discharges into surface water bodies. The removal of the deposits also has the potential to expose pre-existing contamination which then may be mobilised.
53. Climate change is causing more extreme weather in the UK resulting in wetter winters and drier summers. This change in climate conditions has the potential to mobilise pre-existing contamination through, for example, increased rates of infiltration due to heavier rainfalls, increased surface run off due to heavy rainfall

following a period of drought/dry weather, dust generation through drier summers, and the creation of fissures (either via drier summers or periods of cold weather) within soils allowing infiltration into deeper layers where contamination may be present (Society of Brownfield Risk Assessment, 2022).

54. There is also the potential for groundwater levels to rise as a result of increased rainfall. A rise in groundwater levels into the unsaturated zone has the potential to mobilise pre-existing contaminants resulting in potential migration and adversely impacting controlled waters.
55. It should also be noted that natural degradation of contaminants over time may result in a general improvement in ground conditions.
56. Climate change has the potential to impact on the hydrology of surface drainage networks, with higher winter flows, lower summer flows and a greater number of storm related flood flows. The risk of flooding would also be amplified as a result of the predicted increase in rainfall which may result in an increase in peak river flows and an increase in the magnitude of surface water flooding.
57. An increase in population, increasing urbanisation and improvement in living standards may lead to a reduction in land available for agriculture. For land that is retained for agricultural use, pressures for more productive practices may increase to feed the increased population. As such, there may be an increase in the use of agricultural chemicals and industrial fertiliser to ensure continued high crop yields.
58. Although there is the potential for increased usage of agricultural chemicals to maintain crop yields, ongoing measures, such as the regulation of agricultural chemicals and catchment wide initiatives, as part of the implementation of the WFD are likely to improve the baseline environment by reducing the existing pressures on groundwater bodies. Also, as with the degradation of contaminants within soils, the baseline for groundwater quality is likely to improve over time through the natural breakdown of chemicals that may currently be present.
59. Increasing demand from population growth may also drive the expansion of urban areas into new areas, including land that has been previously developed (i.e. brownfield land). This expansion could result in an increase in the number of potential receptors to pre-existing sources of contamination. The expansion could also result in the introduction of new sources of contamination (e.g. fuel spills) and new pathways (e.g. piled foundations).

## 19.6 Assessment of significance

### 19.6.1 Potential effects during construction

#### 19.6.1.1 *Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts*

60. The excavation of cable trenches, earthworks, and piling (if required for the onshore substation), as well as the movement and stockpiling of soils, have the potential to mobilise existing ground contamination (where present). This could result in impacts to human health through dermal contact, inhalation, and ingestion of contaminants.

61. A PRA (Appendix 19.1, Volume III) has been undertaken for the study area to identify plausible contaminant linkages as a result of the potential presence of contaminants within the soils and groundwater. The PRA identified that the majority of land within the study area has an agricultural use where unacceptable risks from contamination are not anticipated.
62. The PRA also identified localised areas within the study area with a history of potential contaminative uses. These areas have the potential to act as sources of contamination. The areas identified include former mineral extraction sites which may have been infilled, historical landfills, general industry, railway land and historical gun emplacements (see Table 19.10).
63. The PRA identified Potential Contaminants of Concern (PCOC) that could be present in the study area and could represent a risk to construction workers, landowners, land users and neighbouring land users if exposed during construction activities. Construction activities, particularly earthworks, could disturb and expose construction workers and other site users to localised Made Ground soils and potential soil and / or groundwater contamination associated with historical and current land uses. Construction activities could create pollutant linkages through ingestion, inhalation, and direct dermal contact pathways.
64. In the event of exposing soils and stockpiling construction waste (including excavated soils), dust could be generated during dry and windy conditions. Under these conditions, construction workers and landowners, land users and neighbouring land users could temporarily be exposed to contamination via the inhalation of potentially contaminated dusts.
65. Additionally, the risk associated with soil contamination sources to human health could be altered by a change in the migration pathways as a result of construction activities. A specific risk of concern is ground gases. Excavation of the onshore cable corridor(s) and piling work (if required) for the onshore substation has the potential to create a preferential pathway for any gases or vapours to migrate and accumulate in confined spaces. The ground gas and vapour risk for the proposed onshore project area is unknown. The potential risk from ground gas and vapours, could represent a risk to human health through asphyxiation and explosion.
66. Construction workers are considered to be the most sensitive receptors as the activities they are engaged in constitute more direct exposure routes over longer period of times.

#### 19.6.1.1.1 Magnitude of impact

67. During the construction phase of North Falls there would be the requirement for materials to be excavated to construct the onshore cable corridor(s), temporary haul roads, joint bays, link boxes and temporary construction compounds. Excavation and movement of material would also be required at landfall and the onshore substation.
68. The maximum construction period for North Falls is anticipated to be 30 months. However, earthworks would not be taking place continuously or at the same location during the whole construction phase. At the time of writing the anticipated onshore cable corridor(s) construction rate and extent of open cut trenches per work front are yet to be determined.

69. The impacts are predicted to be of local spatial extent (localised to the work areas and areas where contamination may be present), of short-term duration, of intermittent occurrence and high reversibility (occurring only during the works). The magnitude of impact is therefore considered to be low.
70. In relation to risks associated with the migration of ground gases and / or vapours along the onshore cable corridor(s), the impacts could be present over the length of the onshore cable corridor(s) for the duration of the works and represent both acute or chronic health risks. The magnitude of impact is considered to be high in relation to ground gas and vapours. It should, however, be noted that this is subject to the plausibility of a ground gas / vapour source of contamination and receptor linkage.

#### 19.6.1.1.2 Sensitivity of receptor

71. The sensitivity of construction workers, landowners, land users and neighbouring land users is considered high.

#### 19.6.1.1.3 Significance of effect

72. With the implementation of the embedded mitigation measures included in Table 19.3, the potential impacts associated with the excavation works required for the construction of North Falls is low on a high sensitivity receptor. Therefore, the significance of effect is considered moderate adverse.
73. In relation to the migration of ground gases and / or vapours, the potential impacts to human health during construction works are considered to be high on a high sensitivity receptor. Therefore, the potential impact significance is considered major adverse in the absence of additional mitigation.

#### 19.6.1.1.4 Additional mitigation

74. Where areas of potential contamination cannot be avoided, such as areas that cross the entire width of the onshore cable corridor(s) (e.g. active rail lines), targeted ground investigations may be required post consent to determine the extent and source of any contamination. The ground investigation may include, but is not limited to, the collection of soil, soil-leachate, groundwater and surface water samples for laboratory analysis. The range of contaminants tested for may vary between locations and sample type, examples of contaminants that may be tested for include, but is not limited to, metals, PAHs, PCBs and PFAS. Ground gas monitoring wells would be installed in areas identified as potentially containing ground gas generating materials. Groundwater monitoring wells would also be required as part of the ground investigation works in order to establish the groundwater regime and to identify, for example, whether contamination is from onsite or offsite sources.
75. This would characterise the conditions within the onshore project area, identify unacceptable risks and determine whether remediation is required. If areas of potential concern are identified, then a remediation strategy would be developed and agreed with the relevant bodies prior to the commencement of remedial works and construction activity. The ground investigation, risk assessment and remediation would follow guidance provided within the 2021 Environment Agency Land Contamination Risk Management Framework.
76. Risks associated with the creation of a preferential pathway for ground gas and vapours via the onshore cable corridor(s) can be mitigated via re-instating excavated materials following the installation of the onshore cables. If, however,



a different source of material is required to backfill excavations (i.e. because the excavated material was deemed to pose an unacceptable risk), the risks associated with the creation of preferential pathways can be mitigated via ensuring that the material has the same porosity as that of the excavated material. This would help reduce the risks posed to human health receptors as it would provide continuity with the surrounding environment and not introduce areas of lower porosity soils which could act as preferential pathways.

- 77. If a significant source of gas / vapour generating material is encountered during construction further consideration would be required.
- 78. Potential risks to construction workers would be mitigated via the measures implemented as part of the CoCP which form part of the embedded mitigation measures (see Table 19.3).

#### 19.6.1.1.5 Residual significance effect

- 79. Following the incorporation of both the embedded and additional mitigation measures, the risk to human health from exposure to potentially contaminated soils, ground gas and vapours during construction, would be minimised as far as is reasonably practicable. This would effectively reduce the magnitude of impact from high to negligible on a highly sensitivity receptor. Therefore, the residual significance of effect would be reduced to minor adverse.

#### 19.6.1.2 Impact 2: Direct impacts on groundwater quality and groundwater resources

- 80. Direct impacts to the Principal Aquifer of the Red Crag Formation and the SPZ may occur from deep ground workings related to trenchless crossing (e.g. HDD), operations for cable installation beneath surface infrastructure (e.g. railways) and watercourses. There is the potential for creating preferential pathways, for drilling mud / other contaminants to leak along the drill path, which could cause contamination of groundwater. The volume of drilling fluid that could be released during HDD works is dependent on a number of factors, including the size of the fracture, the permeability of the geological material, the viscosity of the drilling fluid and the pressure of the hydraulic drilling system. Piling may be required for the foundations of the onshore substation, which is located within an SPZ 3. Piling activities (dependent on the method of piling chosen) have the potential to create preferential pathways through a low permeability layer, allowing potential contamination to migrate impacting water quality and associated groundwater abstractions (if present).
- 81. Direct impacts to the Secondary A and Secondary B Aquifers within the superficial deposits may occur due to the intrusive nature of trenching. The significance of the disturbance would be dependent on the depth of the aquifer unit in relation to the proposed depth of the excavations, with superficial aquifers present at the surface at greater risk of direct impacts.
- 82. During construction, surface layers would be excavated, which would allow increased infiltration of rainwater and surface run-off to the subsurface. This could potentially mobilise any residual contamination already present in the overlying strata which could potentially migrate into the underlying superficial aquifers impacting groundwater quality and associated groundwater abstractions (if present). Whilst significant areas of contamination are not expected across the majority of the onshore project area, there are localised areas where crossing potentially contaminated land may be unavoidable.



83. If required, dewatering of perched water or groundwater within excavations could also affect groundwater flow and water quality, resulting in impacts to base flow of local watercourses or impact on groundwater abstractions (if present).
84. In addition, during construction there is the potential for the accidental release of lubricants, fuels, and oils from construction machinery. This can occur as a result of spillages, leakage, or storage. These can enter into the ground and subsequently into groundwater affecting groundwater quality and associated groundwater abstractions (if present).

#### 19.6.1.2.1 Magnitude of impact

85. During the construction phase of North Falls there would be the requirement for materials to be excavated to construct the onshore cable corridor(s), temporary haul roads, joint bays, link boxes and temporary compounds. Excavation of material would also be required at landfall and within the onshore substation zone.
86. The maximum construction period for North Falls is anticipated to be 30 months. However, earthworks would not be operating continuously during the whole construction period.
87. Any changes to infiltration rates, surface runoff or dewatering that may occur as a direct result of earthwork activities and direct effects on the underlying superficial aquifers are predicted to be of local spatial extent within each aquifer unit, of short-term duration (related to the working areas only), of intermittent occurrence and high reversibility (occurring only during the works and returning to baseline conditions following completion of the works). The magnitude of impact associated with earthworks is therefore considered to be low.
88. Trenchless crossings (e.g. HDD) will be required as part of the construction works, e.g., where the onshore cable corridor(s) intersects a Main River. The foundation design of the onshore substation, i.e. whether piling is required, is yet to be determined. The onshore substation is underlain by bedrock of the Thames Group which is classified as unproductive strata and so risks to groundwater resources associated with piling in this area are not anticipated. Therefore, the magnitude of impact is considered to be negligible.
89. Dependent on the depth and thickness of the superficial aquifer units, there is the potential for them to also be affected by trenchless crossing techniques and piling (if required). As mentioned previously, the potential effects are predicted to be of local spatial extent (occurring only at trenchless crossings, if required) and of intermittent occurrence. Therefore, in relation to the impacts to superficial aquifers from these activities, the magnitude of impact is considered to be low.

#### 19.6.1.2.2 Sensitivity of receptor

90. At the time of writing it is not known whether there are private domestic potable groundwater abstractions within the onshore project area. As such, the sensitivity of the underlying Secondary Aquifers has been assessed conservatively by assuming groundwater abstractions are present and are taken from the superficial deposits. Therefore, the sensitivity of the superficial Secondary Aquifers (A and B) is considered high.
91. The isolated area within the onshore cable corridor(s) underlain by the Principal Aquifer is not located within an SPZ, indicating that groundwater abstractions

for public potable water supply are not associated with this aquifer unit. There is the potential that the Principal Aquifer is abstracted for private water supply, therefore, the sensitivity of the Principal Aquifer is considered high.

92. Information in relation to the presence of private groundwater abstractions, including those from private wells, will be gathered through ongoing consultation with local authorities and individuals. This will allow for the sensitivity of Principal and Secondary Aquifers to be refined and identification of mitigation measures that are bespoke to each location should they be required. This information will be collated prior to DCO submission.
93. The SPZ 3 which is present within the onshore cable corridor(s) north of Tendring Green up to and including the onshore substation zone is considered medium sensitivity.

#### 19.6.1.2.3 Significance of effect

94. Prior to the implementation of additional mitigation measures discussed below, the significance of effect associated with construction works on water quality or the resource potential of the Secondary Aquifers is considered moderate adverse. The significance of effect is inclusive of the potential impacts associated with trenchless crossings and piling (if required).
95. In relation to impacts on the Principal Aquifer present within an isolated area within the onshore cable corridor(s), the significance of effect is considered minor adverse.

#### 19.6.1.2.4 Additional mitigation

96. As discussed in Section 19.6.1.1.4, additional mitigation includes measures such as investigations to characterise ground conditions. Should contamination be encountered that is considered to pose an unacceptable risk to groundwater and groundwater resources, a remediation strategy proportionate to the level of risk would be developed and agreed with the relevant bodies. Once agreed, any required remediation works, which would be dependent on the type and level of contamination encountered, would be undertaken to mitigate the potential risks posed.
97. In addition, mitigation measures relating specifically to impacts to groundwater are likely to include the development of a hydrogeological risk assessment where earthworks / excavations are within 50m (or 250m dependent upon the volume abstracted) of private potable groundwater abstractions. The risk assessment, which would be desk-based, follows a tiered approach with more detailed assessments carried out in areas considered to be a potentially greater risk to groundwater. The production of the hydrogeological risk assessment would be undertaken prior to the commencement of construction works (should one be deemed necessary) and meet the requirements of the Environment Agency's Approach to Groundwater Protection 2018 Framework. Furthermore, a piling risk assessment would be undertaken where piles are to be used (e.g. the onshore substation zone) in areas of potential contamination, in line with the Environment Agency's Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001). The mitigation measures and monitoring requirements recommended by these assessments would be included in the Outline CoCP, implemented during construction works and secured as part of the DCO Requirements.

#### 19.6.1.2.5 Residual significance of effect

98. Following the implementation of the mitigation measures described, the overall risk to groundwater within the SPZ 3 and Secondary Aquifers during construction would be minimised as far as is reasonably possible. This would effectively reduce the magnitude of impact to negligible for both the Secondary Aquifers and SPZ 3. Therefore, the residual significance of effect would be minor adverse. The residual significance of effect to the Principal Aquifer would remain minor adverse, which is not significant in EIA terms.

#### 19.6.1.3 Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination

99. The study area crosses four Main Rivers: Holland Brook, Kirby Brook, Tendring Brook and an unnamed tributary (main river) of Landmere Creek / Hamford Water.
100. In addition to these larger rivers, there are unnamed watercourses, reservoirs, ponds and ditches that are located either wholly or partially within the study area.
101. As described in Table 19.11 and the PRA (Appendix 19.1, Volume III), potential sources of contamination have been identified within the study area. Installation of the onshore export cables and construction of the onshore substation would require substantial earthworks, as well as the potential for piling. These activities have the potential to disturb potential contamination which could migrate and be released into surface water via the following pathways:
- Mobilisation and migration of free phase hydrocarbons, soil contaminants or dissolved phase contaminants in groundwater by construction activities with subsequent release into surface waters;
  - Surface water runoff from contaminated Made Ground soils brought to the surface during construction works;
  - Runoff from stockpiles of potentially contaminated soils;
  - Migration of soil or groundwater contaminants into surface water drains during construction activities which then enter surface water;
  - Accidental spillage whilst handling, storage or treatment of contaminated water or fuels or other chemicals used during construction; and
  - The hydraulic regime of the local area could also be affected by the construction of North Falls, for example, by backfilling excavated areas with less compacted soil / material could potentially create preferential flow paths into surface water receptors.

#### 19.6.1.3.1 Magnitude of impact

102. It is possible that there would be multiple sources of contamination within a river catchment for North Falls, however with the implementation of embedded mitigation measures (see Table 19.3), the magnitude of impact is considered negligible.

#### 19.6.1.3.2 Sensitivity of receptor

103. Any migration and discharge of contaminants into surface waters could lead to a reduction in surface water quality and impact on the ecological habitats that they support. As the study area crosses Holland Brook which flows through

Holland Haven Marshes (also within the study area), which is a statutory designated site (SSSI), the sensitivity of surface waters of considered to be high.

104. Additional effects relating to surface water quality and the ecological habitats they support are provided in Chapter 21 Water Resources and Flood Risk and Chapter 23 Onshore Ecology (Volume I).

#### 19.6.1.3.3 Significance of effect

105. With the implementation of embedded mitigation measures, the significance of effect on surface water bodies during the construction phase is considered minor adverse.

#### 19.6.1.3.4 Additional mitigation

106. The significance of effect is minor adverse which is not considered to be a 'significant effect' under the EIA regulations. Therefore, no additional mitigation is required.

#### 19.6.1.4 Impact 4: Sterilisation of future mineral resources

107. As described in Table 19.10, there are a number of MSAs, and a MCA located within the onshore project area. Construction activities and installation of cables within these areas would prevent the extraction of sands and gravels across the whole construction area.

##### 19.6.1.4.1 Magnitude of impact

108. The installation of up to four trenches as part of the construction of the onshore cable corridor(s) running the length of 24km at a construction width of up to 60m (increasing up to 122m at trenchless crossings), has the potential to sterilise the resources present within the linear route of the onshore cable corridor(s) during construction. In all cases, where the onshore cable corridor(s) intersect a MSA or MCA, only part of each area would be impacted and not the whole protected area.
109. The maximum footprint of the onshore substation would be 8ha (plus a 3.75ha temporary construction compound) and has the potential to temporarily sterilise mineral resources within its footprint during construction works. The total area of MSAs impacted during the construction phase of North Falls will be quantified following route refinement and included within the ES.
110. The footprint required for construction works will be greater than that required for permanent infrastructure during the operational phase. Therefore, the potential impacts during the construction phase will temporarily sterilise a larger area than that which would be permanently sterilised during operation (see Section 19.6.2.3).
111. Following completion of construction works, infrastructure associated with temporary haul roads, construction compounds etc., that have effectively sterilised mineral resources present in MSAs or MCAs will be removed. This would then allow for mineral resources to be available for extraction. Therefore, the magnitude of impact during construction is considered to be low.

##### 19.6.1.4.2 Sensitivity of receptor

MSAs and MCAs are considered to be of regional importance and therefore the sensitivity of the receptor is considered to be medium.

#### 19.6.1.4.3 Significance of effect

112. The significance of effect on mineral resources associated with the construction of North Falls is low magnitude on a medium sensitivity receptor, resulting in a minor adverse significance of effect.

#### 19.6.1.4.4 Additional mitigation

113. Although the significance of effect is minor adverse, and therefore not considered significant in EIA terms, additional mitigation may be required post consent to determine the quality and viability of resources. This mitigation would include consultation with Essex Minerals and Waste Planning Authority regarding the practicality and viability of extraction of any mineral resource present within the works footprint. Supporting information may include, for example, ground investigation prior to construction to better determine the depth, accessibility and quality of the mineral resource and enable a quantification of the amount of the mineral that would be sterilised, should it be required by Essex Minerals and Waste Planning Authority. If it was determined that extraction of the resource was reasonably practical, it may be extracted prior to the commencement of construction works and therefore reduce the area that may be potentially sterilised.
114. A Minerals Resource Assessment (MRA) would be undertaken (if required) post consent, and prior to the commencement of construction works, to provide an indication of the likely quality and extent of the mineral resource, the commercial viability of extraction and environmental impact. This may also aid in determining whether it is reasonably practical for the resource to be extracted prior to the commencement of construction works and therefore, reduce the area that may be potentially sterilised.
115. In addition to the MRA, a MIIA may be required to identify and discuss the potential impacts associated with the construction of North Falls on mineral infrastructure already present. This would be undertaken in consultation with Essex Minerals and Waste Planning Authority. As with the MRA, this would be undertaken post consent and prior to the commencement of construction works.

#### 19.6.1.4.5 Residual significance of effect

116. Following the mitigation measures described above, the residual significance of effect on mineral resources during construction would remain as minor adverse which is not significant in EIA terms.

#### 19.6.1.5 Impact 5: Built environment

117. The construction phase has the potential to impact the existing built environment. This may be through creating new preferential pathways for contaminants or gases to migrate that may lead to degradation of utilities and concrete from aggressive attack. This could potentially compromise the integrity of buildings or utilities, or the migration of ground gases into buildings could cause explosion.

#### 19.6.1.5.1 Magnitude of impact

118. Commercial and residential properties are located within the study area, however, they tend to be isolated and not widespread or present in large numbers. Commercial and residential properties are also located within 250m of the onshore project area, in a similar isolated distribution. The greatest concentration of buildings within 250m of the onshore project area is around the settlement of Frinton-on-Sea.



119. Potential impacts to the built environment are considered to be localised to work area and areas of contamination, the magnitude of impact is therefore considered to be medium.

#### 19.6.1.5.2 Sensitivity of receptor

120. With reference to Table 19.6, the presence of commercial and residential infrastructure within both the onshore project area and 250m buffer, the sensitivity of the built environment is considered to be medium.

#### 19.6.1.5.3 Significance of effect

121. The potential significance of effect to the built environment associated with the construction of North Falls is considered moderate adverse.

#### 19.6.1.5.4 Additional mitigation

122. Mitigation includes the reduction of construction activities in proximity to commercial and residential properties where possible. However, where this isn't possible, pre-construction site characterisation works in areas of the onshore project area identified as potential sources of contamination may be required. This would allow for the identification of potential contamination and the risks these may present to the built environment during construction works. Should it be determined that risks to the built environment are present, appropriate remediation works would be undertaken to mitigate the potential impacts.

#### 19.6.1.5.5 Residual significance of effect

123. Following the implementation of mitigation measures described above, the risk to the built environment during the construction of North Falls would be reduced as far as is reasonably practical. The reduced risk lowers the magnitude of impact to negligible, reducing the residual significance of effect to minor adverse which is not considered significant in EIA terms.

### 19.6.2 Potential impacts during operation

#### 19.6.2.1 *Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts*

124. During the operation of North Falls there would be no planned maintenance along the onshore cable corridor(s) which would require the excavation of soils. In the unlikely event of cable failure then that stretch of cable between two joint bays may need to be replaced. This would require excavation at the two joint locations to expose the joint bays and allow the cable to be pulled out and replaced. Maintenance works associated with the onshore substation are anticipated to be undertaken during the operational life of North Falls, which may include the need for soils to be excavated.
125. If contaminated materials are brought to the surface through excavation during the operational phase and no mitigation measures are implemented, these materials would permanently be exposed at surface. This creates the potential for maintenance workers, landowners, land users and neighbouring land users to come into direct contact with contaminated soils left in-situ via direct contact pathways.
126. Materials excavated during the installation of the onshore cables and construction of the onshore substation would be re-instated following completion where possible. Reinstatement of materials with a similar porosity

as the surrounding environment would help mitigate the potential for preferential pathways be created. However, if a different source of material is used to backfill excavations that is not of a similar porosity as the surrounding environment (e.g. a more porous material such as coarse hardcore is used) there is the potential for ground gases and / or vapours to migrate along the length of the corridors or from beneath the onshore substation area. This may lead to the accumulation of ground gases and vapours within the onshore substation accessed by maintenance workers during the operational phase represents risks associated with asphyxia and explosion may be present.

127. If however, during site characterisation works areas considered to represent an unacceptable risk to human health be identified remedial works proportionate to the level of risk would be undertaken. In addition, should areas of unexpected contamination be encountered during construction works, appropriate mitigation measures (including potential remediation) would also be undertaken to reduce the significance of effect to human health receptors.
128. In relation to risks posed by ground gases and vapours, should potential sources of ground gas / vapour generating materials be identified as part of site characterisation works or encountered unexpectedly during construction appropriate mitigation measures, including removal of the source material would be implemented prior to construction. Impacts associated with ground gas / vapours to the built environment are discussed in Section 19.6.2.4).

#### 19.6.2.1.1 Magnitude of impact

129. There may be a need for ground excavations to be undertaken at joint bay locations or at the onshore substation as part of the maintenance for North Falls. The impacts are predicted to be of local spatial extent (localised areas where contamination may be present and to areas where excavation works are required), of short-term duration, of intermittent occurrence and high reversibility (occurring only during the maintenance works). The magnitude of impact is therefore considered to be low.
130. In areas where there is the potential for ground gases and / or vapours to accumulate (e.g. within the onshore substation building) mitigation measures implemented during the construction phase would form the embedded mitigation measures during operation. The incorporation of the embedded mitigation measures would reduce the magnitude of impact during operation. Therefore, the magnitude of impact is considered to be low.

#### 19.6.2.1.2 Sensitivity of receptor

131. The sensitivity of maintenance workers, landowners, land users and neighbouring land users located with 50m of North Falls is considered high (see Table 19.6).

#### 19.6.2.1.3 Significance of effect

132. Without the implementation of the additional mitigation measures outlined below, the potential magnitude of impact on human health associated with the operation of North Falls is low on a high sensitivity receptor, representing a moderate adverse significance of effect.

#### 19.6.2.1.4 Additional mitigation

133. Following the completion of construction works, the health and safety folder for North Falls will be handed to the Applicant by the Principal Contractor. The



folder will include information in relation to the residual risks present within the onshore project area, including the potential risks associated with ground gas (should materials of a differing porosity be used to backfill excavations).

134. Maintenance workers that are required to undertake ground excavations during the operation of North Falls would be provided with the information contained within the health and safety folder regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessments and method statements with their recommendations being implemented.

#### 19.6.2.1.5 Residual significance of effect

135. With the incorporation of mitigation measures, the risk to human health during the operation of North Falls would be minimised as far as possible. The magnitude of impact would be reduced to negligible and thereby reduce the residual significance of effect to minor adverse, which is not considered significant in EIA terms.

#### 19.6.2.2 Impact 2: Impact on controlled waters (groundwater and surface waters)

136. Maintenance activities at landfall, along the onshore cable corridor(s) and at the onshore substation have the potential to mobilise pre-existing contamination or create new contamination through the leakage or spillage of fuels, oils or other chemicals from machinery, vehicles, or operational equipment. This could affect water quality within the aquifers underlying the onshore project area, surface water receptors and the water abstractions they support (if present).

#### 19.6.2.2.1 Magnitude of impact

137. Although excavation works will not form part of planned maintenance activities during the operational phase of North Falls, there is the potential for excavations to be undertaken to conduct unplanned repairs. Should excavation works be required as part of unplanned works, these would be at joint bay locations for cable repairs or at the onshore substation and not involve the entirety of the North Falls infrastructure.
138. The impacts are predicted to be of local spatial extent (localised to areas of excavation / maintenance and where contamination may be present). The magnitude of impact is therefore considered to be low during operation.

#### 19.6.2.2.2 Sensitivity of receptor

139. Any migration and discharge of contamination into surface waters through direct or indirect pathways (e.g. surface run-off, discharge of groundwater into surface water bodies) could lead to a reduction in surface water quality and impact on the ecological habitat they support. Although Holland Haven Marshes SSSI is located within the landfall area, surface water features (e.g., Holland Brook) from other areas of the onshore project area may flow and discharge into the protected area. Therefore, the sensitivity of controlled waters is considered to be high.

#### 19.6.2.2.3 Significance of effect

140. The potential significance of effect to controlled waters resulting from the operation of North Falls is considered moderate adverse.

#### 19.6.2.2.4 Additional mitigation

141. Maintenance workers that are required to undertake ground excavations or maintenance works during the operation of North Falls would be provided with the information contained within the health and safety folder regarding the nature of ground conditions within each area so that they can develop site and task specific risk assessments and method statements with their recommendations implemented to protect controlled waters.
142. During cable repair / maintenance works and at the onshore substation, all fuels, oils, lubricants, and other chemicals would be stored in an impermeable bund with at least 110% of stored capacity. Spill kits would be available on site and an Emergency Response Plan (ERP) (or similar) would be developed and recorded within the health and safety folder. The ERP will outline the mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials.

#### 19.6.2.2.5 Residual significance of effect

143. Following the implementation of the mitigation measures discussed above, the risk to controlled waters would be minimised as far as possible. This would reduce the magnitude of impact to negligible, and therefore reduce the residual significance of effect to minor adverse which is not considered significant in EIA terms.

#### 19.6.2.3 Impact 3: Sterilisation of future mineral resources

144. Future extraction of resources from within MSAs and MCAs would be prevented within the permanent easement of the onshore export cables and the onshore substation, as well as areas required for permanent access routes. This would prevent extraction within these areas for the duration of the operational period.
145. The impacts are predicted to be permanent and could affect the receptor directly. When reviewing the Essex Minerals and Waste Planning Policy map (Essex County Council, 2014), the proportion of the total MSA and MCA that would be effectively sterilised appears to be a small proportion. The total area of MSAs and MCA impacted during the operational phase of North Falls will be quantified following route refinement and included within the Environmental Statement.

#### 19.6.2.3.1 Magnitude of impact

146. Although the operational footprint of North Falls will be smaller than that of the construction footprint, the impacts would be permanent during the lifetime of the Project rather than temporary. However, following decommissioning of North Falls, these areas may become available for mineral extraction once more and so the impacts are considered to be ultimately reversible. Therefore, the magnitude of impact is considered to be medium.

#### 19.6.2.3.2 Sensitivity of receptor

147. MSAs and MCAs are considered to be of regional importance and therefore the sensitivity of future mineral resources is considered medium.

#### 19.6.2.3.3 Significance of effect

148. The potential impacts to mineral resources resulting from the operation of North Falls is medium magnitude on a medium sensitivity receptor, representing a moderate adverse significance of effect.

#### 19.6.2.3.4 Additional mitigation

149. As discussed in Section 19.6.1.4.4, prior to construction and operation consultation with Essex Minerals and Waste Planning Authority would be undertaken to determine potential mitigation measures, including for example the feasibility of mineral extraction within the area that would be sterilised. It may be necessary for a MRA to be undertaken to determine the amount of mineral at risk from sterilisation and the viability of extraction. Where viable, consideration would be given to the extraction of the mineral resource during construction.

#### 19.6.2.3.5 Residual significance of effect

150. Following the implementation of mitigation measures, the magnitude of impact is reduced to negligible and therefore the residual significance of effect is considered minor adverse which is not considered significant in EIA terms.

#### 19.6.2.4 Impact 4: Built environment

151. Materials such as concrete used in the infrastructure associated with North Falls have the potential to undergo degradation, such as chemical attack, from aggressive ground conditions due to the presence of acids or sulphates. This has the potential to compromise the integrity of structures associated with the onshore substation.
152. In addition, the presence of contaminants in soils could also result in a risk of corrosion and permeation of utilities such as plastic water supply pipes that may be installed at the onshore substation. If utilities corridors are within land affected by contamination, construction of clean or lined service corridors would be installed to protect land users and utilities. This would include, for example, the use of soils deemed not to contain contamination above human health generic assessment criteria appropriate for the end use within the onshore project area.
153. Buildings built on or near sources of ground gas (such as infilled land) could also be at risk from the accumulation of gases potentially causing explosion. Should unexpected sources of ground gas be identified prior to or during construction works, a ground investigation would be undertaken to characterise ground conditions and assess potential risks. Depending on the outcome of the assessment, mitigation measures such as the use of gas protection measures within the onshore substation design would be implemented.
154. The above measures would be implemented during the construction phase and form part of the embedded mitigation measures for the operational phase of North Falls.

#### 19.6.2.4.1 Magnitude of impact

155. The PRA (Appendix 19.1, Volume III) indicates that the onshore substation zone is not situated on or near potential sources of ground gases, such as infilled land.
156. Depending on the location of jointing bays and link boxes in relation to potential sources of ground gas generating contamination, there is the potential for the gases to migrate and accumulate in these underground structures at landfall and along the onshore cable corridor(s). However, mitigation measures implemented at the construction phase such as the use of gas protection

measures within the onshore substation design would reduce the potential magnitude of impact during operation to negligible.

#### 19.6.2.4.2 Sensitivity of receptor

157. Due to the presence of the onshore substation and ancillary structures, as well as commercial and residential properties within the onshore project area, the sensitivity of the built environment is considered to be medium.

#### 19.6.2.4.3 Significance of effect

158. With the implementation of embedded mitigation measures during the construction phase, the risk to the built environment during the operation of North Falls would be reduced as far as possible. The significance of effect during operation is therefore considered minor adverse, which is not considered significant in EIA terms.

### 19.6.3 Potential impacts during decommissioning

159. No decision has been made regarding the final decommissioning policy for the onshore export cables, as it is recognised that industry best practice, rules and legislation change over time. It is likely that the cables would be pulled through the ducts and removed, with the ducts themselves left in situ.

160. In relation to the onshore substation, the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined and agreed with the relevant planning authority later within the lifetime of North Falls, but are expected to include:

- Dismantling and removal of outside electrical equipment from the onshore project area located outside the substation building;
- Removal of cabling from onshore project area;
- Dismantling and removal of electrical equipment from within the substation building;
- Removal of main substation building and minor services equipment;
- Demolition of support buildings and removal of fencing;
- Landscaping and reinstatement of the onshore project area (including land drainage); and
- Removal of areas of hard standing.

161. Whilst details regarding the decommissioning of the substation are currently unknown, considering a worst-case scenario, which would be the removal and reinstatement of the current land use, it is anticipated that the impacts would be similar or less than those during construction. This is because areas of identified contamination would have been remediated during the construction phase.

162. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of North Falls to be in line with current guidance, policy, and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licensing and consenting approach.

## 19.7 Cumulative effects

### 19.7.1 Identification of potential cumulative effects

163. The first step in the CEA process is the identification of which residual effects assessed for North Falls on their own have the potential for a cumulative effect with other plans, projects, and activities. This information is set out in Table 19.12. Only potential effects assessed in Section 19.6 as negligible adverse or above are included in the CEA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

**Table 19.12 Potential cumulative effects**

Impact	Potential for cumulative effect	Rationale
<b>Construction</b>		
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Yes	The residual effects to construction workers would be confined to the onshore project area. Effects on landowners, land users and neighbouring land users may be exacerbated by other projects.
Impact 2: Direct impacts on groundwater quality and groundwater resources	Yes	Residual effects on Secondary and Principal Aquifers may be exacerbated by other projects which are located within the same aquifer and / or SPZ.
Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination	Yes	Residual effects on surface water and the ecological habitats they support may be exacerbated by other projects that are located within the same river catchment.
Impact 4: Sterilisation of future mineral resources	Yes	Residual effects on MSAs and MCAs may be exacerbated by other projects if located within the same safeguarding area.
Impact 5: Built environment	Yes	Residual effects on the built environment may be exacerbated by other projects if located near to the same structures.
<b>Operation</b>		
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Yes	The residual effects to maintenance workers would be confined to the onshore project area. Residual effects on landowners, land users and neighbouring land users may be exacerbated by other projects.
Impact 2: Impact on controlled waters (groundwater and surface waters)	Yes	Residual effects on Secondary and Principal Aquifers may be exacerbated by other projects which are located within the same aquifer and / or SPZ.
Impact 3: Sterilisation of future mineral resources	Yes	Residual effects on MSAs and MCAs may be exacerbated by other projects if they are located within the same safeguarding area.
Impact 4: Built environment	Yes	Residual effects on the built environment may be exacerbated by other projects if located near the same buildings.

### 19.7.2 Other plans, projects and activities

164. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative effects for inclusion in the CEA (described as 'project screening'). This information is set out in Table 19.13 below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to North Falls, status of available data and rationale for including or excluding from the assessment.
165. The Project screening has been informed by the development of a CEA project list which forms an exhaustive list of plans, projects and activities within the study area (Section 19.3.1) relevant to North Falls. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.
166. Only projects within a 1km Zone of Influence (Zol) for ground conditions and contamination have been included in the CEA as it considered unlikely that projects at distances greater than this will result in cumulative effects between projects.

**Table 19.13 Summary of projects considered for the CEA in relation to ground conditions and contamination (project screening)**

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CEA (Y/N)	Rationale
Five Estuaries	Pre-application	2028-2030	0	High	Y	<p>The proposed Five Estuaries Offshore Wind Farm development is located off the coast of Suffolk and would form an extension to the operational Galloper Offshore Wind Farm. At the time of writing information relating to the proposed mitigation measures associated with the construction and operation of Five Estuaries was not available.</p> <p>Due to the nature and scale of the proposed development however, it is anticipated that there is the potential for the onshore elements of the project to have direct and / or indirect cumulative impacts on the receptors identified. There is also the potential for there to be a temporal overlap during construction and operational phases of both Five Estuaries and North Falls. The potential for cumulative effects to occur is considered limited. This is due to the anticipated mitigation measures that would be incorporated into the Five Estuaries project.</p>
East Anglia Green	Pre-application	2027-2031	0	High	Y	<p>The proposed East Anglia Green project seeks to reinforce the high voltage power network in East Anglia between existing substations (Norwich Main, Bramford in Suffolk and Tilbury in Essex) as well as connect the Five Estuaries and North Fall Offshore Wind Farm developments to the network. At the time of writing, information relating to the proposed mitigation measures associated with the East Anglia Green project was not available.</p> <p>Due to the nature and scale of the proposed project however, it is anticipated that there is the potential for the project to have direct and / or indirect cumulative impacts on the receptors identified, this is centred the onshore substation zone where there is a spatial overlap present. There is also the potential for there to be a temporal overlap during construction and operational phases of both East Anglia Green and North Falls. The potential for cumulative effects to occur is considered limited. This is due to the anticipated mitigation measures that would be incorporated into the East Anglia Green project.</p>
Land adjacent to Lawford Grid Substation Ardleigh Road Little Bromley Essex CO11 2QB	Awarded	Information unavailable	0.3km	N/A	N	<p>The project involves the construction and operation of a 50MW Battery Energy Storage System (BESS), and related infrastructure with associated access, landscaping and drainage.</p> <p>It is anticipated that due to the nature of the development that appropriate mitigation measures will be implemented to protect the surrounding environment. There is no spatial overlap between the proposed BESS and North Falls and so it is considered that there is no potential for cumulative effects to occur.</p>



### 19.7.3 Assessment of cumulative effects

167. Based on the Project screening in Table 19.13, two of the listed projects will be included in the CEA for further assessment: Five Estuaries Offshore Wind Farm and East Anglia GREEN. These projects are summarised below and assessed in Table 19.14 and Table 19.15.

#### 19.7.3.1 *Five Estuaries Offshore Wind Farm*

168. At the time of writing, the latest publicly available information for Five Estuaries Offshore Wind Farm comprises of a Scoping Report (Five Estuaries Offshore Wind Farm Ltd., 2021). The level of information included within the Scoping Report is not sufficient to undertake a full CEA.
169. The Applicant is in regular and on-going dialogue with Five Estuaries Offshore Wind Farm Ltd. It has been established that the location of landfall, onshore cable corridor and onshore substations will broadly be the same as North Falls and construction may occur at the same time and for a similar duration.
170. Recognising that both North Falls and Five Estuaries are comparable in terms of location and scale, it is possible to predict potential high level cumulative effects during construction and operation.
171. The Applicant will incorporate relevant new information presented by Five Estuaries within the CEA in the ES.

#### 19.7.3.2 *East Anglia GREEN*

172. At the time of writing, the latest publicly available information for East Anglia GREEN comprises of a Scoping Report (National Grid, 2022). The level of information included within the Scoping Report is not sufficient to undertake a full CEA.
173. The Applicant is in regular and on-going dialogue with National Grid and will seek to continue working closely with National Grid, and with statutory consultees to assess potential cumulative effects. There will be a spatial overlap between the infrastructure associated with East Anglia GREEN's new substation and North Falls. Based on this likely location, it is possible to forecast potential high level cumulative effects during construction and operation.
174. The Applicant will incorporate relevant new information presented by East Anglia GREEN within the CEA in the ES.

**Table 19.14 Cumulative effects from other projects on ground conditions and contamination during construction**

Project	Cumulative effect 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Cumulative effect 2: Impacts on groundwater quality and groundwater resources	Cumulative effect 3: Impacts on surface water quality and the ecological habitats they support from contamination	Cumulative effect 4: Sterilisation of future mineral resources	Cumulative effect 5: Built environment
Five Estuaries Offshore Wind Farm	<p>Details within the scoping reports include mitigation measures that would be adopted as part of Five Estuaries construction. In relation to the potential impacts to human health, mitigation measures highlighted in the scoping report include:</p> <ul style="list-style-type: none"> <li>• Development of task specific method statements and risk assessments with reference to any potentially significant sources of contamination identified during both desk and site based assessments;</li> <li>• Use of appropriate personal protective equipment for the tasks being undertaken;</li> <li>• Adoption of dust suppression measures, particularly during dry weather; and</li> <li>• Implementation of a CoCP and adoption of appropriate safe working practices.</li> </ul> <p>Given the proposed mitigation measures that would be adopted by Five Estuaries and considering that any alteration in ground conditions would be highly localised it is considered that no cumulative effects would occur during the construction I phase with North Falls. Therefore, the residual effect on human health is not considered to increase from the minor adverse impact predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>The potential cumulative effects upon superficial aquifers are likely to occur as a result of accidental spillages of fuels or chemicals during construction and mobilisation of existing contamination (if present). Given the spatial overlap of Five Estuaries to North Falls there is the potential for the projects to be overlapping the same aquifers.</p> <p>Mitigation measures highlighted within the Five Estuaries scoping report include provision of spill kits on all site plant and where potentially contaminative liquids are stored, in addition to a CoCP.</p> <p>Although Five Estuaries may be overlying the same aquifer units, given the proposed mitigation measures that would be adopted, as well as the localised nature of the effects in isolation, the potential for effects to act cumulatively on the aquifer is low.</p> <p>Impacts to the SPZ may occur where there is piling (if required and dependent on methodology) or trenchless crossings within the same SPZ. Should piling be required as part of the construction of the onshore substations for Five Estuaries and North Falls, the preferred locations for each project's substations are underlain by the unproductive bedrock strata of the Thames Group.</p> <p>Impacts to the Principal Aquifer associated with the Red Crag Formation may occur should trenchless crossings be required within the same areas.</p> <p>The construction phases of Five Estuaries and North Falls overlap, due to the localised nature of potential effect, the residual significance of effect is considered minor adverse and therefore does not represent an increase in the predicted impacts of North Falls during construction.</p> <p>Given the anticipated mitigation measures of Five Estuaries, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Direct cumulative effects on surface waters are likely to occur in areas where there are spatial or temporal overlaps between Five Estuaries and North Falls. The direct cumulative effects to surface waters from accidental discharge would be likely to occur as a result of accidental spillages of fuel or chemicals, as well as the mobilisation of existing contamination via large scale excavations (and piling if required) during construction and / or operation.</p> <p>Given the proposed mitigation measures outlined within the scoping report for Five Estuaries, it is considered unlikely that there would be a cumulative change to the magnitude of impact to surface waters from that described for North Falls.</p> <p>The indirect cumulative effects to groundwater, and subsequent surface water discharge, are likely to be highly localised and would be unlikely to have long term impacts on groundwater discharge to surface water in areas of spatial overlap. Therefore, the residual cumulative effect is not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Five Estuaries and North Falls have the potential to lead to increased cumulative impacts on strategic mineral resources. Additional areas designated as MSA would be impacted and represents the potential for additional losses of strata resources through mineral sterilisation. However, the areas impacted are spread along narrow linear routes (onshore cable corridors) rather than sterilising large areas, i.e. only a very small proportion of each MSA is potentially at risk from sterilisation.</p> <p>Identification and assessment of the areas of strategic mineral resources located within the Five Estuaries onshore project areas is to be undertaken as part of the baseline characterisation of their site. Therefore, proposed mitigation measures have not been included within their scoping report. An assessment of the potential cumulative effects to strategic mineral resources will be made once the information is available. It is however, anticipated that mitigation measures for Five Estuaries would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Potential impacts to the built environment are likely to occur in areas of spatial overlap between Five Estuaries and North Falls. The construction phases of both projects have the potential to create new preferential pathways for contaminants or gases to migrate leading to the potential degradation of utilities and concrete from aggressive attack.</p> <p>Mitigation measures associated with the built environment specifically are not included within the scoping report for Five Estuaries. It is however, anticipated that mitigation measures for Five Estuaries would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls which are deemed not significant in EIA terms.</p>
East Anglia GREEN	<p>A new onshore substation is proposed to be built as part of East Anglia GREEN, close to the North Falls onshore substation area. Details within the scoping reports include mitigation measures that would be adopted as part of East Anglia GREEN. In relation to the</p>	<p>The potential cumulative effects upon superficial aquifers are likely to occur as a result of accidental spillages of fuels or chemicals during construction and mobilisation of existing contamination (if present). Given the spatial overlap of East Anglia GREEN and</p>	<p>Direct cumulative effects on surface waters are likely to occur in areas where there are spatial or temporal overlaps between East Anglia GREEN and North Falls. The direct cumulative effects to surface waters from accidental discharge would be likely to occur as a result of</p>	<p>East Anglia GREEN and North Falls have the potential to lead to increased cumulative impacts on strategic mineral resources. Additional areas designated as MSA would be impacted and represents the potential for</p>	<p>Potential impacts to the built environment are likely to occur in areas of spatial overlap between East Anglia GREEN and North Falls. The construction phases of both projects have the potential to create new preferential pathways for contaminants or gases to migrate</p>

Project	Cumulative effect 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Cumulative effect 2: Impacts on groundwater quality and groundwater resources	Cumulative effect 3: Impacts on surface water quality and the ecological habitats they support from contamination	Cumulative effect 4: Sterilisation of future mineral resources	Cumulative effect 5: Built environment
	<p>potential impacts to human health, mitigation measures highlighted in the scoping report include:</p> <ul style="list-style-type: none"> <li>• Use of appropriate personal protective equipment for the tasks being undertaken;</li> <li>• Implementation of a CoCP and adoption of appropriate safe working practices;</li> <li>• Development of a protocol for dealing with unexpected contamination; and</li> <li>• Control of earthworks and materials movement in accordance with relevant best practice and guidance.</li> </ul> <p>Given the proposed mitigation measures that would be adopted by East Anglia GREEN and considering that any alteration in ground conditions would be highly localised it is considered that no cumulative effects would occur during the construction phase with North Falls. Therefore, the residual effect on human health is not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>North Falls there is the potential for the projects to be overlapping the same aquifers. Mitigation measures highlighted within the East Anglia GREEN scoping report include:</p> <ul style="list-style-type: none"> <li>• Adoption of appropriate piling techniques (if required) to reduce the risk of creating new preferential pathways between aquifer units;</li> <li>• Provision of a Foundation Works Risk Assessment within the CoCP; and</li> <li>• Undertaking dewatering activities in accordance with Environment Agency guidance and permits (if required).</li> </ul> <p>Due to the localised nature of potential effect, the residual significance of effect is considered minor adverse and therefore does not represent an increase in the predicted impacts of North Falls during construction.</p> <p>Given the anticipated mitigation measures of East Anglia GREEN, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>accidental spillages of fuel or chemicals, as well as the mobilisation of existing contamination via large scale excavations (and piling if required) during construction.</p> <p>Given the proposed mitigation measures outlined within the scoping report for East Anglia GREEN, it is considered unlikely that there would be a cumulative change to the magnitude of impact to surface waters from that described for North Falls.</p> <p>The indirect cumulative effects to groundwater, and subsequent surface water discharge, are likely to be highly localised and would be unlikely to have long term impacts on groundwater discharge to surface water in areas of spatial overlap. Therefore, the residual cumulative effect is not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>additional losses of strata resources through mineral sterilisation.</p> <p>Mitigation measures associated with mineral resources specifically are not included within the scoping report for East Anglia GREEN. It is however, anticipated that mitigation measures for East Anglia GREEN would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>leading to the potential degradation of utilities and concrete from aggressive attack.</p> <p>Mitigation measures associated with East Anglia GREEN include pre-construction geotechnical ground investigation to inform geotechnical design in relation to site specific conditions including adverse ground conditions.</p> <p>Additional mitigation measures associated with the built environment specifically are not included within the scoping report for East Anglia GREEN. It is however, anticipated that mitigation measures for East Anglia GREEN would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>

**Table 19.15 Cumulative effects from other projects on ground conditions and contamination during operation**

Project	Cumulative effect 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Cumulative effect 2: Impact on controlled waters (groundwater and surface waters)	Cumulative effect 3: Sterilisation of future mineral resources	Cumulative effect 4: Built environment
Five Estuaries Offshore Wind Farm	<p>Following the completion of construction works, a health and safety folder for North Falls will be handed over to the Applicant.</p> <p>The folder would contain information in relation to the residual risks present within the onshore project area.</p> <p>It is anticipated that following the completion of the construction works associated with Five Estuaries, a health and safety folder will be handed over from the Principal Contractor.</p> <p>The information in these folders will enable the development of site and task specific risk assessments during the operational phases of both North Falls and Five Estuaries. Given the anticipated mitigation measures of Five Estuaries, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>The health and safety folder that will be handed to the Applicant following completion of construction works will enable task and site-specific risk assessments to be developed for any required maintenance works during the operational phase of North Falls.</p> <p>Included within the folder would be an ERP which will outline the mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials. It is anticipated that the same information and an ERP will be available for the Five Estuaries project.</p> <p>Given the anticipated mitigation measures of Five Estuaries, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Should the onshore substations for both North Falls and Five Estuaries be located within the same MSA, then during the operational phases of both projects there is the potential to generate cumulative effects within the same MSA.</p> <p>Although mitigation measures have not been included within the Five Estuaries scoping report, it is anticipated that measures similar to those proposed by North Falls, e.g. undertaking a MRA, would form part of the mitigation measures for the operational phase of Five Estuaries.</p> <p>Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Potential impacts to the built environment are likely to occur during the operational phase in areas of spatial overlap between Five Estuaries and North Falls.</p> <p>Mitigation measures associated with the built environment specifically are not included within the scoping report for Five Estuaries.</p> <p>It is however, anticipated that mitigation measures for Five Estuaries would be similar to those of North Falls given the nature of the project.</p> <p>Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls which are deemed not significant in EIA terms.</p>
East Anglia GREEN	<p>Following the completion of construction works, a health and safety folder for North Falls will be handed over to the Applicant. The folder would contain information in relation to the residual risks present within the onshore project area. It is anticipated that following the completion of the construction works associated with East Anglia GREEN a health and safety folder will be handed over from the Principal Contractor.</p> <p>The information in these folders will enable the development of site and task specific risk assessments during the operational phases of both North Falls and East Anglia GREEN. Given the anticipated mitigation measures of East Anglia GREEN, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>The health and safety folder that will be handed to the Applicant following completion of construction works will enable task and site specific risk assessments to be developed for any required maintenance works during the operational phase of North Falls. Included within the folder would be an ERP which will outline the mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials. It is anticipated that the same information and an ERP will be available for the East Anglia GREEN project.</p> <p>Given the anticipated mitigation measures of East Anglia GREEN, it is not considered likely that the significance of effect would increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>East Anglia GREEN and North Falls have the potential to lead to increased cumulative impacts on strategic mineral resources due to the spatial and temporal overlap between the projects.</p> <p>Mitigation measures associated with mineral resources specifically are not included within the scoping report for East Anglia GREEN. It is however, anticipated that mitigation measures for East Anglia GREEN would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls, which are deemed not significant in EIA terms.</p>	<p>Potential impacts to the built environment are likely to occur during the operational phase in areas of spatial overlap between East Anglia GREEN and North Falls.</p> <p>Mitigation measures associated with the built environment specifically are not included within the scoping report for East Anglia GREEN. It is however, anticipated that mitigation measures for East Anglia GREEN would be similar to those of North Falls given the nature of the project. Should this be the case, residual cumulative effects are not considered to increase from what is predicted for North Falls which are deemed not significant in EIA terms.</p>

## 19.8 Transboundary effects

175. There are no transboundary effects with regards to ground conditions and contamination as the onshore project area would not be sited in proximity to any international boundaries. Transboundary effects are therefore scoped out of this assessment and are not considered further.

## 19.9 Interactions

176. The receptors identified within this chapter (including human health, controlled waters, the built environment, mineral resources, and ecological habitats) are intrinsically linked to:

- Water resources (including surface waters and groundwaters), which are influenced by ground conditions and contamination through the quality of groundwater, groundwater flow within the subsurface strata and interactions with surface waters.
- Ecology, which is influenced by ground conditions and contamination through the chemical quality of groundwater, surface waters and soils.
- Human health which is potentially impacted by the presence of contaminated soils and groundwater.

177. A summary of the potential interactions between ground conditions and contamination receptors, water resources and onshore ecology is provided in Table 19.16.

**Table 19.16 Ground conditions and contamination interactions**

Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
<b>Construction</b>			
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	N/A	Section 19.6.1.1	No additional effects on human health have been identified for these receptors during construction which would increase the standalone assessment from minor adverse.
Impact 2: Direct impacts on groundwater quality and groundwater resources	Chapter 21 Water Resources and Flood Risk	Section 19.6.1.2	Any project related changes to ground conditions (both physically and chemically) during construction could impact the quality and quantity of groundwater resources and any hydraulically connected surface water receptors. This is assessed within Section 19.6.1.2.
Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination	Chapter 23 Onshore Ecology	Section 19.6.1.3	Potential changes to the quality and quantity of groundwater resources and any hydraulically connected surface waters during construction could impact upon water dependent biological features, inclusive of designated sites.



Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
			This assessed within Section 19.6.1.3.
Impact 4: Sterilisation of future mineral resources	N/A	Section 19.6.1.4	No additional effects on mineral resources have been identified.
Impact 5: Built environment	N/A	Section 19.6.1.5	No additional effects on the existing built environment have been identified.
<b>Operation</b>			
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	N/A	Section 19.6.2.1	No additional effects on human health have been identified for these receptors during operation, which would increase the standalone assessment from minor adverse.
Impact 2: Impact on controlled waters (groundwater and surface waters)	Chapter 21 Water Resources and Flood Risk Chapter 23 Onshore Ecology	Section 19.6.2.2	Potential changes to the quality of groundwater or hydraulically connected surface water bodies have the potential to also impact on water dependent biological features. However, no additional effects on controlled waters have been identified.
Impact 3: Sterilisation of future mineral resources	N/A	Section 19.6.2.3	No additional effects on mineral resources have been identified.
Impact 4: Built environment	N/A	Section 19.6.2.4	No additional effects on the built environment have been identified.
<b>Decommissioning</b>			
Effects associated with the decommissioning phase would be no greater than those identified for the construction phase.			

## 19.10 Inter-relationships

178. The impacts identified and assessed in this chapter have the potential to interrelate with each other. The areas of potential inter-relationships between impacts are presented in Table 19.17. This provides a screening tool for which impacts have the potential to interrelate.

179. Table 19.18 provides an assessment for each receptor (or receptor group) as related to these impacts.
180. Within Table 19.18 the impacts are assessed relative to each development phase (i.e. construction, operation, or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the significance of effect upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.



181. Table 19.18 the impacts are assessed relative to each development phase (i.e. construction, operation, or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the significance of effect upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

**Table 19.17 Inter-relationships between impacts - screening**

Potential interactions between impacts					
Construction					
	Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Impact 2: Direct impacts on groundwater quality and groundwater resources	Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination	Impact 4: Sterilisation of future mineral resources	Impact 5: Built environment
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts		Yes	No	No	No
Impact 2: Direct impacts on groundwater quality and groundwater resources	Yes		Yes	No	No
Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination	No	Yes		No	No
Impact 4: Sterilisation of future mineral resources	No	No	No		No
Impact 5: Built environment	No	No	No	No	
Operation					
	Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Impact 2: Impact on controlled waters (groundwater and surface waters)	Impact 3: Sterilisation of future mineral resources	Impact 4: Built environment	
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts		Yes	No	No	
Impact 2: Impact on controlled waters (groundwater and surface waters)	Yes		No	No	
Impact 3: Sterilisation of future mineral resources	No	No		No	
Impact 4: Built environment	No	No	No		

**Table 19.18 Inter-relationship between impacts – phase and lifetime assessment**

Receptor	Highest significance level			Phase Assessment	Lifetime Assessment
	Construction	Operation	Decommissioning		
Human health	Minor adverse	Minor adverse	Minor adverse	<b>No greater than individually assessed impact</b> The impacts to human health are assessed as of minor adverse significance on receptors deemed to be of high sensitivity, with the most sensitive receptors identified as construction workers. Impacts to human health during construction, operation and decommissioning phases of North Falls would be managed through standard and best practice methodologies. Given the proposed mitigation measures and the minor adverse significance, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of North Falls, or that interactions would be no greater than when assessed individually.	<b>No greater than individually assessed impact</b> The impacts to human health are considered a potential risk during the construction, operation and decommissioning of North Falls. Risk associated with each of the phases would be managed through best practices and adoption of appropriate mitigation measures discussed within this chapter.
Groundwater	Minor adverse	Minor adverse	Minor adverse	<b>No greater than individually assessed impact</b> The impacts to groundwater are assessed as minor adverse significance on receptors of high sensitivity. Impacts to groundwater during the construction, operational and decommissioning phases of North Falls would be managed through standard and best practice methodologies. Given the proposed mitigation measures and the minor adverse significance, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of North Falls, or that interactions would be no greater than when assessed individually.	<b>No greater than individually assessed impact</b> The impacts to groundwater quality in the superficial aquifers during earthworks are only considered a potential risk during the construction and operational phases of North Falls. It is considered unlikely that earthworks would be required during the operational phase of North Falls, however, should they be required they are anticipated to be managed in line with best practice with appropriate risk assessments conducted and submitted to the relevant agency.
Surface water	Minor adverse	Minor adverse	Minor adverse	<b>No greater than individually assessed impact</b> The impacts to surface waters are assessed as of minor adverse significance on receptors of a high sensitivity. Impacts to surface waters during the construction, operational and decommissioning phases of North Falls would be managed through standard and best practice methodologies. Given the proposed mitigation measures and the minor adverse significance, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of North Falls, or that interactions would be no greater than when assessed individually.	<b>No greater than individually assessed impact</b> The impacts to surface water quality from contamination of groundwater are only considered to be a potential risk during the construction and decommissioning phases of North Falls. Risks associated with the operational phase would be managed by following best practice. Therefore, no lifetime effects for receptor are anticipated.
Mineral resources	Minor adverse	Minor adverse	Minor adverse	<b>No greater than individually assessed impact</b> The impacts to mineral resources are assessed as minor adverse significance on receptors of medium sensitivity. Loss of mineral resources during the construction, operational and decommissioning phases of North Falls would be managed by undertaking an assessment of the feasibility of extraction prior to development and, where viable, undertaking extraction prior to the commencement of works. Given the proposed mitigation measures and the minor adverse significance, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of North Falls, or that interactions would be no greater than when assessed individually.	<b>No greater than individually assessed impact</b> Impacts to MSAs and MCAs are considered a potential risk during the construction, operational and decommissioning phases of North Falls. Risks associated with each of the phases would be managed through adoption of appropriate mitigation measures discussed within this chapter.
Built environment	Minor adverse	Minor adverse	Minor adverse	<b>No greater than individually assessed impact</b> The impacts to the built environment are assessed as minor adverse significance on receptors of medium sensitivity. Impacts to the built environment during the construction, operational and decommissioning phases of North Falls would be managed through standard and best practice methodologies. Given the proposed mitigation measures and the minor adverse significance, it is considered that there would either be no interactions between impacts during the construction, operational and decommissioning phases of North Falls, or that interactions would be no greater than when assessed individually.	<b>No greater than individually assessed impact</b> The impacts to the built environment are considered a potential risk during the construction, operational and decommissioning phases of North Falls. Risks associated with each of the phases would be managed through best practice thereby reducing the potential impacts to the built environment. Therefore, no lifetime effects for receptor are anticipated.

### 19.11 Potential monitoring requirements

182. Groundwater and ground gas monitoring may be required as part of any pre-construction targeted ground investigations that may be required in order to determine the site characteristics of the onshore project area and if they pose a potential risk to human health, groundwater and surface water receptors identified within this chapter. The need for any ground investigations would be secured as part of the DCO Requirements.

### 19.12 Summary

183. This chapter has provided a characterisation of the existing environment for ground conditions and contamination based on existing data, which has established that there would be some minor adverse residual effects on the receptors associated with ground conditions and contamination during the construction, operational and decommissioning phases of North Falls.
184. The assessment has established that the receptors relating to ground conditions and contamination could be affected as a result of direct disturbance and mobilisation of existing contamination, introduction of new sources of contamination and mineral sterilisation during the construction, operation, and decommissioning phases. Although the residual impacts on the receptors identified following implementation of mitigation measures would be minor adverse and therefore not significant in EIA terms.

**Table 19.19 Summary of potential likely significant effects on ground conditions and contamination**

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Additional mitigation measures proposed	Residual effect
<b>Construction</b>						
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Human health	High	High	Major adverse	A pre-construction targeted ground investigation would be undertaken in areas identified as potential sources of contamination in order to assess site characteristics of the onshore project area. This would then allow for the assessment of contaminated areas and appropriate remediation strategies to be produced should the identified contamination be deemed to represent an unacceptable risk to human health. The strategy would be implemented following approval by the local authorities.  The use of materials with a similar porosity, e.g. re-instatement of excavated materials, as the surrounding environment would mitigate the ground gas / vapour risks associated with creating a preferential pathway along the length of the onshore cable corridor(s).	Minor adverse
Impact 2: Direct impacts on groundwater quality and groundwater resources	Secondary A and B Aquifers	High	Low	Moderate adverse	A pre-construction targeted ground investigation would be undertaken in areas identified as potential sources of contamination in order to assess site characteristics of the onshore project area. This would then allow for the identification of contaminated areas and appropriate remediation strategies to be produced should the identified contamination be deemed to represent an unacceptable risk to controlled waters. The strategy would be implemented following approval by the local authorities.	Minor adverse
	Principal Aquifer	High	Negligible	Minor adverse	No additional mitigation is required as the significance of effect is not considered to be significant under EIA regulations.	Minor adverse
Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination	Controlled waters	High	Negligible	Minor adverse	No additional mitigation is required as the significance of effect is not considered to be significant under EIA regulations.	Minor adverse
Impact 4: Sterilisation of future mineral resources	Mineral Safeguarding Areas and Mineral Consultation Areas	Medium	Low	Minor adverse	Additional mitigation would include consultation with the Essex Minerals and Waste Planning Authority with regards to the feasibility of mineral extraction prior to development. This would be supported by ground investigations prior to construction to help better determine the depth, accessibility and quality of the mineral resource and enable a quantification of the amount of the mineral that may be sterilised.  A Mineral Resource Assessment would be undertaken if required, to provide an indication of the likely quality and extent of the mineral resource, the commercial viability of extraction and environmental impact.	Minor adverse
Impact 5: Built environment	Buildings and utilities	Medium	Medium	Moderate adverse	A pre-construction targeted ground investigation would be undertaken in areas identified as potential sources of contamination in order to assess site characteristics of the onshore project area. This would then allow for the identification of contaminated areas and appropriate remediation strategies to be produced should unacceptable risks be identified in relation to contamination present. The strategy would be implemented following approval by the local authorities.	Minor adverse
<b>Operation</b>						
Impact 1: Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Human health	High	Low	Moderate adverse	A programme of remedial works would be undertaken if areas of contamination identified during the site characterisation works are deemed to present an unacceptable risk to human health. The works would be undertaken prior to the operation of North Falls and would reduce the potential for impacts to human health. The use of appropriate material to line the onshore cable corridor(s) would also reduce the potential impacts to human health.  Maintenance workers that are required to undertake ground excavations during the operation of North Falls would be provided with information regarding the nature of ground conditions within each area so that they can develop and implement site and task specific risk assessments and method statements.	Minor adverse
Impact 2: Impact on controlled waters (groundwater and surface waters)	Controlled waters	High	Low	Moderate adverse	Maintenance workers that are required to undertake ground excavation or maintenance works during the operation of North Falls would be provided with information regarding the nature of ground conditions within each area so that they can develop and implement site and task specific risk assessments and method statements, thereby protecting controlled waters.  At the onshore substation, all fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of stored capacity. Spill kits would be available on site at all times and an ERP would be developed which outlines mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials.	Minor adverse
Impact 3: Sterilisation of future mineral resources	Mineral Safeguarding Areas and Mineral Consultation Areas	Medium	Medium	Moderate adverse	Prior to construction and operation, a mineral resource assessment would be undertaken, if required, to determine the amount of mineral at risk from sterilisation and the viability of extraction. Where viable, consideration would be given to the extraction of the mineral resource during construction.	Minor adverse

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Additional mitigation measures proposed	Residual effect
Impact 4: Built environment	Buildings and utilities	Medium	Negligible	Minor adverse	It is anticipated that additional mitigation measures would not be required.	Minor adverse
<b>Decommissioning</b>						
No decision has been made regarding the final decommissioning policies for North Falls as it is recognised that industry best practice, rules and legislation change over time. The detail and scope of decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and would be agreed with the regulator with a Decommissioning Programme provided. However, it is considered likely that the proposed onshore substation would be removed and would be reused or recycled and that the onshore cables would be removed and recycled, with the landfall transition joint bays and cable ducts (where used) left in situ. For the purposes of a worst-case scenario, it is considered that the impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.						

## 19.13 References

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