East Anglia TWO Offshore Windfarm

Chapter 18

Ground Conditions and Contamination

Preliminary Environmental Information
Volume 1
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Glossary of Acronyms

BGS	British Geological Survey
CoCP	Code of Construction Practice
CCS	Construction Consolidation Site
CDM	Construction Design Management
CEMP	Construction Environment Management Plan
CGS	County GeoSite
CIA	Cumulative Impact Assessment
CIRIA	Construction Industry Research and Information Association
CLR	Contaminated Land Report
CSM	Conceptual Site Model
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
DM	Development Management
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
ha	hectares
HDD	Horizontal Directional Drilling
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
MMP	Materials Management Plan
MPS	Minerals Policy Statement
MW	Megawatt
NPPF	National Planning Policy Framework
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
OHL	Overhead Line
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
PID	Public Information Day
PPE	Personal Protective Equipment
PPG	Pollution Prevention Guidance
PRA	Preliminary Land Quality Risk Assessment
RIGS	Regionally Important Geological Sites
SoS	Secretary of State
SNIC	Site of Nature Conservation Interest

SP	Strategic Policies
SPR	ScottishPower Renewables
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SVOCs	Seni-Volatile Organic Compounds
VOCs	Volatile Organic Compounds
WFD	Water Framework Directive

Glossary of Terminology

Applicant	East Anglia TWO Limited.
Construction consolidation sites	Compounds which will contain laydown, storage and work areas for onshore construction works. The HDD construction compound will also be referred to as a construction consolidation site.
Development Area	The area comprising the Proposed Onshore Development Area and the Offshore Development Area
East Anglia TWO project	The proposed project consisting of up to 75 wind turbines, up to four offshore electrical platforms, up to one offshore construction operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
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 area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mitigation areas	Areas captured within the Development Area specifically for mitigating expected or anticipated impacts.
National Grid infrastructure	A National Grid substation, connection to the existing electricity pylons and National Grid overhead line realignment works which will be consented as part of the proposed East Anglia TWO project Development Consent Order but will be National Grid owned assets.
National Grid overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines to transport electricity from the National Grid substation to the national electricity grid
National Grid overhead line realignment	The proposed area for National Grid overhead line realignment works.

works area	
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia TWO project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia TWO project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
Onshore cable corridor	The corridor within which the onshore cable route will be located
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables and two fibre optic cables.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia TWO project from landfall to the connection to the national electricity grid.
Onshore substation	The East Anglia TWO substation and all of the electrical equipment, both within and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia TWO project.
Proposed Onshore Development Area	The area in which the landfall, onshore cable corridor, onshore substation, mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Transition Bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

18 Ground Conditions and Contamination

18.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR), prepared by Royal HaskoningDHV, provides a description of the anticipated physical environment (soils, geology, hydrogeology and contamination) for the proposed East Anglia TWO project. It provides an assessment of the potential impacts of the construction and decommissioning of the proposed East Anglia TWO project on these conditions. Operational impacts were scoped out of the assessment as detailed in the Scoping Report (ScottishPower Renewables (SPR) 2017).

2. The focus of this chapter is on ground conditions and contamination and specifically considers the physical elements of the ground conditions, and potential impacts of the proposed scheme on hydrology (surface water quality) and hydrogeology (groundwater quality and levels), mineral resources, as well as the potential interrelationship with potential contamination and how this could affect the health of construction site workers, future site users and off-site workers/residents during the construction phase of the proposed East Anglia TWO project. Wider land use impact considerations are considered in ***Chapter 21 Land Use***, including soils as resources.

3. It should be noted that the East Anglia ONE North offshore windfarm project (the proposed East Anglia ONE North project) is also in the pre-application stage. The proposed East Anglia ONE North project will have a separate Development Consent Order (DCO) process but is working to the same programme of submission as the proposed East Anglia TWO project. This assessment considers the cumulative impact of the proposed East Anglia TWO project with the proposed East Anglia ONE North project and subsequently with other proposed developments.

4. The findings of this assessment have the potential to influence other topics within the PEIR; reference should be made to ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 21 Land Use***. ***Chapter 20 Water Resources and Flood Risk*** includes assessments of the effects of surface water run-off arising from the proposed East Anglia TWO project on the integrity and quality of local surface water bodies and on the quality of local groundwater; the risk of pollution from discharges of waste water and spillages; and effects on flood risk.

5. A desk based Preliminary Risk Assessment (PRA) has been undertaken for the proposed project and is presented in ***Appendix 18.1***.

18.2 Consultation

6. Consultation is a key driver of the Environmental Impact Assessment (EIA) process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent.

7. To date, consultation with regards to ground conditions and contamination has been undertaken via an Expert Topic Group (ETG), described within ***Chapter 5 EIA Methodology***, with meetings held in April 2018, and the East Anglia TWO Scoping Report (ScottishPower Renewables (SPR) 2017). Feedback received through this process has been considered in preparing the PEIR where appropriate and this chapter will be updated for the final assessment submitted with the Development Consent Order (DCO) application.

8. ***Table 18.1*** provides a summary of those consultation responses that have been received as a response to the Scoping Report and are relevant to ground conditions and contamination.

Table 18.1 Consultation Responses

Consultee	Date/ Document	Comment	Response / where addressed in the PEI
Suffolk County Council and Suffolk Coastal District Council	08/12/2017 Scoping Response	A full site survey indicating historical records and analytical reports for the presence of contaminated land should be undertaken for the study area, including; the landfall, onshore cable corridor, onshore substation and National Grid infrastructure/connection locations. Where investigation indicates the presence of contaminants, a remediation plan detailing the safe handling, removal or encapsulation of material, should be provided.	***Section 18.5*** provides a description of the existing environment. Information sources are shown in ***Table 18.6***.
Environment Agency	08/12/2017 Scoping Response	The Scoping Report names the Crag Formation as a secondary aquifer. This must be amended to a primary aquifer. Whilst the London Clay Formation is considered unproductive, the underlying Thanet Sand Formation and Lambeth Group is designated as secondary A aquifer. All of the aquifers warrant special attention and support significant abstraction and surface water features.	Amended to a primary aquifer (see ***section 18.5.3***) and considered as such in the assessment (***section 18.6***). Impacts on secondary aquifers are detailed in ***sections 18.6.1.2*** and ***18.6.1.3.***
Environment Agency	08/12/2017 Scoping Response	The baseline in the Scoping Report has not considered the presence / importance of superficial deposits in the cable corridor or the aquifer designations	Included in existing environmental conditions (see ***section 18.54***) and considered

Consultee	Date/ Document	Comment	Response / where addressed in the PEI
		they are given. It has also not considered the presence of source protection zones (SPZ), abstractions or private water supplies in the area. There are 2 public water supply boreholes in the corridor, Leiston (AN307) and Coldfair Green (AN034). As such there are two SPZ 1's within the application corridor.	in assessment (see ***section 18.6.1.2***).
Environment Agency	08/12/2017 Scoping Response	The potential to alter shallow groundwater and therefore have an adverse impact on local abstractors and surface water features should be considered. The following should be included: Potential impact on abstractions / private water supplies; Potential impact on surface water from directional drilling / trenching; Risks to the water environment from mobilising land contamination; and The presence of unexpected contamination and how it will be dealt with, including waste soils.	Local Authority records of private water abstractions have been incorporated into the conceptual site model (CSM) included in ***Appendix 18.1***.
Environment Agency	08/12/2017 Scoping Response	We agree a contaminated land phase 1 desk study and walk over will be required, as outlined in the Scoping Report. Depending on the findings, intrusive investigation at identified locations may be required followed by risk assessment and remediation. A written strategy detailing how unexpected contamination will be dealt with should be reviewed and agreed by the regulators. A written scheme detailing pollution prevention measures incorporated into the scheme to ensure the protection of the water environment should be reviewed and agreed by the regulators.	A contaminated land phase 1 desk study was completed including a site walk-over and is included in ***Appendix 18.1***. Pollution prevention measures are outlined in embedded mitigation ***section 18.3.3***.
Public Health England	05/12/2017 Scoping Response	We would expect the promoter to provide details of any hazardous contamination present on site (including ground gas) as part of the site condition report. Emissions to and from the ground should be considered in terms of the previous history of the site and the potential of the site, once operational, to give rise to issues. Public health impacts associated with ground contamination and/or the migration of material off-site should be	A contaminated land phase 1 desk study was completed and is included in ***Appendix 18.1***.and the impacts assessed in this PEIR (***section 18.6***).

Consultee	Date/ Document	Comment	Response / where addressed in the PEI
		assessed and the potential impact on nearby receptors and control and mitigation measures should be outlined. Relevant areas outlined in the Government's Good Practice Guide for EIA include: Effects associated with ground contamination that may already exist; Effects associated with the potential for polluting substances that are used (during construction / operation) to cause new ground contamination issues on a site, for example introducing / changing the source of contamination; and Impacts associated with re-use of soils and waste soils, for example, re-use of site-sourced materials on-site or offsite, disposal of site-sourced materials offsite, importation of materials to the site, etc.	
Public Health England	05/12/2017 Scoping Response	The PEI should demonstrate compliance with the waste hierarchy (e.g. with respect to re-use, recycling or recovery and disposal). For wastes arising from the installation the PEI should consider: The implications and wider environmental and public health impacts of different waste disposal options; and Disposal route(s) and transport method(s) and how potential impacts on public health will be mitigated.	This is included in ***section 18.3.3***.
The Planning Inspectorate	20/12/2017 Scoping Response	The PEI should clearly define the chosen study area and provide a justification in support of its suitability. This was not clear in the Scoping Report.	A defined buffer zone of 1 km from the proposed onshore development one area for all parts of the onshore scheme is shown in ***Figure 18.1*** and addressed in ***section 18.3.1***.
The Planning Inspectorate	20/12/2017 Scoping Response	The Scoping Report states that the chosen assessment methodology will be informed by CLR11 but no other information is provided. The ES should clearly explain the methodology used to inform the assessment and the Applicant should seek agreement on the approach with relevant statutory consultees.	The legislation, guidance and policy used in this assessment is presented in ***section 18.4.1*** and the impact assessment methodology is set out in ***section 18.4.3***.

Consultee	Date/ Document	Comment	Response / where addressed in the PEI
The Planning Inspectorate	20/12/2017 Scoping Response	Buffer zones with specific distances are set out in the Scoping Report for the data collection and assessment. There is no justification provided for the distances chosen. The PEI should clearly set out the study area used for the assessment in each of the aspect chapters and include a justification for the approach to ensure that the study area encompasses all receptors that could be significantly affected.	A defined buffer zone of 1 km from the proposed onshore development area for all parts of the onshore scheme is shown in ***Figure 18.1*** and addressed in ***section 18.3.1***.
The Planning Inspectorate	20/12/2017 Scoping Response	The Inspectorate notes the reference to potential impacts on construction workers but does not reference any potential impacts on the local population, nor is this matter proposed to be scoped out. The PEI should include an assessment of impacts on the local population.	An initial human health risk assessment for various users was considered in the development of the CSM and is presented in ***Appendix 18.1***. The effects to human health are considered in ***section 18.4.3*** and impacts addressed in ***section 18.6.1.1***.
The Planning Inspectorate	20/12/2017 Scoping Response	The Inspectorate advises that the PEI should include an assessment on abstraction and private water supplies.	Suffolk Coastal District Council was contacted for their records of private water supplies. These were incorporated into the CSM and assessed as part of the preliminary contaminated land risk assessment included in ***Appendix 18.1*** and are addressed in ***section 18.4.1.5, Table 18.6.***
The Planning Inspectorate	20/12/2017 Scoping Response	The Inspectorate considers that a mitigation plan should be developed in consultation with relevant consultees to ensure that should any of the impacts identified during construction occur despite mitigation they will be minimised.	This is included in ***section 18.3.3.***
Suffolk County Council and the Environment Agency	26/04/2018 ETG	ETG recommends that private water supplies are included within the baseline.	This is addressed in ***Appendix 18.1*** and ***section 18.4.1.5***, ***Table 18.6***
Suffolk County Council and the Environment Agency	26/04/2018	ETG recommends the use of Envirocheck as a data source for land quality assessment. Stating this provides the best historical map source for the	This is addressed in ***section 18.4.1.5, Table 18.6*** and ***Appendix 18.1.***

Consultee	Date/ Document	Comment	Response / where addressed in the PEI
		study area.	
Suffolk County Council and the Environment Agency	ETG	ETG defined the study area.	This is addressed in ***section 18.3.1***.
Suffolk County Council and the Environment Agency	26/04/2018	Assessment methodology should consider all principle aquifers and Secondary-A aquifers as high sensitivity. In order to take into account, the importance of superficial aquifers for base flow of surface waters, potential hydraulic continuity with the principle aquifer and potential private potable supplies.	This is addressed in ***section 18.4.3.1***.
Suffolk County Council and the Environment Agency	ETG	Assessment methodology should consider all secondary b aquifers as a low value category and very low for unproductive strata.	This is addressed in ***section 18.4.3.1 Table 18.7***.
Suffolk County Council and the Environment Agency	26/04/2018	Assessment methodology should consider the Water Framework Directive (WFD) status of groundwater to classify sensitivity.	This is addressed in ***section 18.4.3.1 Table 18.7***.

9. Ongoing public consultation has been conducted through a series of Public Information Days (PIDs) and Public Meetings. PIDs have been held throughout Suffolk in November 2017, March 2018, and June / July 2018 with further events planned in 2019. A series of stakeholder engagement events were also undertaken in October 2018 as part of consultation phase 3.5. These events were held to inform the public of potential changes to the onshore substation location. This consultation aims to ensure that community concerns are well understood and that site specific issues can be taken into account, where practicable. Consultation phases are explained further in ***Chapter 5 EIA Methodology.*** Full details of the proposed East Anglia TWO project consultation process will be presented in the Consultation Report, which will be submitted as part of the DCO application.

10. No public consultation feedback specific to ground conditions and contamination have been raised during any public consultation undertaken to date.

18.3 Scope

18.3.1 Study Area

11. The onshore infrastructure for the proposed East Anglia TWO project will include the following elements:

- Landfall;
- Onshore cable corridor;
- Onshore substation; and
- National Grid infrastructure.

12. A full description of the above infrastructure is provided in ***Chapter 6 Project Description***.

13. For the purpose of the assessment, and to aid baseline descriptions, study areas have been determined by a number of factors such as distribution of receptors, footprint of potential impact, or political/management boundaries, and where possible these were agreed with regulators or advisors.

14. The proposed onshore development area, as outlined in ***Chapter 6 Project Description***, is the largest area over which direct impacts could be experienced. At this stage, the direct impact study area includes an additional buffer of 1km. However, contamination sources are only considered likely within a 250m buffer of the proposed onshore development area. This is presented in ***Figure 18.1***.

18.3.2 Worst Case Scenarios

15. This section identifies the realistic worst-case scenarios associated with the proposed East Anglia TWO project alone. This includes all onshore infrastructure for the proposed East Anglia TWO project and the National Grid infrastructure that the proposed East Anglia TWO project will require for ultimate connection to national electricity grid.

16. ***Chapter 6 Project Description*** details the project parameters using the Rochdale Envelope approach for the PEIR.

17. ***Table 18.2*** identifies those realistic worst-case parameters of the onshore infrastructure that are relevant to potential impacts on ground conditions and contamination during construction, operation and decommissioning phases of the proposed East Anglia TWO project. Please refer to ***Chapter 6 Project Description*** for more detail regarding specific actvities and their durations, which fall within the construction phase.

Table 18.2 Realistic Worst Case Scenarios

Impact	Parameter	Notes
Construction		
Impacts related to the landfall	HDD temporary works area: 7,000m^2 (70m x 100m) Transition bay excavation footprint (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS): 18,400m^2 (160m x 115m) Landfall transition bays approximate quantity of spoil material (for 2 transition bays): 454m^3	Landfall to be achieved via HDD. No beach access required.
Impacts related to the onshore cable corridor	Onshore cable route: 287,360m^2 (8,980m x 32m) Jointing bay construction excavation footprint: 570m^2 (30.6m x 18.6m). Total for 36 jointing bays: 20,520m^2 (570m^2 x 36) HDD (retained as an option to cross SPA / SSSI): • Entrance pit CCS (x1): 7,000m^2 (100m x 70m) • Exit pit CCS (x1): 3,000m^2 (100m x 30m) Onshore cable route CCS: 18,400m^2 (160m x 115m). Total for 5 CCS: 92,000m^2 (18,400m^2 x 5) Temporary roads: • Onshore cable route haul road between landfall and Snape Road (4.5m wide with additional 4m for passing places at approximately 87m intervals): 41,376m^2 • Onshore cable route and substation access haul road (9m width): 18,675m^2 • Temporary access road: 23,495m^2 Onshore cable trench approximate quantity of spoil material: 13,321m^3	Onshore cable corridor construction footprint may be located anywhere within the proposed onshore development area. The location strategy for access routes, CCS and jointing bays will be to site them near to field boundaries or roads as far as practical. Two link boxes sit underground beside each jointing bay at a depth of approximately 1.2m. The construction footprint of these is included in the jointing bay construction excavation footprint.
Impacts related to the onshore substation	Onshore substation CCS: 17,100m^2 (190m x 90m) Permanent footprint (used as CCS during construction): 36,100m^2 (190m x 190m) Substation operational access road: 12,800m^2 (1,600m x 8m)	Construction access is included above as the onshore cable route and substation access haul road.
Impacts related to the	National Grid substation CCS: 78,750m^2	Design for the required overhead

Impact	Parameter	Notes
National Grid Infrastructure	(250m x 315m) Permanent footprint (used as CCS during construction): 45,500m^2 (325m x 140m)	line (OHL) realignment work (including cable sealing end CCSs and pylon realignment CCS) is currently on going. As more detail is made available, this will be fully assessed and included in the Environmental Statement (ES) and DCO application. However, indicative locations for cable sealing end CCSs and pylon realignment CCS are shown in ***Figure 6.6*** of ***Chapter 6 Project Description***. Construction access is included above as the onshore cable route and substation access haul road. Operational access is included above as the substation operational access road,
Operation		
Impacts related to the landfall	2 transition bays will be installed underground, each with an operational volume of 227m^3	Transition bays will be buried approximately 1.2m underground – there will no above ground infrastructure.
Impacts related to the onshore cable corridor	36 jointing bays will be installed underground, each with an operational volume of 77m^3 72 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 3m^3	Jointing bays will be buried approximately 1.2m underground – there will no above ground infrastructure. Link boxes will be located underground immediately adjacent to jointing bays – there will be no above ground infrastructure.
Impacts related to the onshore substation	Operational footprint: 36,100m^2 (190m x 190m) Substation operational access road: 12,800m^2 (1,600m x 8m)	The operational footprint does not include the additional landscaping footprint (which will be agreed post-PEIR).
Impacts related to the National Grid Infrastructure	National Grid operational substation: 45,500m^2 (325m x 140m)	The operational footprint does not include the additional landscaping footprint (which will be agreed post-PEIR). Design for the required overhead line (OHL) realignment work (including cable sealing end

Impact	Parameter	Notes
		CCSs and pylon realignment CCS) is currently on going. As more detail is made available, this will be fully assessed and included in the Environmental Statement (ES) and DCO application. However, indicative locations for cable sealing end CCSs and pylon realignment CCS are shown in ***Figure 6.6*** of ***Chapter 6 Project Description***.
Decommissioning		
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.		

18.3.3 Embedded Mitigation

18. All construction work has the potential to impact on land and water quality and human health, through spillages, mobilisation of sediment and contaminants by surface run-off or disturbance of contaminated ground. To minimise the risk of such impacts, all construction phase activities would be carried out in accordance with the embedded mitigation outlined in ***Table 18.3***.

Table 18.3 Embedded Mitigation for Ground Conditions

Parameter	Mitigation Measures Embedded into the Project Design
General	
Code of Construction Practice (CoCP)	Environmental best practice would include both the now revoked Environment Agency best practice guidelines (e.g. Pollution Prevention Guidance (PPG) PPG1, PPG5, PPG6, PPG22) and current best practice guidelines.
Construction Design Management Regulations (CDM-2015)	• All works/operations to be carried out by appropriately trained personnel. • Appropriate personal protective equipment (PPE) and working practices to be adopted by construction workers, including subcontractors, and health and safety measures would be undertaken to mitigate any short term risk during construction. • Development of CDM site specific risk assessment.
Construction Environmental Management Plan (CEMP)	Adherence to a Construction and Environmental Management Plan (CEMP) and an Incident/Emergency Response Plan which will be drafted in advance of any construction works. The CEMP will provide a protocol under which the environmental risk mitigation and other

Parameter	Mitigation Measures Embedded into the Project Design
	specific remedial measures will be defined and executed.
CL:AIRE Industry Code of Practice for waste management	Adoption of a CL:AIRE Industry Code of Practice to manage excavated soils on site, thereby maximise sustainability and providing an audit trail to demonstrate the appropriate use of materials. A Materials Management Plan (MMP) will be drafted in advance of any construction works. Validation of materials imported to site in line with pre-agreed assessment criteria to ensure they are suitable for proposed end use. A soil and waste management plan for the project will be developed.
Environment agency groundwater protection pollution prevention guidance	Best practice guidance including the Environment Agency's PPG notes and guidance from the Construction Industry Research and Information Association (CIRIA).
General best practice	Store oils and fuel within designated areas above ground in impervious storage bunds with a minimum of 110% capacity to contain any leaks or spillages; Carry out regular inspection of oil and fuel storage areas; Restrict refuelling activities to designated areas were impermeable surfaces and drip trays are utilised; Have spill kit available for use on site always; All staff to have site inductions were appropriate use of chemical and fuels on site are discussed. A pollution prevention plan and incident response plan will be incorporated into the environmental management plan. This is to be agreed with the Environment Agency and follow industry best practice; Storage of hazardous materials will be done with due care and if adequate store locations cannot be identified within the site compound these materials will be stored off-site in a secure location; and A protocol for dealing with potentially contaminated materials will be utilised during the construction works.
Landfall and Onshore Cable Route	
Land Quality	Avoidance of construction in areas of historic development. Including all historic pits and areas of infill land identified. Should any unanticipated contamination be encountered during the work, work should be halted and a written statement on how contamination will be dealt with should be agreed with the local authority.
Groundwater Quality	A hydrogeological risk assessment to ensure protection of groundwater where abstractions are present. This should include a detailed hydrogeological risk assessment of the effects of HDD on the source protection zones encountered. This assessment and the proposed methods used to avoid contamination of the groundwater should be agreed with the Environment Agency.
Onshore Substation and National Grid Substation	
Land Quality	Avoidance of construction in areas of historic development. Including

Parameter	Mitigation Measures Embedded into the Project Design
	all historic pits and areas of infill land identified. Should any unanticipated contamination be encountered during the work, work should be halted and a written statement on how contamination will be dealt with should be agreed with the local authority.
Groundwater Quality	A hydrogeological risk assessment to ensure protection of groundwater where abstractions are present. This should include a detailed hydrogeological risk assessment of the effects of HDD and piling on the source protection zones encountered. This assessment, and the proposed methods used to avoid contamination of the groundwater, should be agreed with the Environment Agency.

18.3.4 Monitoring

19. Post-consent, the final detailed design of the proposed East Anglia TWO project and the development of the relevant Management Plan will refine the worst-case parameters assessed in this PEIR. It is recognised that monitoring is an important element in the management and verification of the actual proposed East Anglia TWO project impacts. Outline Management Plans, across a number of environmental topics, will be submitted with the DCO application. These Outline Management Plans will contain key principles that provide the framework for any monitoring that could be required. The requirement for a final appropriate design and scope of monitoring will be agreed with the relevant stakeholders and included within the relevant Management Plan, submitted alongside a suite of certified consent discharge documents, prior to construction works commencing.

18.4 Assessment Methodology

18.4.1 Legislation, Guidance and Policy

20. The following sections provide detail on key pieces of UK legislation, policy and guidance which are relevant to this chapter.

18.4.1.1 Legislation and Guidance

21. The following UK legislation and guidance is considered the most relevant legislation to ground conditions and contamination and is considered in this chapter:

- The Environmental Permitting (England and Wales) Regulations (2010);
- The Water Resources Act 1991, as amended by the Water Act (2003);
- Environmental Protection Act (1990) Part 2A;
- Environment Act (1995);

- The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017);
- Environmental Damage (Prevention and Remediation) (England) Regulations (2015), and
- HSE Construction (Design and Management (CDM)) Regulations (2015).

22. The following UK guidance is considered the most relevant to ground conditions and contamination and is considered in this chapter:

- Environment Agency and Defra Pollution Prevention for businesses (2016);
- Environment Agency Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11);
- CIRIA publication C532 Control of water pollution from construction sites (2001);
- CIRIA publication C650 Environmental good practice on site (2005);
- CIRIA publication C503 Environmental good practices working on site (2000);
- CIRIA publication C502 Environmental good practices on site (2000);
- CIRIA publication C665 Assessing risks posed by hazardous ground gases to buildings (2007);
- Defra Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (2009);
- British Standard BS10175 Investigation of Potentially Contaminated Sites;
- British Standard BS5930 Code of Practice for Site Investigations, and
- British Geological Survey Report Mineral safeguarding in England: good practice advice, OR/11/046 (2011).

18.4.1.2 Policy

18.4.1.2.1 National Policy Statements

23. This assessment 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 (NSIP). The specific assessment requirements for soils, geology and ground conditions in the NPS are detailed in the overarching statement for Energy EN-1 (DECC 2011) as stated in ***Table 18.5*** below.

Table 18.4 NPS EN-1 Guidance Relevant to Ground Condition and Contamination

NPS Reference	NPS Requirement	PEIR Reference
EN-1 Section 5.3.3	Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7.*** There are no designated sites of geological importance and any impacts upon ecology are assessed in ***Chapter 22 Onshore Ecology*** and ***Chapter 23 Onshore Ornithology***

18.4.1.2.2National Planning Policy Framework Guidance

24. The National Planning Policy Framework (NPPF) and associated guidance provide guidance to planning authorities on how to assess planning applications. Sections relevant to this aspect of the PEIR are summarised in ***Table 18.5***.

Table 18.5 National Policy Framework Guidance Relevant to Ground Condition and Contamination

NPPF Reference	NPPF Requirement	PEIR Reference
NPPF15-170	The planning system should contribute to and enhance the natural and local environment by inter alia preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7***.
NPPF15-171	In preparing plans to meet development needs, the aim should be to distinguish between the hierarchy of international, national and locally designated sites and minimise adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity value, where consistent with other policies in the Framework, and take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure, planning for the enhancement of natural capital at catchment or landscape scales.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7***.

NPPF Reference	NPPF Requirement	PEIR Reference
NPPF15-179 and NPPF15-180	To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7***.
NPPF15-178	Planning policies and decisions should also ensure that: • The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation; • After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and • Adequate site investigation information, prepared by a competent person, is presented.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7***.
NPPF 15-183	In doing so, local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities 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.	Existing environment is discussed in ***section 18.5***. Impacts are set out in ***sections 18.6*** and ***18.7***.

18.4.1.3 National Mineral Policy

25. The Minerals Policy Statement 1: Planning and Minerals (MPS1) aims to secure adequate and steady supplies of the minerals needed by society and the economy. This publication has been withdrawn and is currently out for consultation on the new draft. It is still, however, deemed relevant in the context of this assessment.

18.4.1.4 Local Planning Policy

26. The NPS EN-1 states that the Planning Inspectorate will consider Development Plan Documents or other documents in the Local Development Framework to be relevant to its decision making.

27. The proposed onshore development area falls under the jurisdiction of Suffolk County Council and the following local planning authorities:

- Suffolk Coastal District Council; and
- Waveney District Council.

28. Suffolk Coastal District Council is reviewing their current Local Plan, a First Draft Local Plan has been published for public consultation (period of consultation from 20th July to 14th September 2018) (Suffolk Coastal District Council 2018). This plan sets out strategic planning policies within East Suffolk and how the local planning authorities address the NPPF on a local basis. The Suffolk Coastal District Council Local Plan incorporates 'saved' polices from the 2006 and 2013 revisions of the Local Plan and includes core strategies such as the Suffolk Minerals Core Strategy and Suffolk Waste Core Strategy. Strategic Policies (SP), Development Management Policies (DM) and Objectives from this plan.

29. Waveney District Council has a similar Development Plan Document 2009-2021. This includes 'saved' policies from previous plans, an overarching area management plan and site-specific management criteria. It should be noted that this plan is currently being updated; the new Local Plan will be published in autumn 2018 and address development goals for 2014-2036. The Environmental Statement will address any updated policies that arise from the issuing of the new Local Plan.

30. Further information is given in ***Chapter 3 Policy and Legislative Context.***

18.4.1.5 Assessment Guidance

31. The assessment methodology used in this chapter follows the methodology set out in ***Chapter 5 EIA Methodology.*** There is no specific assessment guidance to reference in relation to this topic.

18.4.2 Data Sources

32. A contaminated land Phase 1 desk-based study was produced for the site (***Appendix 18.1***). Site walkovers were made for geomorphology and ecology and from the results of these surveys, assessments were made to determine any obvious signs of contamination. The data sources that were used to further inform the baseline knowledge of ground conditions and contamination are provided in ***Table 18.6.***

Table 18.6 Data Sources Features

Data	Source	Year	Confidence[1]
Suffolk Coastal District Local Plan	Suffolk Coastal District Council	2013	High
Private Water Supplies	Suffolk Coastal District Council	2018	High
Historical Maps	Landmark Envirocheck	2017	High
Radon Gas Risk	Public Health England UK radon affected areas: http://www.ukradon.org/information/ukmaps	2018	High
Historic landfills	Environment Agency: www.environemnt.data.gov.uk	2018	High
Pollution incidents	Environment Agency: https://data.gov.uk/dataset/f/environmental-pollution-incidents	2018	High
Solid Geology	British Geological Survey Onshore Geoindex: http://www.bgs.ac.uk/GeoIndex/	2018	High
Superficial Geology	British Geological Survey Onshore Geoindex: http://www.bgs.ac.uk/GeoIndex/	2018	High
Regionally Important Geological / Geomorphological Sites (RIGS)	Suffolk County Council Geosuffolk and Suffolk Biodiversity Information Service Defra Magic Map SSSI geological sites	2018	Low
Ground water Source Protection Zones	www.environemnt.data.gov.uk/catchment-planning	2018	High
Nitrate Vulnerable Zones	Defra magic map	2018	High

18.4.3 Impact Assessment Methodology

33. The generic assessment methodology that is applied throughout the PEIR is explained in detail in ***Chapter 5 EIA Methodology***. The following sections describe more specifically the methodology used to assess the potential impacts of the proposed East Anglia TWO project on onshore ground conditions and contamination, following the characterisation of the existing environment.

18.4.3.1 Sensitivity

34. Definitions of the different sensitivity levels for the receptors are presented in ***Table 18.7*** below.

[1] Confidence level based upon the organisation responsible for collating data source (high = regulatory, low = non-regulatory)

Table 18.7 Sensitivity Criteria for Ground Conditions and Contamination Receptors

Sensitivity	Definition
High	Human Health Construction works Future site end-users General Public (off-site) Controlled waters Groundwaters (Source Protection Zone Tier 1/2) Surface waters – supporting internationally or nationally important sites Site of Special Scientific Interest (SSSI) Receptor is Internationally or Nationally important / rare with limited potential for offsetting / compensation.
Medium	Principle Aquifer Secondary A – undifferentiated aquifer Groundwater Source Protection Zone Tier 3 Surface water – supporting regionally important sites (LNR, SNCI) Licenced groundwater and surface water abstractions Private water abstractions Mineral Resources Mineral Safeguard Zones Receptor is regionally important / rare with limited potential for offsetting / compensation.
Low	Secondary B – water bearing unproductive strata (resource potential) Unlicensed water supplies Surface waters supporting locally important wildlife or amenities Receptor is locally important / rare
Negligible	Surface waters not associated with locally important sites Receptor is not considered to be particularly important / rare

18.4.3.2 Magnitude

35. Potential effects may be adverse, beneficial or neutral. The magnitude of an effect is assessed qualitatively, according to criteria set out in ***Table 18.8.*** The following definitions apply to time periods used in the magnitude assessment:

- Long-term: > 5 years;
- Medium-term: 1 to 5 years, and
- Short-term: <1 year.

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

Table 18.8 Effect Magnitude and Definition

Magnitude Definition	Examples
High Permanent or large-scale change affecting usability, risk, value over a wide area, or certain to affect regulatory compliance	Human Health Risk • Permanent or major change to existing risk of exposure (Adverse / Beneficial). • Unacceptable risks to one or more receptors over the long-term or permanently (Adverse) • Prosecution under health and safety legislation (Adverse) • Remediation and complete source removal (Beneficial) • Construction workers at risk due to lack of appropriate personal protective equipment (Adverse)
	Controlled Waters • Permanent, long-term or wide scale effects on water quality or availability (Adverse / Beneficial). • Permanent loss or long-term derogation of a water supply source of a water supply source resulting in prosecution (Adverse) • Change in WFD water body status / potential or its ability to achieve WFD status objectives in the future (Adverse / Beneficial) • Permanent habitat loss or creation (Adverse / Beneficial) • Measurable habitat change that is sustainable / recoverable over the long-term (Adverse / Beneficial).
Medium Moderate permanent or long-term reversible change affecting usability, value, risk, over the medium-term or local area; possibly affecting regulatory compliance	Human Health Risk • Medium-term or moderate change to existing risk of exposure (Adverse / Beneficial). • Unacceptable risks to one or more receptors over the medium-term (Adverse)
	Controlled Waters • Medium-term or local scale effects on water quality or availability (Adverse / Beneficial). • Medium-term derogation of a water supply source, possibly resulting in prosecution (Adverse). • Observable habitat change that is sustainable / recoverable over the medium-term (Adverse / Beneficial). • Temporary change in status / potential of a WFD waterbody or its ability to meet objectives (Adverse / Beneficial).

Magnitude Definition	Examples
Low Temporary change affecting usability, risk or value over the short-term or within the site boundary; measurable permanent change with minimal effect usability, risk or value; no effect on regulatory compliance	Human Health Risk • Short-term temporary or minor change to existing risk of exposure (Adverse / Beneficial). • Unacceptable risks to one or more receptors over the short-term (Adverse)
	Controlled Waters • Short-term or very localised effects on water quality or availability. (Adverse / Beneficial). • Short-term derogation of a water supply source (Adverse). • Measurable permanent effects on a water supply source that do not impact on its operation (Adverse). • Observable habitat change that is sustainable / recoverable over the short-term (Adverse / Beneficial). • No change in status / potential of a WFD waterbody or its ability to meet objectives (Neutral).
Negligible Minor permanent or temporary change, undiscernible over the medium- to long-term short-term, with no effect on usability, risk or value	Human Health Risk • Negligible change to existing risk of exposure • Activity is unlikely to result in unacceptable risks to receptors (Neutral)
	Controlled Waters • Very minor or intermittent impact on local water quality or availability (Adverse / Beneficial). • Usability of a water supply source will be unaffected (Neutral) • Very slight local changes that have no observable impact on dependent receptors (Neutral) • No change in status / potential of a WFD waterbody or its ability to meet objectives (Neutral).

18.4.3.3 Impact Significance

37. Following the identification of receptor sensitivity and magnitude of the effect, it is possible to determine the significance of the impact.

38. The matrix which will be used as a tool to aid this assessment is presented in ***Table 18.9.*** The assessment of impact significance is qualitative and reliant on professional experience, interpretation and judgement. The matrix should

therefore be viewed as a framework to aid understanding of how a judgement has been reached, rather than as a prescriptive tool.

Table 18.9 Impact Significance Matrix

		Negative 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*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

39. Following initial assessment, if the impact does not require additional mitigation (or none is possible) the residual impact will remain the same. If, however, additional mitigation is proposed there will be an assessment of the post-mitigation residual impact.

40. As with the definitions of magnitude and sensitivity, the matrix used for a topic is clearly defined by the assessor within the context of that assessment. The impact significance categories are divided as shown in ***Table 18.10.***

Table 18.10 Impact Significance Definitions

Value	Definition
Major	Very large or large changes 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.
Moderate	Intermediate changes in receptor condition, which are likely to be important considerations at a local level.
Minor	Small changes in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No change	No impact, therefore no change in receptor condition.

41. Note that for the purposes of the EIA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts

as they may contribute to significant impacts cumulatively or through interactions.

42. Embedded mitigation should be referred to and included in the initial assessment of impact. If the impact does not require mitigation (or none is possible) the residual impact will remain the same. If, however, mitigation is required there should be an assessment of the post-mitigation residual impact.

18.4.4 Cumulative Impact Assessment

43. The proposed East Anglia TWO project Cumulative Impact Assessment (CIA) will initially consider the cumulative impact with only the proposed East Anglia ONE North project against two different construction scenarios. The worst case scenario of each impact is then carried through to the full CIA which considers other developments which are in close proximity to the proposed East Anglia TWO and East Anglia ONE North Projects.

44. For a general introduction to the methodology used for the CIA please refer to ***Chapter 5 EIA Methodology***. Further detail of the CIA in regard to ground conditions and contamination is given in ***section 18.6.***

18.4.5 Transboundary Impact Assessment

45. There are no transboundary impacts with regard to ground conditions and contamination as the proposed onshore development area is not sited in proximity to any international boundaries. Therefore, transboundary impacts on ground conditions and contamination are scoped out of this assessment and will not be considered further.

18.5 Existing Environment

46. The characterisation of the existing environment is undertaken using the data sources listed in ***Table 18.6*** plus other relevant literature.

18.5.1 Site Setting

47. The onshore study area is largely agricultural in nature, which represents potential for both diffuse and point sources of pollution to be present in relation to current agricultural activities. Settlements within or adjacent to the proposed onshore development area include Leiston, Aldringham, Friston, Knodishall and Coldfair Green – developed areas also have the potential for historic sources of ground contamination.

18.5.2 Geology

48. The underlying geology across the proposed onshore development area comprises superfical deposits (Till) of varying lithologies overlaying the Crag Group comprising sands, as summarised in ***Table 18.11*** and presented in ***Figure 18.2*** and ***Figure 18.3.***

49. Thorpeness Cliffs are identified as a County GeoSite (CGS) – a non-statutory designation reflecting its value as the most southerly exposure of glacial till in the cliffs of East Anglia – and fall within the proposed onshore development area. No statutory Regionally Important Geological / Geomorphological Sites (RIGS) are known to be present within the proposed onshore development area. Given that the only identified statutory designated feature is located some distance beyond the proposed onshore development area, the feature is considered to be a negligible sensitivity receptor in the context of the proposed East Anglia TWO project, and is therefore not considered further within the assessment.

Table 18.11 Geology under the Proposed Onshore Development Area

Stratum	Unit Name	Description
Superficial deposits	Till – Diamicton	Variable lithology, usually sandy, silty clay with pebbles, but can contain gravel-rich, or laminated sand layers; varied colour and consistency.
	Till – Lowersoft formation	Sands and gravels, Clay and silts, and sands.
Bedrock	Crag Group – Crag Formation	Sands

18.5.3 Hydrology

50. The nearest water course to the proposed onshore development area is the Hundred River and the nearest water body is the Suffolk coast, with several smaller unnamed rivers all of which discharge into the Suffolk Coast. The Hundred River is hydrologically connected with Aldeburgh SSSI and Sandlings Special Protection Area (SPA). The sensitivity of the Hundred River is therefore considered High.

18.5.4 Hydrogeology

51. The Environment Agency's groundwater vulnerability data indicates parts of the proposed onshore development area are designated as having a high groundwater vulnerability (overlying a permeable aquifer). This indicates soils which may be able to transmit a wide range of pollutants into any groundwater stored in strata beneath them. However, the superficial deposits are classified as unproductive strata and are likely to minimise the flow of contamination and therefore provide a degree of protection to underlying water resources. The proposed onshore development area is within the Crag Formation, which is designated as a principle aquifer. There is also London Clay and Thanet Sand Formation which are designated as Secondary A aquifers.

52. There are two groundwater source protection zones identified within the proposed onshore development area. These are the Leiston (AN307) and Coldfair Green (ANO34) public water supply abstractions, shown in ***Figure 18.4.***

53. Groundwater Source Protection Zones (SPZs) are defined around abstraction boreholes used for potable water supply, to delineate the area where release of a contaminant into the aquifer could impact on the abstraction, shown in ***Figure 18.4***. There are three types of SPZ:

- The Inner Zone (Zone 1) is the most sensitive and some activities with the potential to pollute groundwater are restricted in this area;
- The Outer Zone (Zone 2) is less sensitive, and there are fewer restrictions; and
- Outside Zone 2 is the Total Catchment (Zone 3), which indicates the recharge area that contributes to that water supply.

54. The Environment Agency has published SPZs for public water supplies and other significant sources. For potable abstractions without published SPZs there is a default Inner Zone of 50m radius and, an Outer Zone of 250m or 500m radius (depending on the size of the abstraction). Additional data from the Environment Agency identifies three abstraction licences within the study area. There are two groundwater abstractions and a surface water abstraction, all of which are for agricultural use (irrigation).

55. The sensitivity of groundwater as a receptor in the proposed onshore development area is considered to be High.

18.5.5 Land Quality

56. The majority of the proposed onshore development area is located in agricultural land, where significant contamination is not anticipated. There is the potential for agrochemical wastes and asbestos containing materials to be encountered during the works. Areas of made ground were identified in the PRA (***Appendix 18.1***). Sand and gravel pits are also present in various locations within the proposed onshore development area, that have been infilled, and may contain unknown and potentially contaminated fill material due to the nature of their infilling. Specifically the following potential sources of contamination within the proposed onshore development area were identified:

- Agricultural land which can be associated with some contaminative activities including use/storage of fertilisers, pesticides and herbicides and burial of wastes (including asbestos).

- A number of historical clay and shale pits and sand and gravel pits present in various locations within the survey area have been infilled and may contain unknown and potentially contaminated fill material. This could include potential contaminants of concern.
- Waste management facilities could be associated with numerous contaminant sources such as: Volatile Organic Compound (VOCs), semi-volatile Organic Compound (SVOCs), heavy metals, cyanides,ammonium, chlorides, sulphates and polycyclic aromatic hydrocarbons (PAHs) (DoE-industry profile).
- Former railways and tramways present on the cable route and landfall area. These activities are historically associated with herbicides, metals, hydrocarbons, sulphates, polychlorinated biphenyls (PCBs) and PAHs (DoE-industry profiles).

57. In addition to the sources identified above the following potential sources of contamination have been identified within 1km of the proposed onshore development area:

- Sizewell A Nuclear Power Station;
- Historic Landfill and sewage treatment works; and
- Areas of made ground.

58. ***Figure 18.5*** shows sensitive land uses.

18.5.6 Mineral Safeguarding

59. The proposed onshore development area contains glaciofluvial superficial deposits which provide sand and gravel resources. The proposed onshore development area crosses a number of Mineral Safeguard Areas, these are shown in ***Figure 18.6.*** A mineral safeguard area is an area designated by a Mineral Planning Authority and are areas of a known deposit of mineral which are desired to be kept safe from unnecessary sterilisation by non-mineral development. Mineral resources are considered of importance at a regional scale and therefore the sensitivity of them as a receptor is considered to be medium sensitivity.

18.5.7 Anticipated Trends in the Baseline Condition

60. This section discusses the likely future evolution of the existing baseline environment according to known trends in the base condition without implementation of the proposed East Anglia TWO project.

18.5.7.1 Geology

61. No major changes to the geology of the proposed onshore development area are anticipated to occur.

18.5.7.2 Hydrology

62. Predicted climate changes are likely to result in wetter winters, drier summers and a greater number of convectional rain storms. This means that the hydrology of the surface drainage network could change, with higher winter flows, lower summer flows and a greater number of storm-related flood flows. This means that the surface drainage network is unlikely to remain stable and is likely to become more typical of the natural river types in the future. The risk of flooding will be amplified as a result of the predicted increase in rainfall associated with climate change, with an increase in peak river flows and an increase in the magnitude of surface water flooding. Detailed information on the anticipated trends associated with surface water is provided in ***Chapter 20 Water Resources and Flood Risk section 20.5.4.1.***

18.5.7.3 Hydrogeology

63. Pressures on groundwater levels are therefore likely to decrease in the future. Detailed information on the anticipated trends associated with groundwater is provided in ***Chapter 20 Water Resources and Flood Risk section 20.5.4.2.***

18.5.7.4 Land Quality

64. The desk based study and land quality and PRA (***Appendix 18.1***) provides a comprehensive review of the anticipated land quality and potential contaminant sources likely to be present. The relevant environmental baseline from this assessment is discussed in ***section 18.5.5*** of this PEIR. This suggests that the proposed onshore development area is located on an area with few existing potential sources of contamination. The assessment of contaminated land considers the risk from historical land uses as a source of potential contaminants of concern as regulatory regimes of the past were less stringent than modern requirements.

65. Given that we now have a more stringent regulatory regime and permitting requirements for activities associated with potential contaminants of concern, it is therefore unlikely that a significant source of contamination will be introduced within the proposed onshore development area.

18.6 Potential Impacts

18.6.1 Potential Impacts during Construction

66. Full details of construction activities are outlined in ***Chapter 6 Project Description*** and in ***section 18.3.2*** of this chapter. The proposed construction activity includes excavation, specifically directional drilling, surface excavation and earth moving during cable laying and site preparation for the substation and

other onshore infrastructure. There is also the potential for deep piling of foundations for the onshore substation and for the National Grid substation. These activities have the potential to disturb potential contaminants of concern in soil and groundwater (and designated geological features if present) and create preferential pollutant pathways. This could result in potential human health impacts to construction workers and pollution risks to controlled waters (including groundwater).

67. Each area of the proposed onshore development area has different proposed construction activities and therefore different potential impacts could occur in each.

68. A summary of the identified features which could be associated with sources of contamination with migration pathways to the proposed onshore development area are as follows:

- Agricultural land;
- Historic clay, sand and gravel pits;
- Dismantled railways and tramways;
- Roads; and
- Waste management facilities.

18.6.1.1 Impact 1: Impact to Human Health Including Construction Workers and Public During Any Construction Related Excavations

69. The excavation of the cable trench, earthworks and piling for onshore substation and National Grid substation construction, movement and stockpiling of soils have the potential to mobilise existing ground contamination (where present), which could result in impacts on human health through dermal contact, inhalation and ingestion. In addition, the disturbance of potential contamination could result in pollution of controlled waters.

70. The desk-based assessment of land quality (***Appendix 18.1***) showed that the majority of the proposed onshore development area crosses agricultural land where areas of significant contamination are not anticipated. However, potential sources of contamination were identified within the proposed onshore development area and within potential migration pathways (>250 m) including, former buildings, clay, sand and gravel pits, roads, dismantled railways, waste management facilities and contemporary trades (dry cleaners).

71. Potential Contaminants of Concern (PCOC) could be present in the proposed onshore development area and represent a risk to construction workers, the public, and future site end-users. Construction activities and specifically

earthworks associated with the proposed development could disturb contamination sources.

72. Additionally, the risk associated with soil contamination sources to human health could be altered by a change in the migration pathways by construction activities. A specific risk of concern is ground gases. The ground gas risk for the proposed onshore development area is unknown and no ground gas information is known. Consideration of the potential risk from ground gas, including the potential risk of ground gas accumulation in confined spaces could represent a risk to human health through asphyxiation and explosion.

73. Construction workers are considered to be the most sensitive receptors as the activities they are engaged in constitute more direct exposure routes over longer periods of time. Potential impacts to construction workers are however the most manageable as how they conduct their work can be controlled. An adequate construction design and management plan required as part of CDM (2015) regulations will address the risk posed from contaminated land. In addition, a plan for dealing with unexpected contamination will be developed as part of the construction code of practice. This plan will incorporate the updated Environmental Agency best practice guidelines for pollution prevention.

74. Potential impacts as a result of incidental releases of contaminants will be managed through the adoption of an environmental management plan, as part of the CEMP, which will include the requirement for dust suppression and monitoring, as required. These impacts would be temporary and considered a short-term exposure. Therefore, the magnitude is considered to be low.

75. The sensitivity of all human health receptors is considered to be high. The magnitude of impact from exposure to contamination will vary depending on the exposure scenario e.g. duration of exposure, proximity to contamination. Best practice will control the majority of impacts associated with ground contamination. The magnitude of impact has been assessed as low for construction workers and low for the public. With the incorporation of standard mitigation measures as outlined in the proposed embedded mitigation in ***section 18.3.3*** and specific mitigation such as further investigations to address ground gas risks, the magnitude would become negligible to human health and therefore of **minor adverse** significance.

18.6.1.2 Impact 2: Impact on Groundwater Quality of The Principle Aquifer and Source Protections Zones from Construction

76. Construction activities will likely involve the direct disturbance of superficial deposits and soils during trenching and temporary compound set-up. Primary aquifers within the superficial deposits could therefore be affected by the removal of superficial deposits and exposure. Superficial deposits are not

present across all of the proposed onshore development area and therefore there is a possibility of direct impacts.

77. Removal of superficial deposits could alter the surface hydrology and disrupt infiltration rates and alter surface runoff interactions with the subsurface. This could alter pathways and allow the mobilisation of sources of contamination within superficial deposits and allow the migration of contaminants into strata containing the underlying superficial aquifer.

78. The sensitivity of the secondary A aquifer is considered to be medium. Considering the few identified potential contaminant sources in the proposed onshore development area and the embedded mitigations proposed for construction activities to avoid accidental discharge of contaminants of concern into the environment, it is anticipated that the magnitude of construction impacts would be negligible and therefore the impact would be **minor adverse**.

79. Where present, superficial deposits cover the principal aquifer, superficial deposits are not present across the whole of the proposed onshore development area and are considered to be high vulnerability for groundwater migration. The sensitivity of the receptor is therefore considered to be high.

80. The proposed onshore development area crosses SPZs as shown in ***Figure 18.4***. If works are required within or close to the identified SPZ, then it may be appropriate for consultation with the Environment Agency to ensure that any adverse effects are minimised. This could include the development of a hydrogeological risk assessment meeting the requirements of Groundwater Protection Principles and Practice (GP3) (Environment Agency 2017) for this area of the works. The potential magnitude of these effects is however, considered to be low. The sensitivity of SPZs is high.

81. Taking into account the embedded mitigation and if an agreement on appropriate groundwater protection measures is made the magnitude would be considered negligible. Therefore, the anticipated significance of the development of a new contaminant pathway from an existing contaminant source, and the accidental release of contamination during construction is considered to be **minor adverse.**

18.6.1.3 Impact 3: Impact on Groundwater Quality of Principle Aquifer Including Source Protection Zones from Trenchless Crossing and Piling Activities

82. Direct impacts to the principal aquifers may occur from deep ground workings related to trenchless crossing (e.g. HDD) operations for cable installation beneath surface infrastructure and watercourses. There is potential for drilling mud to leak along the drill path, or from the immediate area of the mud pits or tanks which could cause contamination of groundwater. The volume of drilling

fluid that could be released 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 substations. Piling has the potential to create preferential pathways through a low permeability layer allowing potential contamination of an underlying aquifer.

83. Areas of the proposed onshore development area do occur in SPZ2 and SPZ3, as shown in ***Figure 18.4***. The sensitivity of groundwater is therefore considered to be high.

84. The impacts are predicted to be localised in occurrence. Any impacts would be managed by embedded mitigation measures. Specifically, the identified required adherence to Environment Agency groundwater protection and pollution prevention guidance and adherence to a CEMP and CoCP. The magnitude is therefore considered to be low.

85. The magnitude of effect on public water supply from trenchless crossing works within SPZ2 areas is considered to be low. In order to ensure this level of impact the use of an inert drilling fluid for HDD is required. Any drilling fluids and HDD methodologies should be agreed with the Environment Agency when working within or close to SPZ1, an appropriate risk assessment and consultation with the Environment Agency will be undertaken to ensure that any adverse effects are minimised. Alternatives to trenchless techniques would be considered where required.

86. The Principal Aquifer (which underlies the superficial deposits) beneath the whole of the proposed onshore development area is deemed to be of high vulnerability. The sensitivity of the receptor is considered to be high. For works in SPZ1 and SPZ2 areas, the aquifer and surface water sensitivities are considered to be high. When working within or close to SPZ1, an appropriate risk assessment and consultation with the Environment Agency will be undertaken to ensure that any adverse effects are minimised. Alternatives to trenchless techniques would be considered where required. It is anticipated that after adopting mitigation measures the magnitude of effect will be reduced to negligible and therefore the impact would be **minor adverse**.

18.6.1.4 Impact 4: Impact on Surface Water Quality from Contamination of Groundwaters And Subsequent Discharge

87. The accidental release of contamination into ground or surface waters either via the creation of new exposure pathways or the accidental discharge of contaminants during construction, could lead to a reduction in water quality. ***Figure 18.7*** shows potential sources of contamination.

88. Given that surface waters in the area are associated with designated sites (i.e. SSSI and SPA) it is considered that surface waters represent a high sensitivity receptor. It is anticipated that after adopting the outlined embedded mitigation measures, specifically the adherence to the Environment Agency pollution prevention guidance, the magnitude of effect will be negligible and therefore the impact would be **minor adverse**.

18.6.1.5 Impact 5: Sterilisation of Mineral Resources

89. There are mineral resource areas within the proposed onshore development area. The works proposed have the potential to prevent future resource utilisation and over the full proposed onshore development area could restrict future mineral resource development for a relatively large area of the mineral planning authority's jurisdiction. The impacts are predicted to be permanent and relatively large scale. The magnitude is therefore considered to be high**.** Mineral resources are considered to be regionally important and the sensitivity of the receptor is therefore considered to be medium.

90. The overall significance of the impact on mineral resource availability during the construction works is considered to be major adverse. However, the development of MMP which included the reuse of materials on site and, where possible, the avoidance of Mineral Safeguard Areas within the proposed onshore development area would reduce / avoid the effect. It is considered that with these appropriate mitigations the magnitude of effects will be reduced and the overall significance of impact would be **minor adverse**.

18.6.2 Potential Impacts during Operation

91. This was scoped out of the assessment, as agreed with stakeholders and stated in the Scoping Report (SPR 2017).

18.6.3 Potential Impacts during Decommissioning

92. No decision has been made regarding the final decommissioning policy for the proposed East Anglia TWO onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the proposed East Anglia TWO substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.

18.7 Cumulative Impacts

18.7.1 Cumulative Impact with proposed East Anglia ONE North Project

93. The East Anglia ONE North offshore windfarm project (the proposed East Anglia ONE North project) is also in the pre-application phase. The proposed East Anglia ONE North project will have a separate DCO application but is working to the same programme of submission as the proposed East Anglia TWO project. The two projects will share the same landfall and onshore cable route and the two onshore substations will be co-located.

94. The proposed East Anglia TWO project CIA will therefore initially consider the cumulative impact with only the East Anglia ONE North project.

95. The CIA considers the proposed East Anglia TWO project and the proposed East Anglia ONE North project under two construction scenarios:

- Scenario 1 - the proposed East Anglia TWO project and proposed East Anglia ONE North project are built simultaneously; and
- Scenario 2 - the proposed East Anglia TWO project and the proposed East Anglia ONE North project are built with a construction gap.

96. The worst case (based on the assessment of these two construction scenarios) for each impact is then carried through to the wider CIA which considers other developments which are in close proximity to the proposed East Anglia TWO project (***section 18.7.2***). The operational phase impacts will be the same irrespective of the construction scenario. For a more detailed description of the assessment scenarios please refer to ***Chapter 5 EIA Methodology***.

97. Full assessment of scenario 1 and scenario 2 can be found in ***Appendix 18.2***. The assessment concluded that the worst case construction scenario for impacts on ground conditions and contamination was scenario 2. A summary of the potential cumulative impacts can be found in ***Table 18.12***.

Table 18.12 Summary of Potential Impacts Identified for Ground Conditions and Contamination under Scenario 2

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Examples of Potential Mitigation Measures	Residual Impact
Construction						
Impact 1: Impacts to human health, including construction workers and public during any excavations associated with construction.	Human Health.	High	Negligible	Minor	Further investigation to assess ground gas risk	**Minor Adverse**
Impact 2: Impacts on groundwater quality of aquifers from general construction activity	Principle Aquifer Secondary A Aquifer Surface water	High	Negligible	Minor	n/a	**Minor Adverse**
Impact 3: Impact on groundwater quality of the principle aquifer including source protection zone from HDD and piling.	Principal Aquifer including SPZ areas and Secondary A Aquifer.	High	Negligible	Minor	Alternative trenchless techniques considered where possible.	**Minor Adverse**
Impact 4: Impact to surface water quality from the contamination of groundwater and discharge to the surface.	Principal Aquifer including at SPZ areas and Secondary A Aquifer.	Low	Negligible	Minor	n/a	**Minor Adverse**
Impact 5: Sterilisation of mineral resources.	Mineral safeguard areas	Medium	High	Major	Development of a MMP and the avoidance of Mineral Safeguard Areas where possible	**Minor Adverse.**

18.7.2 Cumulative Impact Assessment with Other Developments

98. The assessment of cumulative impacts has been undertaken here as a two stage process. Firstly, all impacts from ***section 18.6*** have been assessed for potential to act cumulatively with other projects. This summary assessment is set out in ***Table 18.13.***

Table 18.13 Potential Cumulative Impacts

Impact	Potential for Cumulative Impact	Rationale
Construction		
Impact 1: Impacts to human health, including construction workers and public during any excavations associated with construction.	Yes	Impacts to human health are likely to be highly localised.
Impact 2: Impact on groundwater quality of the aquifers and source protection zones from general construction activity	Yes	There are pathways for other developments to affect the same receptors.
Impact 3: Impact on groundwater quality of the principle aquifer including source protection zone from HDD and piling.	Yes	There are pathways for other developments to affect the same receptors.
Impact 4: Impact to surface water quality from the contamination of groundwater and discharge to the surface.	Yes	There are pathways for other developments to affect the same receptors.
Impact 5: Sterilisation of mineral resources.	Yes	Impacts to Mineral Safeguard Areas may be exacerbated by other projects.
Operation		
Operational impacts were scoped out of the assessment (SPR 2017), therefore there is no pathway for cumulative impact.		
Decommissioning		
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.		

99. The second stage of the CIA is an assessment of whether there is temporal or spatial overlap between the extent of potential effects of the onshore infrastructure and the potential effects of other projects scoped into the CIA upon the same receptors. To identify whether this may occur, the potential nature and extent of effects arising from all projects scoped into the CIA have been identified and any overlaps between these and the effects identified in ***section 18.6.*** Where there is an overlap, an assessment of the cumulative magnitude of effect is provided.

100. Following a review of projects which have the potential to overlap temporally or spatially with the proposed East Anglia TWO project, one development has been scoped into the CIA.

101. ***Table 18.14*** provides detail regarding the project.

102. The full list of projects for consideration will be updated following PEIR and agreed in consultation with local authorities. The remainder of the section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

Table 18.14 Summary of Projects Considered for the CIA in Relation to Ground Conditions and Contamination

Project	Status	Development period	[2]Distance from East Anglia TWO proposed onshore development area (km)	Project definition	Level of information available	Included in CIA	Rationale
Sizewell C New Nuclear Power Station	Scoping Opinion Adopted by SoS on 02.06.2014	Uncertain	0.49km	Full Scoping Report Available: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-000103-Sizewell%20C%20EIA%20Scoping%20Report_Main%20text.pdf	Tier 5[3]	Yes	The close proximity of the project to the propsoed East anglia TWO project may result in impacts of a direct or indirect nature.

[2] Shortest distance between the considered project and East Anglia TWO– unless specified otherwise
[3] Based on criteria set out in ***section 5.7.2*** of ***Chapter 5 EIA Methodology***

18.7.2.1 Cumulative Impact during Construction

18.7.2.1.1 Cumulative Impact 1: Impact to Human Health Including Construction Workers and the Public During Construction Stage Activities

103. Given the likely embedded mitigation measures for both the proposed East Anglia TWO and East Anglia ONE North projects and Sizewell C New Nuclear Power Station (which will be subject to an EIA) and considering that any alteration to land quality would be highly localised it is considered that no cumulative impacts are likely to occur. Therefore, the residual impact to human health is not considered to increase from the **minor adverse** impact predicted for the proposed East Anglia TWO project.

18.7.2.1.2 Cumulative Impact 2: Impact to Groundwater Quality of Aquifers, including source protection zones during construction stage activities

104. Sizewell C New Nuclear Power Station will not be located within any SPZs therefore there is no pathway for cumulative impacts with the proposed East Anglia TWO and East Anglia ONE North projects. The potential cumulative impacts to aquifers would likely occur as a result of accidental spillages during construction. However, given the likely embedded mitigation measures and considering that any effect would be highly localised it is considered that no cumulative impacts are likely to occur. Therefore, the residual impact to aquifers is not considered to increase from the **minor adverse** impact predicted for the proposed East Anglia TWO project.

18.7.2.1.3 Cumulative Impact 3: Impact to Groundwater Quality of the Principle Aquifer including Source Protection Zones from HDD and Piling

105. Sizewell C New Nuclear Power Station will not be located within any source protection zones therefore there is no pathway for cumulative impacts with the proposed East Anglia TWO and East Anglia ONE North projects. The potential cumulative impacts to aquifers would likely occur as a result of accidental spillages during construction. However, given the likely embedded mitigation measures and considering that any effect would be highly localised it is considered that no cumulative impacts are likely to occur. Therefore, the residual impact to aquifers is not considered to increase from the **minor adverse** impact predicted for the proposed East Anglia TWO project.

18.7.2.1.4 Cumulative Impact 4: Impact on Surface Water Quality from Direct and Indirect Contamination of Surface Water Bodies

106. Direct cumulative impacts on surface water quality are likely to occur if there are spatial or temporal overlaps with the proposed East Anglia TWO project, the proposed East Anglia ONE North project and the Sizewell C New Nuclear Power Station.

107. The cumulative direct impacts to surface water from accidental discharge would be likely to occur as a result of accidental spillages during construction. Given the nature of the likely embedded mitigation however, it is unlikely to cause an alteration in the magnitude of impacts on surface waters from the proposed developments.

108. The cumulative indirect impacts to groundwater and subsequent surface water discharge is likely to be highly localised and will be unlikely to have long term impacts on groundwater discharge to surface waters as the proposed East Anglia TWO project has limited spatial overlap of groundwater areas with the Sizewell C New Nuclear Power Station.

109. Therefore, the residual cumulative impact is not considered to increase from the **minor adverse** impact predicted for the proposed East Anglia TWO project alone.

18.7.2.1.5 Cumulative Impact 5: Impact to Strategic Mineral Resources

110. The proposed East Anglia TWO project, proposed East Anglia ONE North project and the Sizewell C New Nuclear Power Station will likely have increased cumulative impacts on strategic mineral resources. Additional area will be utilised and there would be an increase in the potential loss of strategic resource through mineral sterilisation of different areas (assuming that this resource cannot be avoided). This would likely cause the impact to be major adverse significance. With the application of current embedded mitigation and requirement for a materials management plan (MMP) (under the proposed East Anglia TWO project) and a comprehensive assessment of local mineral resource the impact would be reduced. Additional mitigation would also be identified once detailed design is completed and the exact nature of the cumulative impacts is known, therefore reducing the impact to **minor adverse** significance (assuming no avoidance).

18.7.2.2 Cumulative Impacts during Decommissioning

111. No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.

18.8 Inter-relationships

112. Inter-relationships address situations where a number of parameters, or 'sources', interact to affect a single receptor. Those sources that are considered to interact with receptors identified in this chapter are listed in ***Table 18.15.***

Table 18.15 Inter-relationships with Ground Conditions and Contamination

Inter-relationship all Phases and Linked Chapter	Section where Addressed	Rationale
Chapter 7 Marine Geology, Oceanography and physical processes	***Sections 18.6*** and ***18.7.***	Changes to marine physical process could impact on geologically designated sites.
Chapter 8 Water and Sediment Quality	***Sections 18.6*** and ***18.7.***	Changes to ground condition and contamination could impact water quality
Chapter 20 Water Resource and Flood Risk	***Sections 18.6*** and ***18.7.***	Changes in ground condition and contamination could impact water resources and therefore have implications in terms of flood risk
Chapter 21 Land use	***Sections 18.6*** and ***18.7.***	Changes in ground condition and contamination could impact on soil quality and potential future land uses
Chapter 27 Human Health	***Sections 18.6*** and ***18.7.***	Changes in ground condition and contamination could impact on health

18.9 Interactions

113. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. For clarity, the areas of interaction between impacts are presented in ***Table 18.16*** along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 18.16 Interactions between Impacts

Potential interaction between Impacts Construction	Impact 1 – Impact to Human Health including construction workers and public during any construction related excavations	Impact 2- Impact on groundwater quality of Aquifers including source protection zones during construction stage activity.	Impact 3 - Impact on groundwater quality of Principle Aquifer including source protection zones from HDD and piling activates	Impact 4 - Impact on surface water quality from contamination of groundwaters and subsequent discharge	Impact 5 – Sterilisation of Mineral Resources
Impact 1 – Impact to Human Health including construction workers and public during any construction related excavations		No	No	No	No
Impact 2- Impact on groundwater quality of Aquifers including source protection zones during construction stage activity.	No		Yes	Yes	No
Impact 3 - Impact on groundwater quality of Principle Aquifer including source protection zones from HDD and piling activates	No	Yes		Yes	No
Impact 4 - Impact on surface water quality from contamination of groundwaters and subsequent discharge	No	Yes	No		No
Impact 5 – Sterilisation of Mineral Resources	No	No	No	No	
Operation					
Operational impacts were scoped out of the assessment (SPR 2017).					
Decommissioning					
No decision has been made regarding the final decommissioning policy for the proposed East Anglia TWO onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the proposed East Anglia TWO substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.					

18.10 Summary

114. A summary of the anticipated impacts is set out in ***Table 18.17***.

Table 18.17 Potential Impacts Identified for Ground Conditions and Contamination

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Examples of Potential Mitigation Measures	Residual Impact
Construction						
Impact 1: Impacts to human health, including construction workers and public during any excavations associated with construction.	Human Health.	High	Negligible	Minor	Further investigation to assess ground gas risk	**Minor Adverse**
Impact 2: Impacts on groundwater quality of aquifers from general construction activity, including source protection zones.	Principle Aquifer, Secondary A Aquifer, and Surface waters	High	Negligible	Minor	n/a	**Minor Adverse**
Impact 3: Impact on groundwater quality of the principle aquifer including source protection zone from HDD and piling.	Principal Aquifer including SPZ areas and Secondary A Aquifer.	High.	Negligible	Minor	Alternative trenchless techniques considered where possible.	**Minor Adverse**
Impact 4: Impact to surface water quality from the contamination of groundwater and discharge to the surface.	Principal Aquifer including at SPZ areas and Secondary A Aquifer.	Low.	Negligible	Minor	n/a	**Minor Adverse**
Impact 5: Sterilisation of mineral resources.	Mineral safeguard areas	Medium.	High	Major	Development of a MMP and the avoidance of Mineral Safeguard Areas where possible	**Minor Adverse**
Operation						
Operational impacts were scoped out of the assessment (SPR 2017).						

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Examples of Potential Mitigation Measures	Residual Impact
Decommissioning						
It is anticipated that the decommissioning impacts will be no worse than those of the construction phase.						
Cumulative Impact during Construction with the proposed Sizewell C New Nuclear Power Station						
Impact 1: Impacts to human health, including construction workers and public during any excavations associated with construction.	Human Health.	High	Negligible	Minor	Further investigation to assess ground gas risk	**Minor Adverse**
Impact 2: Impact on groundwater quality of the aquifers and source protection zones from general construction activity	Principle Aquifer Secondary A Aquifer Surface water	High	Negligible	Minor	n/a	**Minor Adverse**
Impact 3: Impact on groundwater quality of the principle aquifer including source protection zone from HDD and piling.	Principal Aquifer including SPZ areas and Secondary A Aquifer.	High.	Negligible	Minor	Alternative trenchless techniques considered where possible.	**Minor Adverse**
Impact 4: Impact to surface water quality from the contamination of groundwater and discharge to the surface.	Principal Aquifer including at SPZ areas and Secondary A Aquifer.	Low.	Negligible	Minor	n/a	**Minor Adverse**
Impact 5: Sterilisation of mineral resources.	Mineral safeguard areas	Medium.	High.	Major.	Development of a MMP and the avoidance of Mineral Safeguard Areas where possible	**Minor Adverse**
Cumulative – Operational						

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Examples of Potential Mitigation Measures	Residual Impact
Operational impacts were scoped out of the assessment (SPR 2017).						
Cumulative – Decommissioning						
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. However, the onshore substation will likely be removed and be reused or recycled. It is expected that the onshore cables will be removed and recycled, with the transition bays and cable ducts (where used) left *in situ*. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.						

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