East Anglia ONE North Offshore Windfarm

Chapter 20

Water Resources and Flood Risk

Environmental Statement
Volume 1

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Glossary of Acronyms

AIS	Air Insulated Switchgear
CoCP	Code of Construction Practice
CCS	Construction consolidation Site
CDA	Critical Drainage Area
CIA	Cumulative Impact Assessment
CIRIA	Construction Industry Research and Information Association
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
ESC	East Suffolk Council
ETG	Expert Topic Group
EU	European Union
FRA	Flood Risk Assessment
FWMA	Flood and Water Management Act
GEP	Good Ecological Potential
GES	Good Ecological Status
GIS	Gas Insulated Switchgear
GP3	Groundwater Protection Principles and Practice
HDD	Horizontal Directional Drilling
IDB	Internal Drainage Board
IPC	Infrastructure Planning Committee
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LMP	Landscape Mitigation Plan
LNR	Local Nature Reserve
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OCoCP	Outline Code of Construction Practice
OHL	Overhead Line
PEIR	Preliminary Environmental Information Report
PFRA	Preliminary Flood Risk Assessment
PID	Public Information Days
PPG	Pollution Prevention Guidance
RBD	River Basin District
RBMP	River Basin Management Plan
RIGS	Regionally Important Geological Site
SAC	Special Area of Conservation

SBIS	Suffolk Biodiversity Information Service
SCDC	Suffolk Coastal District Council
SFRA	Strategic Flood Risk Assessment
SNIC	Site of Nature Conservation Interest
SPA	Special Protection Area
SPZ	Source Protection Zone
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SWDP	Surface Water Drainage Plan
WDC	Waveney District Council
WFD	Water Framework Directive

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one 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.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
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 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 within the onshore cable route housing electrical earthing links.
Mitigation areas	Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.

National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North 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 (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North 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 (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.
Onshore preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre–planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.

Onshore substation	The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia ONE North project.
Transition Bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

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20 Water Resources and Flood Risk

20.1 Introduction

1. This Environmental Statement (ES) chapter considers the potential impacts of the proposed East Anglia ONE North project on water resources and flood risk. The chapter provides an overview of the existing baseline for the onshore development area, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning of the proposed East Anglia ONE North project. This chapter was produced by Royal HaskoningDHV.

2. The assessment also considers cumulative impacts with other proposed projects. The proposed methodology adhered to for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) is discussed in ***section 20.7***.

3. It should be noted that the East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application stage. The proposed East Anglia TWO project has a separate Development Consent Order (DCO) process which has been submitted at the same time as the proposed East Anglia ONE North project. This assessment considers the cumulative impact of the proposed East Anglia ONE North project with the proposed East Anglia TWO project (***Appendix 20.2***) and subsequently with other proposed developments (***section 20.7***).

4. This chapter should also be read in conjunction with ***Chapter 22 Onshore Ecology*** and ***Chapter 18 Ground Conditions and Contamination*** due to the close association between water resources and flood risk, onshore ecology and ground conditions.

5. Additional information to support the assessment of impacts on water resources and flood risk is provided separately in the following appendices:

- ***Appendix 20.1:*** Consultation Responses;
- ***Appendix 20.2:*** Cumulative Impact Assessment with the Proposed East Anglia TWO Project;
- ***Appendix 20.3:*** Flood Risk Assessment (FRA);
- ***Appendix 20.4:*** Water Framework Directive (WFD) Compliance Assessment; and
- ***Appendix 20.5:*** Geomorphological Walkover Survey (July 2018).

20.2 Consultation

6. Consultation is a key feature of the 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 water resources and flood risk has been undertaken via Expert Topic Group (ETG), described within ***Chapter 5 EIA Methodology***, with meetings held in April 2018, November 2018 and May 2019 and the East Anglia ONE North Scoping Report (ScottishPower Renewables (SPR) 2017) and Preliminary Environmental Information Report (PEIR) (SPR 2019). Feedback received through this process has been considered in preparing the ES where appropriate and this chapter has been updated for the final assessment submitted with the Development Consent Order DCO application.

8. The responses received from stakeholders with regards to the ETG process, Scoping Report and PEIR, are summarised in ***Appendix 20.1*** including details of how these responses have been taken account of within this assessment.

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, June / July 2018 and February / March 2019. A series of stakeholder engagement events were also undertaken in October 2018 as part of phase 3.5 consultation. Details of the consultation phases are discussed further in ***Chapter 5 EIA Methodology***.

10. ***Table 20.1*** shows public consultation feedback pertaining to water resources and flood risk. Full details of the proposed East Anglia ONE North project consultation process are presented in the Consultation Report (document reference 5.1), which is provided as part of the DCO application.

Table 20.1 Public Consultation Responses Relevant to Water Resources and Flood Risk

Topic	Response / where addressed in the ES
Phase 1	
• Flooding should be taken into account during connection point decision making	A Flood Risk Assessment (FRA) has been conducted and is shown in ***Appendix 20.3***
Phase 2	
• Flood risk impacts – at coastal location 1, 2, 3 and 4 and at Friston	A FRA has been conducted and is shown in ***Appendix 20.3***
Phase 3	
• Risk of flooding in Friston area (Zone 3 category for flood risk) • Soil (clay) and low drainage	A FRA has been conducted and is shown in ***Appendix 20.3*** Impact on drainage are assessed in ***section 20.6***.

Topic	Response / where addressed in the ES
• Flooding mitigation • Local roads and existing flood risk (e.g. Grove Road)	
Phase 3.5	
• Area of hard surface will result in flash flooding of Friston • Drainage option inadequate (ford on Church Lane) • New drainage ditches may result in flooding in the centre of Friston • Dependency on the village's pumping station loads additional responsibility for careful water-release management from sub-station reservoir. • Impacts with changing weather patterns/ more extreme weather • The overflow reservoir proposed would leave the lower part of Friston prone to more flooding	A FRA has been conducted and is shown in ***Appendix 20.3*** Changing weather patterns have been addressed in ***section 20.5.5***. Impacts associated with drainage are assessed in ***section 20.6.1.4***.
Phase 4	
• Concerns about agricultural drainage • Flooding concerns at substation site and impacts on Friston due to historic flooding	A FRA has been conducted and is shown in ***Appendix 20.3.*** This flood risk assessment takes into consideration historic flooding in the village of Friston. Impacts associated with drainage, including agricultural drainage, are assessed in ***section 20.6.1.4***.

20.3 Scope

20.3.1 Study Area

11. The study area for water resources and flood risk has been defined on the basis of surface hydrological catchments. Catchments have been included in the study area if they contain, or are hydrologically connected to (i.e. upstream or downstream) the onshore development area. The Environment Agency’s WFD river water body catchments are based on surface hydrological catchments and have therefore been used to delineate the boundaries of the study area and define surface water receptors, shown alongside the onshore development area for reference (***Figure 20.1***).

20.3.1.1 Offsite Highway Improvements

12. Offsite highway improvements may take place at three locations; the A1094 / B1069 junction, the A12 / A1094 junction and Marlesford Bridge. These works are part of the onshore preparation works which may take place prior to the commencement of main construction. Therefore, detailed assessment of these

works does not form part of the assessment of construction impacts presented in ***section 20.6.*** These works are to allow larger construction vehicles to access and navigate certain parts of the public road network. Any modifications to roads would be undertaken in consultation with and in accordance with the requirements of the local Highways Authority in accordance with the requirements of the draft DCO. Further details of the works required are presented in ***Chapter 6 Project Description.***

13. The offsite highway improvements at the A1094 / B1069 and A12 / A1094 junctions would involve the temporary moving of street furniture and temporary local widening of the highway (or creation of overrun areas). Offsite highway improvements at Marlesford Bridge would additionally require temporary laydown areas for structural works to accommodate abnormal indivisible loads.

14. The offsite highway improvements will not require a large quantity of plant and equipment and the works will have a small footprint, mostly within the existing highway boundary. The potential exception is works at Marlesford Bridge which would be in proximity to the River Ore. If improvements are needed, further detail of the work required at Marlesford bridge will be developed and the precise working methodology will be agreed post consent through an application for an environmental permit from the Environment Agency (e.g. a Flood Risk Activities Permit for works directly affecting a main river and its floodplain, if required).

15. Given the small footprint and temporary nature of the works, along with adherence to the best practice detailed in ***section 20.3.3,*** it is considered that the offsite highway improvements or temporary laydown areas will not give rise to any impacts from disturbance to surface water bodies, increased sediment supply, accidental release of contaminants or changes to surface water run off.

20.3.2 Worst Case Scenario

16. This section identifies the realistic worst case parameters associated with the proposed East Anglia ONE North project alone. This includes all onshore infrastructure for the proposed East Anglia ONE North project and the National Grid infrastructure that the proposed East Anglia ONE North project will require for ultimate connection to national electricity grid. Areas provided for onshore infrastructure are maximum footprints with indicative dimensions provided in brackets.

17. ***Table 20.2*** identifies those realistic worst case parameters of the onshore infrastructure that are relevant to potential impacts on water resources and flood risk during construction, operation and decommissioning phases of the proposed East Anglia ONE North project. Please refer to ***Chapter 6 Project Description***

for more detail regarding specific actvities, and their durations, which fall within the construction phase.

18. As described in ***Chapter 5 EIA Methodology,*** there are two co-located onshore substation locations for either the proposed East Anglia ONE North project or the proposed East Anglia TWO project. It should be noted that the draft DCOs for both the proposed East Anglia ONE North and East Anglia TWO projects have the flexibility for either project to use either onshore substation location. There is no difference in the scoped in and assessed impacts between the two onshore substation locations, therefore the 'project alone' assessment in ***section 20.6,*** and associated chapter figures**,** have been presented on the intended development strategy of the proposed East Anglia ONE North project using the western onshore substation location.

Table 20.2 Realistic Worst Case Scenario

Impact	Parameter	Notes
Construction		
Impacts related to the landfall	HDD temporary working area: 7,000m^2 (70m x 100m) Transition bay temporary working area (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS) (x1): 7,040m^2 (88m x 80m)	
Impacts related to the onshore cable route	Onshore cable route: 290,912m^2 (9,091m x 32m) Jointing bay temporary working area: 570m^2 (30.6m x 18.6m). Total for 38 jointing bays: 21,660m^2 (570m^2 x 38) HDD (retained as an option to cross SPA / SSSI): Entrance pit temporary working area (x1): 6,300m^2 (90m x 70m) Exit pit temporary working area (x1): 2,700m^2 (90m x 30m) Onshore cable route large CCS (1): 16,500m^2 (165m x 100m) Onshore cable route medium CCS (2): 14,080m^2 total (88m x 80m per each medium CCS) Onshore cable route small CCS (2): 6,000m^2 total (60m x 50m per each small CCS) Total footprint of all onshore cable route CCS: 36,580m^2	Refer to ***section 20.3.3*** for instances of onshore cable route adopting a different width

Impact	Parameter	Notes
	Onshore cable route laydown area: 1,000m^2 Onshore cable route haul road between landfall and Snape Road (7,331m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 40,435m^2 Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m^2 Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m^2	
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: 13,600m^2 (1,700m x 8m)	To provide a worst case, this impact assessment assumes that 100% of the onshore substations footprint will be impermeable. However, in reality, the onshore substations design will include impermeable surfaces where appropriate.
Impacts related to the National Grid Infrastructure	National Grid CCS: 23,350m^2 National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m^2 (310m x 145m) Temporary pylon/mast temporary working area (x4): 10,000m^2 (2,500m^2 per each temporary pylon) Permanent pylon permanent footprint (x4): 1,600m^2 (400m^2 per each permanent pylon) Permanent pylon temporary working area (x4): 8,400m^2 (2,100m^2 per each permanent pylon) Overhead line realignment temporary working area: 5,000m^2 Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m^2 (total for three compounds) Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary working area: 30,000m^2 (for three compounds) Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m^2	To provide a worst case, this impact assessment assumes that 100% of the National Grid substation footprint will be impermeable. However, in reality, the National Grid substation design will include impermeable surfaces where appropriate. AIS technology is assessed as the worst case due to a larger footprint. Further detail regarding GIS technology is provided in ***Chapter 6 Project Description***.

Impact	Parameter	Notes
	Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	
Operation		
Impacts related to the landfall	2 transition bays will be installed underground, each with an operational volume of 227m^3 Each bay will typically be buried to a depth of 1.8m, with a basal depth of 3m No above ground infrastructure	
Impacts related to the onshore cable route	38 jointing bays will be installed underground, each with an operational volume of 77m^3 76 link boxes will be installed underground (2 per jointing bay), each with an operational volume of 4m^3 No above ground infrastructure	
Impacts related to the onshore substation	Operational footprint: 36,100m^2 (190m x 190m) Substation operational access road: 13,600m^2 (1,700m x 8m)	The operational footprint does not include the additional landscaping footprint. To provide a worst case, this impact assessment assumes that 100% of the onshore substation footprint will be impermeable. However, in reality, the onshore substation design will include impermeable surfaces where appropriate.
Impacts related to the National Grid Infrastructure	National Grid operational substation (AIS technology): 44,950m^2 (310m x 145m) Pylon operational footprint (x4): 1,600m^2 (20m x 20m per each permanent pylon) Cable sealing end compound operational footprint: 10,000m^2 (for three sealing end compounds) Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	Four permanent pylons include up to three reconstructed/ relocated pylons and up to one additional new pylon. The operational footprint does not include the additional landscaping footprint. To provide a worst case, this impact assessment assumes that 100% of the National Grid substation footprint will be impermeable. However, in reality, the National Grid substation design will include impermeable surfaces where appropriate. AIS technology is assessed as the worst case due to a larger footprint. Further detail regarding GIS technology

Impact	Parameter	Notes
		is provided in ***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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left in situ or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.		

20.3.3 Embedded Mitigation and Best Practice

19. Embedding mitigation into the project design is a type of primary mitigation and is an inherent aspect of the EIA process. The following sections outline the key embedded mitigation relevant for this assessment. Where embedded mitigation measures have been developed into the design of the proposed East Anglia ONE North project with specific regard to water resources and flood risk, these are described in ***Table 20.3***. Any further mitigation measures suggested within this chapter are therefore considered to be additional to this embedded mitigation.

Table 20.3 Embedded Mitigation and Best Practice Measures for Water Resources and Flood Risk

Parameter	Mitigation Measures Embedded into the Project Design
Construction	
Surface Drainage	A construction-stage Surface Water and Drainage Management Plan (SWDP) will be developed as part of the Code of Construction Practice (CoCP) that will be produced post consent, as secured under the requirements of the draft DCO. An Outline CoCP (OCoCP) has been submitted with this DCO application (document reference 8.1). The SWDP will be implemented to minimise water ingress to the onshore cable trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during construction from surface runoff or groundwater seepage, this will be pumped via settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains in order to prevent increases in fine sediment supply to the watercourses.

Parameter	Mitigation Measures Embedded into the Project Design
	All discharges will be limited to a controlled rate (equivalent to the greenfield runoff rate), agreed in consultation with the Lead Local Flood Authority (LLFA) (Suffolk County Council) and Environment Agency. Measures to ensure that any redirected overland flow routes do not cause an increase in off-site flood risk will also be incorporated into the SWDP. Note that the SWDP will encompass construction of all onshore infrastructure. Note that management measures of operational stage surface water drainage will be detailed and secured in the final Landscape Mitigation Plan (LMP) produced post-consent to discharge requirements of the draft DCO. The final LMP will be based upon the Outline Landscape and Ecological Management Strategy (OLEMS) submitted with this DCO application.
Sediment Management	Work along the onshore cable route would be limited to short sections (constructed in 4 sections concurrently, each with a length of 500m to 2km) at any one time. Work within these sections works will be sequential. Topsoil would be stripped from the entire width of the onshore cable route for the length of the section and stored and capped to minimise wind and water erosion. Once all the trenching is completed and back-filled, the stored topsoil will be re-distributed over the area of the section, with the exception of the access road and any associated drainage. CCS and temporary works areas within the onshore development area will comprise hardstanding of permeable gravel aggregate underlain by geotextile, or other suitable material to a minimum of 50% of the total area to minimise the area of open ground. A CoCP will be developed for the construction activities (and outline of which is submitted with this DCO application) and will adhere to construction industry good practice guidance as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21)[1] and Construction Industry Research and Information Association (CIRIA)'s 'Control of water pollution from construction sites: Guidance for consultants and contractors (C532)' (2001). Specific measures to control sediment supply that will be captured within the CoCP include: • Subsoil exposure will be minimised and strips of undisturbed vegetation will be retained on the edge of the working area; • On-site retention of sediment will be maximised by routeing all drainage through the site drainage system; • The drainage system will include measures to intercept sediment runoff at source. Suitable filters will be used to remove sediment from any water discharged into the surface drainage network; • Additional measures will be included in parts of the working area that are in proximity to surface drainage channels; • Soil and sediment accumulation on road surfaces will be minimised as reasonably practicable by cleaning the wheels of vehicles leaving site

[1] The PPGs are revoked as regulatory guidance in England, but still provide a useful guide for best practice measures.

Parameter	Mitigation Measures Embedded into the Project Design
	and, where required, cleaning of the road surface. Traffic movement would be restricted to minimise the potential for surface disturbance; and • Cable routeing to avoid water resources and flood risk receptors, and individual landowner requirements e.g. irrigation reservoirs. An OCoCP has been submitted with this DCO application (document reference 8.1), as secured under the requirements of the draft DCO. The final CoCP which will be submitted post-consent, in consultation with the relevant regulators, will be further developed upon this OCoCP.
Pollution Prevention	Specific measures relating to pollution prevention that will be captured within the CoCP include: • Concrete and cement mixing and washing areas will be situated at least 10m away from the nearest watercourse. These will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment will be undertaken in a contained area, and all water will be collected for off-site disposal; • All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. All refuelling will take place in a dedicated impermeable area, using a bunded bowser. The refuelling and fuel storage area will be located at least 10m from the nearest watercourse. Biodegradable oils will be used; • Spill kits will be available on site at all times. Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency spillages; and • Foul drainage (e.g. from construction welfare facilities) will be collected through a mains connection to an existing mains sewer (if a suitable connection is available) or collected in a septic tank located within the onshore development area and transported off site for disposal at a licensed facility. The specific approach will be determined during detailed design with consideration of the availability of mains connections and the number of working hours for site attendees.
Fluvial Flood Risk	All materials to be stored outside of areas at higher risk of flooding (e.g. Flood Zones 2 and 3) as far as is reasonably practicable. A Flood Management Plan (FMP) will be developed as part of the CoCP that will be produced post consent, as secured under the requirements of the draft DCO. The FMP will be developed in consultation with the Environment Agency and Lead Local Flood Authority. This will include a commitment to subscribe to the Environment Agency's flood warning service.
Operation	
Surface Drainage	Operational surface water drainage requirements will be presented in the final LMP and will be designed to meet the requirements of the National Planning Policy Framework (NPPF) and National Policy Statement (NPS) EN-5, with runoff limited, where feasible, through the use of infiltration techniques which can be accommodated within the area of development. The drainage strategy will be developed according to the principles of the sustainable drainage system (SuDS) discharge hierarchy. Generally, the aim will be to

Parameter	Mitigation Measures Embedded into the Project Design
	discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable: i) into the ground (infiltration); ii) to a surface water body; iii) to a surface water sewer, highway drain or another drainage system; or iv) to a combined sewer. Measures to ensure that any redirected overland flow routes do not cause an increase in off-site flood risk will also be incorporated into the LMP. Changes in surface water runoff as a result of the increase in impermeable area from the onshore substations and National Grid infrastructure will be attenuated and discharged at a controlled rate, in consultation with the Lead Local Flood Authority (LLFA) (Suffolk County Council) and Environment Agency. The controlled runoff rate will be equivalent to the greenfield runoff rate. Following consultation and engineering design work, attenuation ponds (as part of the SuDS) will be included at the onshore substation and National Grid infrastructure to provide sufficient attenuation to enable discharge at greenfield runoff rates into the closest watercourse or sewer connection. The attenuation ponds at the onshore substation will be designed to attenuate flows up to the 1:200 year event (i.e. better than the 1:100 year plus climate change allowance) and will aim to reduce the discharge rate by 20% compared with the existing runoff rate. The full specification for the attenuation ponds will be addressed post consent as part of detailed design, as secured under the requirements of the draft DCO. The attenuation ponds at the National Grid substation will, as a minimum, be designed to attenuate flows up to the 1:100 year event plus a suitable allowance for climate change. In addition, the Applicant retains the option to install further attenuation measures along the existing surface water flow route during the detailed design phase. The Applicant has committed to providing an additional 'surface water management SuDS basin' (currently identified as concept within ***Chapter 29 Landscape and Visual Impact Assessment***, and in the OLEMS (document reference 8.7) to reduce water in-flow rates to the substation area and potentially reduce flood risk for the village of Friston, in addition to the Surface Water Drainage Strategy currently proposed. Confirmation of the size, volume and location of this additional 'surface water management SuDS basin' will follow establishment of an appropriate catchment hydraulic model and the detailed design of the onshore substation and National Grid substation. As a result, the additional attenuation and wider catchment benefit associated with this proposed additional 'surface water management SuDS basin' is not therefore incorporated within this chapter and is therefore a worst case scenario. The site drainage system will be maintained by the site operator during the operational phase of the proposed East Anglia ONE North project (until the site is decommissioned).
Foul Drainage	As a first preference, foul drainage at the onshore substations will be collected through a mains connection to the existing Local Authority sewer

Parameter	Mitigation Measures Embedded into the Project Design
	system (if a suitable connection is available) or collected in a septic tank located within the onshore development area and transported off site for disposal at a licensed facility. It is acknowledged that the use of a septic tank may not be appropriate at some locations, and that alternative options would be considered in consultation with the Environment Agency if mains collections are not achievable.
Pollution Prevention	A Pollution Prevention and Response Plan will be developed as part of the CoCP that will be produced post consent, as secured under the requirements of the draft DCO. Specific measures to control the supply of pollutants that will be captured within the Pollution Prevention and Response Plan include: • All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. All refuelling will take place in a dedicated impermeable area, using a bunded bowser. The refuelling and fuel storage area will be located at least 10m from the nearest watercourse. Biodegradable oils will be used; • Spill kits will be available on site at all times. Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency; and • Foul drainage (e.g. from permanent welfare facilities) will be collected through a mains connection to an existing mains sewer (if a suitable connection is available) or collected in a septic tank located within the onshore development area and transported off site for disposal at a licensed facility. The specific approach will be determined during detailed design with consideration of the availability of mains connections and the number of working hours for site attendees.

20.3.4 Monitoring

20. Post-consent, the final detailed design of the proposed East Anglia ONE North project will refine the worst-case parameters assessed in this ES. It is recognised that monitoring is an important element in the management and verification of the actual impacts based on the final detailed design. Where monitoring is proposed for water resources and flood risk, this is described in the OCoCP submitted with this DCO application (document reference 8.1). Final details of monitoring will be agreed post-consent with the Local Planning Authority and relevant stakeholders.

20.4 Assessment Methodology

20.4.1 Guidance

21. There are a number of pieces of legislation, policy and guidance applicable to water resources and flood risk. The following sections provide detail on key pieces of international and UK legislation, policy and guidance which are relevant to water resources and the FRA as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology for the ES.

22. Further detail is provided in ***Chapter 3 Policy and Legislative Context***.

20.4.1.1 Legislation and Policy (International)

20.4.1.1.1 Water Framework Directive (2000/60/EC)

23. The Water Framework Directive (WFD) (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) was adopted by the European Commission (EC) in December 2000.

24. The WFD requires that all European Union (EU) Member States must prevent deterioration and protect and enhance the status of aquatic ecosystems. This means that Member States must ensure that new schemes do not adversely impact upon the status of aquatic ecosystems, and that historical modifications that are already impacting it need to be addressed.

25. Unlike the EU Birds and Habitats Directives (European Commission (EC) Directive on the Conservation of Wild Birds (2009/147/EC) and EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC), respectively), which apply only to designated sites, the WFD applies to all water bodies (rivers, lakes, estuaries, coastal waters and groundwater) including those that are man-made.

20.4.1.2 Legislation and Policy (National)

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

26. The WFD was transposed into national law in the UK by means of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. These regulations were revoked and replaced by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Regulations provide for the implementation of the WFD, from designation of all surface waters (rivers, lakes, estuarine waters, coastal waters and ground waters) as water bodies, and set objectives for the achievement of Good Ecological Status (GES) or Good Ecological Potential (GEP).

20.4.1.2.2 Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

27. The standards used to determine the ecological or chemical status of a water body are provided in the WFD (Standards and Classification) Directions (England and Wales) 2015. This includes the thresholds for determining the status of the biological, hydromorphological, physico-chemical and chemical status of surface water bodies, and the quantitative and chemical status of groundwater bodies.

20.4.1.2.3 National Policy Statements

28. The assessment of potential impacts upon water resources and flood risk has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the proposed East Anglia ONE North project are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC 2011c).

29. The specific assessment requirements for water resources and flood risk, as detailed in the NPS, are summarised in ***Table 20.4*** together with an indication of the section of this chapter where each is addressed.

Table 20.4 NPS EN-1 Assessment Requirements with Relevance to Water Resources and Flood Risk

NPS Requirement	NPS Reference	ES Reference
'Where the development is subject to EIA [Environmental Impact Assessment] the applicant should ensure that the ES [Environmental Statement] clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Infrastructure Planning Commission (IPC) [now the Planning Inspectorate] consider thoroughly the potential effects of a proposed project.'	Section 5.3	Existing environment is discussed in ***section 20.5***. Impacts on water receptors (i.e. river channels) which support habitats of importance for the conservation of biodiversity are set out in ***sections 20.6*** and ***20.7***.
'Where a proposed development on land within or outside an SSSI [Site of Special Scientific Interest] is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect, after mitigation, on the site's notified special interest features is likely, an exception should only be made where the benefits (including need) of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.'	Section 5.3	Impacts on surface water habitats which flow through or drain into designated sites such as SSSIs are set out in ***sections 20.6*** and ***20.7***.

NPS Requirement	NPS Reference	ES Reference
‘Applications for energy projects of 1 hectare or greater in Flood Zone 1 in England or Zone A in Wales and all proposals for energy projects located in Flood Zones 2 and 3 in England or Zones B and C in Wales should be accompanied by a flood risk assessment (FRA). A FRA will also be required where an energy project less than 1 hectare may be subject to sources of flooding other than rivers and the sea (for example surface water), or where the EA, Internal Drainage Board or other body have indicated that there may be drainage problems. This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.’	Section 5.7	Impacts on flood risk in surrounding areas as a result of the proposed East Anglia ONE North project are set out in ***sections 20.6.1.4, 20.6.2.1*** and ***20.7***, and ***Appendix 20.3***.
‘Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent. The ES should in particular describe: The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges; Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies); Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions.’	Section 5.15	Impacts on the hydrology, geomorphology and quality of surface waters and the quantity and quality of groundwater resources are set out in ***sections 20.6*** and ***20.7***. Impacts under the WFD are assessed in ***Appendix 20.4***.

20.4.1.2.4 National Planning Policy Framework (2019) and Supporting Guidance

30. The National Planning Policy Framework (NPPF), which is secondary to the NPS (***section 20.4.1.2.3***), sets out the UK Government planning policies for England. The NPPF seeks to ensure that flood risk is considered at all stages in the planning and development process, to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at risk of flooding.

31. The National Planning Practice Guidance (NPPG) on Flood Risk and Coastal Change supports the NPPF with additional guidance on flood risk vulnerability classifications and managing residual risks. The NPPG makes use of the concepts of Flood Zones, Vulnerability Classifications and Compatibility in order to assess the suitability of a specific site for a certain type of development.

32. The NPPF directs development away from areas at highest risk of flooding via the application of the Sequential Test. If, following application of the Sequential Test, it is not possible for the project to be located in zones with a lower probability of flooding; the Exception Test can be applied if appropriate. Additional information on the requirements of the NPPF are provided in ***Appendix 20.3***.

20.4.1.2.5 Flood and Water Management Act 2010

33. The Flood and Water Management Act (FWMA) was passed in 2010. It aims to improve both flood risk management and the way we manage our water resources by creating clearer roles and responsibilities. This includes a lead role for Local Planning Authorities in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role of all flood risk for the Environment Agency. The FWMA provides opportunities for a comprehensive, risk-based approach on land use planning and flood risk management by Local Planning Authorities and other key partners.

20.4.1.3 Legislation and Policy (Regional)

20.4.1.3.1 Anglian River Basin District: River Basin Management Plan (2015)

34. The River Basin Management Plan (RBMP) is a strategic document that sets out the objectives that have been set for implementation of the WFD at a regional (River Basin District (RBD)) level. The purpose of a RBMP is to provide a framework for protecting and enhancing the benefits provided by the water environment. To achieve this, and because water and land resources are closely linked, it also informs decisions on land-use planning.

35. The second RBMP for the Anglian RBD was finalised by the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in December 2015 and published in February 2016. This document sets out the current state of the water environment according to WFD parameters, pressures affecting the water environment, environmental objectives for protecting and

improving the waters, programme of measures to improve the water environment and deliver WFD objectives, actions needed to achieve the objectives, progress since the 2009 RBMP, and also informs decisions on land-use planning because water and land resources are closely linked.

20.4.1.3.2 Preliminary and Strategic Flood Risk Assessments

36. The onshore development area also falls within the administrative area of East Suffolk Council Local Planning Authority. East Suffolk Council (ESC) is the merger of Suffolk Coastal District Council (SCDC) and Waveney District Council (WDC), which became effective from 1st April 2019.

37. A Preliminary Flood Risk Assessment (PFRA) for the county was produced by Suffolk County Council (SCC) in June 2011 (SCC 2011). It was subsequently updated in December 2017 (SCC 2017). The PFRA provides a high-level overview of the potential risk of flooding from local sources and identifies areas at flood risk which may require more detailed studies. PFRAs are used to identify areas that are at risk of significant flooding. The PFRA is used to inform the Local Flood Risk Management Strategy (LFRMS).

38. Waveney District Council and Suffolk Coastal District Council jointly commissioned a review and update to their 2008 Level 1 Strategic Flood Risk Assessment (SFRA). The updated Level 1 SFRA was published in April 2018. A Level 2 SFRA was subsequently published in June 2018. This assessment followed completion of the Level 1 SFRA and should be read in conjunction with this study. The purpose of the Level 2 assessment is to analyse the level of flood risk associated with allocated development sites within their study area, in accordance with the NPPF and the NPPF PPG. SFRAs are high level strategic documents carried out by local planning authorities to assess the risk to an area from flooding, at present and into the future, taking into consideration the impacts of climate change and to assess the impact that land use changes and development will have on flood risk. The SFRA informs the Local Plan for development. Five allocated development sites were identified for assessment in the Level 2 SFRA. These sites were allocated during the ongoing formulation of the Waveney District Council Local Plan and are all located in the Lowestoft area (i.e. outside the onshore development area).

20.4.1.3.3 Local Flood Risk Management Strategy

39. SCC produced the Suffolk Local Flood Risk Management Strategy (LFRMS) in March 2016 (Suffolk County Council 2016), updated from their first LFRMS published in February 2013, which outlines the aims and objectives of the Council as the LLFA and provides policies based on these aims. The production of the LFRMS was overseen by the Suffolk Flood Risk Management Partnership which

includes Suffolk County Council as well as District Councils, Internal Drainage Boards (IDB), Highways England and other key organisations.

40. Critical Drainage Areas (CDAs) are defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006, as 'an area within Flood Zone 1 which has critical drainage problems'. Consideration of CDAs is necessary to inform key flood risk priorities. The LFRMS indicates that local authorities should identify CDAs within their SFRA. The Level 1 SFRA indicated that there are no defined CDAs in the area covered by ESC.

20.4.1.4 Local Planning Policy

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

42. Suffolk County Council's Nature Strategy (SCC 2015) includes some policies that are relevant to the proposed East Anglia ONE North project which are included in ***Table 20.5.***

43. The onshore development area also falls within the administrative area of East Suffolk Council Local Planning Authority.

44. ESC published their Suffolk Coastal Final Draft Local Plan for a final stage of consultation in January 2019 (ESC 2019). This plan sets out strategic planning policies within East Suffolk and how the Local Planning Authority addresses the NPPF on a local basis. The Suffolk Coastal Final Draft Local Plan incorporates 'saved' polices from the 2006 and 2013 revisions of the Local Plan.

45. ***Table 20.5*** details Objectives, Strategic Policies and Development Management Policies that are relevant to water resources and flood risk.

Table 20.5 Relevant Local Planning Policies

Document	Policy	Policy/Guidance Purpose
Suffolk County Council		
Suffolk County Council Nature Strategy (2015)	Water management and water resources – Recommendation 20	SuDS (both urban and rural) should be designed to maximise wildlife and landscape potential.

Document	Policy	Policy/Guidance Purpose
East Suffolk Council		
Core Strategy and Development Management Policy	Development Management Policy DM28 -Flood Risk	Proposals for new development, or the intensification of existing development, will not be permitted in areas at high risk from flooding, i.e. Flood Zones 2 and 3, unless the applicant has satisfied the safety requirements in the Technical Guidance to the National Planning Policy Framework (and any successor). These include the 'sequential test'; where needed the 'exception test' and also a site specific flood risk assessment that addresses the characteristics of flooding and has tested an appropriate range of flood event scenarios.
ESC (2019) Suffolk Coastal Final Draft Local Plan	Policy SCLP9.5 – Flood Risk	The Strategic Flood Risk Assessment should be the starting point in assessing whether a proposal is at risk from flooding. Supports development or intensification of existing development that can: • Demonstrate the three main principles of flood risk: safe, resilient and should not increase flood risk elsewhere; and • Include natural flood management measures that complement existing flood defences where already in place. Proposals for new development will not be supported in areas at high risk of flooding unless they satisfy the safety requirements in the Flood Risk National Planning Policy Guidance. These include: • The 'sequential test'; • The 'exception test' where needed; and • A site specific flood risk assessment that addresses the characteristics of flooding and has tested an appropriate range of flood event scenarios (taking climate change into consideration).
	Policy SCLP9.6 – Sustainable Urban Drainage Systems	Developments should use sustainable drainage systems to drain surface water. These should be integrated into the landscaping scheme, not detract from the design quality of the scheme and deliver water quality and aquatic biodiversity improvements. Runoff should be restricted to greenfield runoff rates where achievable. No surface water connections should be made to the foul system and connections to the combined or surface water system should only be made in

Document	Policy	Policy/Guidance Purpose
		exceptional circumstances where there are no feasible alternatives.
	Policy SCLP10.1 – Biodiversity and Geodiversity	Support a development strategy that maintains, restores or enhances existing green infrastructure network and positively contributes towards biodiversity and/or geodiversity through creation of new green infrastructure and improvement to linkages between habitats. Any development with the potential to impact on a Special Protection Area or Special Area for Conservation within or outside of the District will need to be supported by information to inform a Habitat Regulations Assessment.

20.4.1.5 Assessment Guidance

46. 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.

47. Unique assessment approaches are taken for the WFD and FRA, please refer to ***Appendix 20.3*** and ***Appendix 20.4***.

20.4.2 Data Sources

48. The data sources that have been used to inform the water resources and flood risk baseline are listed in ***Table 20.6***.

Table 20.6 Data Sources Features

Data	Year	Coverage	Confidence
Environment Agency's Flood Map for Planning	2017	Nationwide	High
Environment Agency's Risk of Flooding from Surface Water	2017	Nationwide	High
Environment Agency's Risk of Flooding from Rivers and Sea	2017	Nationwide	High
Environment Agency's Catchment Data Explorer for WFD River Basin Districts Management Catchments, Operational Catchments and WFD water bodies	2017	Nationwide	High
Environment Agency fisheries survey data	2017	Local	High

Data	Year	Coverage	Confidence
Environment Agency Product 4 Detailed Flood Risk Assessment Map for Knodishall and Thorpeness	2017	Local	High
Environment Agency groundwater and surface water abstractions data	2018	Local	High
Environment Agency priority species data	2018	Local	High
Suffolk County Council River and Sea Flood Risk and Incident Map	2018	Local	High
Suffolk County Council Surface Water Flood Risk and Incident Map	2018	Local	High

20.4.3 Impact Assessment Methodology

20.4.3.1 Overview

49. ***Chapter 5 EIA Methodology*** provides a summary of the general impact assessment method, and the following sections describe the methodology used to assess the potential impacts of the proposed East Anglia ONE North project on water resources and flood risk in more detail. More detailed methodologies for the FRA and WFD compliance assessment can be found in ***Appendix 20.3*** and ***Appendix 20.4***, respectively.

50. Two key groups of impacts have been identified for the purpose of defining impact significance:

- Water resources: these are potential effects on the physical (including hydrology and geomorphology), biological or chemical character of surface waters or groundwater, potentially impacting on secondary receptors such as wetlands or abstractions, and WFD water body status; and
- Flood risk: these are the potential impacts of the proposed East Anglia ONE North project on site drainage, conveyance and surface water flooding.

51. Whilst there are clear links between the two impact groups, the assessment of receptor sensitivity and the magnitude of effect may differ.

20.4.3.2 Sensitivity

52. Receptor sensitivity has been defined with reference to the adaptability, tolerance, recoverability and value of individual receptors. ***Table 20.7*** provides the criteria for appraisal of the value and sensitivity for identified water resources and flood risk receptors based on professional judgement.

Table 20.7 Definitions of the Different Sensitivity Levels for Water Resources and Flood Risk Receptors

Sensitivity	Definition
High	Receptor has **very limited** capacity to tolerate changes to hydrology, geomorphology, and water quality or flood risk. *Water resources* Controlled waters with an unmodified, naturally diverse hydrological regime, a naturally diverse geomorphology with no barriers to the operation of natural processes, and good water quality. Supports habitats or species that are highly sensitive to changes in surface hydrology, geomorphology or water quality. Supports Principal Aquifer and Secondary A Aquifer with public water supply abstractions by provision of recharge. Site is within Inner or Outer Source Protection Zones. *Flood risk* Highly Vulnerable Land Use and More Vulnerable Land Use, as defined by NPPF PPG (Department for Communities and Local Government (DCLG) 2015). Land with more than 100 residential properties (after Design Manual for Roads and Bridges (DMRB) 2009).
Medium	Receptor has **limited** capacity to tolerate changes to hydrology, geomorphology, and water quality or flood risk. *Water resources* Controlled waters with hydrology that sustains natural variations, geomorphology that sustains natural processes, and water quality that is not contaminated to the extent that habitat quality is constrained. Supports or contributes to habitats or species that are sensitive to changes in surface hydrology, geomorphology and/or water quality. Supports Secondary A or Secondary B Aquifer with water supply abstractions. Public water supply abstractions if Source Protection Zone 1 or 2 is outside of the defined study area. Site is within a Catchment Source Protection Zone. *Flood risk* Less Vulnerable Land Use, as defined by NPPF PPG (DCLG 2015). Land with between 1 and 100 residential properties or more than 10 industrial premises (after DMRB 2009).
Low	Receptor has **moderate** capacity to tolerate changes to hydrology, geomorphology, and water quality or flood risk. *Water resources*

Sensitivity	Definition
	Controlled waters with hydrology that supports limited natural variations, geomorphology that supports limited natural processes and water quality that may constrain some ecological communities. Supports or contributes to habitats that are not sensitive to changes in surface hydrology, geomorphology or water quality. Supports Secondary A or Secondary B Aquifer without abstractions. *Flood risk* Water Compatible Land Use (including a built element), as defined by NPPF PPG (DCLG 2015). Land with 10 or fewer industrial properties (after DMRB 2009).
Negligible	Receptor is **generally** tolerant of changes to hydrology, geomorphology, and water quality or flood risk. *Water resources* Controlled waters with hydrology that does not support natural variations, geomorphology that does not support natural processes and water quality that constrains ecological communities. Aquatic or water-dependent habitats and/or species are tolerant to changes in hydrology, geomorphology or water quality. Non-productive strata that does not support groundwater resources. *Flood risk* Water Compatible Land Use (not including any built element), as defined by NPPF PPG (DCLG 2015). Land with limited constraints and a low probability of flooding of residential and industrial properties (after DMRB 2009).

20.4.3.3 Value

53. It should be noted that high value and high sensitivity are not necessarily linked with respect to a particular impact. A receptor could be of high value but have a low sensitivity to an effect. It is therefore important not to inflate the significance of an impact due to the value of the receptor. Instead, the value can be used as a modifier for the sensitivity assigned to the receptor. Definitions for the value of surface waters are provided in ***Table 20.8***.

Table 20.8 Definitions of the Value Levels for Water Resources and Flood Risk Receptors

Value	Definition
High	Receptor is an **internationally or nationally important** resource with limited potential for offsetting / compensation. *Water resources* Supports or contributes to designated habitats or species of international or national importance (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA), and Site of Special Scientific Interest (SSSI)). Licensed and unlicensed potable abstractions (surface water and groundwater). *Flood risk* Nationally significant infrastructure. Internationally or nationally designated planning policy areas.
Medium	Receptor is a **regionally important** resource with limited potential for offsetting / compensation. *Water resources* Supports or contributes to habitats or species of UK regional value (Site of Nature Conservation Interest (SNCI), Regionally Important Geological Site (RIGS)). Licensed non-potable abstractions (surface water and groundwater). *Flood risk* “Locally significant infrastructure”. Local planning policy designated sites.
Low	Receptor is a **locally important** resource. *Water resources* Supports or contributes to habitats or species of local value (e.g. Local Nature Reserve (LNR)). Unlicensed non-potable abstractions (surface water and groundwater). *Flood risk* Drainage that does not discharge to Critical Drainage Areas.
Negligible	Receptor is not considered to be an important resource. *Water resources* Does not support or contribute to habitats or species of particular importance. No abstractions (surface water and groundwater). *Flood risk* No significant infrastructure.

20.4.3.4 Magnitude

54. Receptor magnitude has been defined with reference to the spatial extent, duration, frequency and severity of the effect. Impact magnitude is defined in ***Table 20.9***.

Table 20.9 Definitions of the Magnitude Levels for Water Resources and Flood Risk Receptors

Value	Definition
High	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the particular receptors character or distinctiveness. *Water resources* Permanent changes to geomorphology and/or hydrology that prevent natural processes operating. Permanent and/or wide scale effects on water quality or availability. Permanent loss or long-term (>5 years) degradation of a water supply source resulting in prosecution. Permanent or wide scale degradation of habitat quality. *Flood risk* Permanent or major change to existing flood risk. Reduction in on-site flood risk by raising ground level in conjunction with provision of compensation storage. Increase in off-site flood risk due to raising ground levels without provision of compensation storage. Failure to meet either sequential or exception test (if applicable).
Medium	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the particular receptors character or distinctiveness. *Water resources* Medium-term (1-5 years) effects on water quality or availability. Medium-term (1-5 years) degradation of a water supply source, possibly resulting in prosecution. Habitat change over the medium-term (1-5 years). *Flood risk* Medium-term (1-5 years) or moderate change to existing flood risk. Possible failure of sequential or exception test (if applicable). Reduction in off-site flood risk within the local area due to the provision of a managed drainage system.

Value	Definition
Low	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the particular receptors character or distinctiveness. *Water resources* Short-term (<1 year) or local effects on water quality or availability. Short-term (<1 year) degradation of a water supply source. Habitat change over the short-term. *Flood risk* Short-term (<1 year), temporary or minor change to existing flood risk. Localised increase in on-site or off-site flood risk due to increase in impermeable area. Passing of sequential and exception test.
Negligible	Discernible, temporary (for part of the proposed East Anglia ONE North project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptors character or distinctiveness. *Water resources* Intermittent (short-term) impact on local water quality or availability. Intermittent (short-term) or no degradation of a water supply source. Very slight local changes to habitat that have no observable impact on dependent receptors. *Flood risk* Intermittent or very minor change (short-term) to existing flood risk. Highly localised increase in on-site or off-site flood risk due to increase in impermeable area.

20.4.3.5 Impact Significance

55. The potential significance of an impact is a function of the sensitivity of the receptor and the magnitude of the effect. The value can be used as a modifier for the sensitivity assigned to the receptor, as detailed in ***section 20.4.3.3***.

56. The significance is derived using an impact significance matrix, as shown in ***Table 20.10***. Definitions of each level of significance are provided in ***Table 20.11***.

57. 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, formulaic tool. Note that impacts may be adverse or beneficial.

58. Effects that result in major or moderate impacts are considered to be 'significant' in EIA terms. Adverse significant impacts may require mitigation; beneficial significant impacts could contribute to the case in favour of the proposed East Anglia ONE North project.

Table 20.10 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*

Table 20.11 Impact Significance Definitions

Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change 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.

59. 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.

20.4.4 Cumulative Impact Assessment

60. The proposed East Anglia ONE North project CIA will initially consider the cumulative impact with only the East Anglia TWO project against two different

construction scenarios (i.e. construction of the two projects concurrently and sequentially). The worst case scenario of each impact is then carried through to the full CIA which considers other developments which have been screened into the CIA.

61. For a general introduction to the methodology used for the CIA please refer to ***Chapter 5 EIA Methodology.***

62. The results of the CIA are presented in ***Appendix 20.2*** and ***section 20.7***.

20.4.5 Transboundary Impact Assessment

63. There are no transboundary impacts with regards to water resources and flood risk as the onshore development area is not sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

20.5 Existing Environment

20.5.1 Surface Water

20.5.1.1 Surface Water Drainage

64. The onshore infrastructure of the proposed East Anglia ONE North project is located within the catchments of three surface watercourses that are designated by the Environment Agency as main rivers for part of their course (***Figure 20.1***):

- The Hundred River, which has a catchment area of approximately 26km^2. The river rises near East Green, from where it flows south towards Knodishall and Coldfair Green. From here, it flows in a south-easterly direction towards the coast. The river flows to the south of The Meare at Thorpeness (to which it is connected via a sluice), from where it flows southwards along the landward edge of the coastal dune system until it discharges to the sea via a sluice to the south of The Haven. The Hundred River catchment would contain the majority of the onshore cable corridor.
- Leiston Beck, which has a catchment area of approximately 16km^2. The beck rises near Leiston Abbey, from where it flows in an easterly direction through Sizewell Belts and Marshes. It then flows in an artificial channel along the coast in a northerly direction until it discharges into the sea alongside the Minsmere River (the neighbouring catchment to the north) at Minsmere Sluice. The southern part of the Leiston Beck catchment, to the east of Leiston and south west of Sizewell, would contain a short section of the onshore cable corridor.
- The Friston Watercourse, which has catchment area of approximately 6km^2, rises to the north of the village of Friston from where it flows southwards through the village towards Firs Farm. From here, it flows eastwards to the

north of Black Heath Wood before turning southwards into the Alde Estuary. The tidal reach of the river is known as Ham Creek. The East Anglia ONE North onshore substation and National Grid infrastructure are located within the catchment of the Friston Watercourse.

65. In addition, the landfall and a small part of the eastern end of the onshore cable corridor are located in an area of the coastal fringe which drains eastwards into the sea rather than south or westwards into the Hundred River catchment. Even though there are no permanent surface drainage features in this area, this receptor has been included in the assessment for completeness.

66. Parts of the study area are located within the East Suffolk IDB's Thorpeness Hundred River and Minsmere catchment boundaries (East Suffolk IDB 2016). However, there are no main IDB drains within the onshore development area.

20.5.1.2 Geomorphology

67. The Hundred River, Leiston Beck and the Friston Watercourse are typical of lowland, low energy drainage systems that have been extensively modified in the past (potentially to facilitate drainage of surrounding wet floodplain habitats so that they can be used for agriculture).

68. The Hundred River has a naturally gently meandering planform, although there is considerable evidence of localised straightening. As a result of these modifications, the watercourse typically has a uniform trapezoidal channel with steep to near vertical banks. The banks are typically shallow, stable and well vegetated, although there is evidence of toe scour in parts of the catchment. Considerable areas of in-channel vegetation growth are also apparent. The channels are largely dominated by depositional processes, reflecting the low energy of the system, with natural silt beds and evidence of considerable fine sedimentation along the channel margins. Flows are typically low, and the upper reaches of the watercourse (upstream of the proposed cable crossing) were dry at the time of the walkover survey. Water levels are much deeper in the lower reaches of the river, which is likely to reflect the impounding and tide-locking influence of the sluice through which the river enters the sea.

69. The Friston Watercourse is largely composed of a uniform, straightened (or entirely artificial) drainage channel, bounded by a network of smaller drains which in places reflect the historical meandering course of the river. The river connects into a highly sinuous tidal creek (Ham Creek) below Mean High Water, which itself drains into the Alde Estuary. The upper estuary contains a moderately sinuous channel at Mean Low Water, bounded on both banks by extensive mudflats. These become much narrower in the lower estuary (the River Ore), which is much more constrained.

70. The Leiston Beck has also been extensively modified, and therefore has very similar geomorphological characteristics to the Hundred River and Friston Watercourse. The largely straightened watercourse has very little geomorphological diversity, a uniform trapezoidal channel with shallow, near vertical banks, and very low energy flows. The bed and banks are largely composed of fine grained materials (e.g. silts), and depositional processes are dominant.

71. A more detailed summary of the geomorphology of the surface watercourses is provided in ***Appendix 20.5***, which describes the results of a targeted geomorphological walkover survey undertaken in July 2018.

20.5.1.3 Water Quality

72. Data presented on the Environment Agency's Catchment Data Explorer indicate that water quality in both the Hundred River and Leiston Beck is relatively poor, with low concentrations of dissolved oxygen and elevated concentrations of phosphates (Environment Agency 2016). High levels of phosphates are attributed by the Environment Agency (2016) to the input of treated waste water effluent into the watercourse, while low levels of dissolved oxygen are attributed to naturally low flows. However, no other contaminants that are monitored under the WFD are noted in the data.

73. There are no water quality data for the Friston Watercourse. However, water quality in the Alde Estuary into which it drains is reported to be generally good, with low concentrations of the majority of potential contaminants that are monitored under the WFD. However, elevated concentrations of dissolved inorganic nitrogen are observed, which is likely to reflect agricultural runoff (Environment Agency 2016).

20.5.1.4 Flood Risk

74. Environment Agency flood zone maps (Environment Agency 2012) indicate that the majority of the onshore development area is located within an area of low flood risk (Flood Zone 1) (***Figure 20.2***). Flood Zone 1 is defined as land which has a less than 1 in 1000 annual probability of river flooding (<0.1%). However, any onshore infrastructure located close to the Hundred River (i.e. where the onshore cable route crosses the Hundred River) has a higher risk of flooding (up to Flood Zone 3; land with a high risk of flooding). There is also an area of increased flood risk (Flood Zones 2 and 3) along the Friston Watercourse, immediately to the south of the onshore development area.

75. There are no formal flood defences (including coastal flood defences) within the onshore development area, although there are coastal defences along the Alde estuary.

76. A more detailed description of the baseline flood risk in the onshore development area is provided in the FRA (***Appendix 20.3***).

77. It is important to note that the Environment Agency's flood modelling (as shown in ***Figure 20.2***) is confined to Main Rivers, and does not consider flood risk along Ordinary Watercourses. The area of increased flood risk in Friston could therefore extend northwards beyond the Main River limit and along the upper reaches of the Friston Watercourse, which are designated as an Ordinary Watercourse and located within the onshore development area. This is taken into account in the assessment presented in ***sections 20.6.1.4*** and ***20.6.2.1*** and ***Appendix 20.3***.

20.5.2 Groundwater

78. The onshore development area is underlain by a Principal Aquifer in the Chalk bedrock. The Chalk Principal Aquifer is at considerable depth in the study area, below the unproductive low permeability deposits of the London Clay. Parts of the area are also underlain by Principal Aquifer in the superficial Crag deposits, which is overlain by glacial deposits which incorporate Secondary (A, B and undifferentiated) aquifers. Due to the depth of the Chalk, the Crag is considered to be the primary aquifer underlying the study area. The Environment Agency's groundwater vulnerability map indicates that the area overlies a minor aquifer with high vulnerability.

79. Regionally, the principal groundwater body underlying the onshore development area is the Waveney and East Suffolk Chalk and Crag (***Figure 20.3***). WFD classification data (Environment Agency 2016) demonstrates that groundwater is under pressure from abstractions of groundwater and connected surface waters for arable agricultural uses, and from diffuse source pollution from livestock farming. However, saline intrusion is not considered to be an issue and adverse effects on groundwater-dependent terrestrial ecosystems and surface water bodies are not reported.

80. There are two groundwater Source Protection Zone (SPZs) located to the west of Leiston and Aldringham (***Figure 20.3***). The Inner Protection Zones (Zone I) are both located outside the onshore development area, but the southern Outer Protection Zone (Zone II) is located beneath the landward end of the onshore cable corridor and onshore substation location. These zones are associated with groundwater and abstraction for public water supply, and therefore suggest that groundwater in this area is likely to be sensitive to change.

81. 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). Furthermore, there

are five unlicensed (private) abstractions known to the Environment Agency within or adjacent to the onshore development area and a further three observation boreholes in the area (which may also be used for abstraction) (***Figure 20.3***). All but one of the unlicensed abstraction points appear to be related to non-industrial abstractions, therefore any abstraction is likely to have minimal impact on local groundwater resources.

20.5.3 Designated Sites

82. The lower reaches of the Hundred River flow through the Leiston – Aldeburgh Site of Special Scientific Interest (SSSI) and Sandlings Special Protection Area (SPA):

- The Leiston – Aldeburgh SSSI is designated due to the acid grassland, heath, scrub, woodland, fen, open water and vegetated shingle habitats that it supports (English Nature 1999). The mosaic of terrestrial habitats and water bodies provides suitable breeding and feeding habitat for a variety of species of dragonfly and damselfly, including the nationally scarce hairy dragonfly *Brachytron pratense* (Natural England 1999). Several SSSI units are of particular relevance from a water resources perspective, with the Hundred River flowing through or immediately adjacent to the following units:
  - Unit 10: Fen, marsh and swamp. Referred to as "The Fens" on Ordnance Survey mapping, this is an area of wetland that is dominated by common reed *Phragmites australis*.
  - Unit 11: Standing open water and canals. Thorpeness Mere (also called "The Meare") is a shallow eutrophic water body underlain by a peat substrate, which is connected to other wetland habitats such as carr woodland, swamp and fen meadows.
  - Unit 12: Broadleaved, mixed and yew woodland. An area of wet woodland bisected by the river and connected drainage channels.
  - Unit 14: Neutral grassland. This area, known as Church Farm Marshes, consists of grassland bisected by a network of largely trapezoidal drainage ditches. Water quality is reported to be good, and the channels support a diverse plant community (Natural England 2010).

83. The Sandlings SPA is designated due to the breeding populations of nightjar and woodlark that are supported by the habitats listed for the SSSI above (JNCC 2001a).

84. Leiston Beck flows through parts of the Sizewell Marshes SSSI, Minsmere – Walberswick Heaths and Marshes SSSI and SAC, and Minsmere – Walberswick SPA:

- Sizewell Marshes SSSI comprises unimproved wet meadows, areas of wet woodland, reed bed and an extensive ditch system, which collectively support important assemblages of invertebrates and rare vascular plants (as well as some of the water bird interest features of the Minsmere to Walberswick Heaths and Marshes SPA and Ramsar site, e.g. marsh harriers and bittern) (Natural England 2018a). The citation for the site itself identifies an important breeding bird assemblage characteristic of wet grassland and associated habitats. However, the site's breeding bird assemblage has declined, in line with a national decline, and species such as snipe and lapwing are no longer present.
- Minsmere – Walberswick Heaths and Marshes SSSI supports a diverse series of habitat types, most notably mudflats, shingle beach, reed beds, heathland and grazing marsh (Natural England 2018b). These habitats provide sheltered feeding grounds for wildfowl and shorebirds, and also support important flora and invertebrate assemblages.
- Parts of the SSSI have also been designated as a SAC because they support several Annex 1 habitats, including annual vegetation of drift lines and European dry heaths (JNCC undated). Perennial vegetation of stony banks is also listed as a qualifying feature.
- Minsmere – Walberswick SPA supports breeding populations of avocet, bittern, little tern, marsh harrier, nightjar and woodlark, and over-wintering populations of avocet, bittern and hen harrier that are of European importance (JNCC 2001b). In addition, the SPA also supports an important assemblage of breeding and wintering wildfowl, including gadwall, teal, shoveler and white-fronted geese.
- The Friston Watercourse is not designated, but it drains directly into the Alde Estuary. The Alde Estuary is designated as part of the Alde – Ore Estuary SSSI and SPA and Alde – Ore and Butley Estuaries SAC, on account of the geomorphological features and the diverse range of habitats and species that they support. (Natural England 2018c). These are located outside the onshore development area.

85. More information on the designated sites is provided in ***Chapter 22 Onshore Ecology*** and ***Chapter 23 Onshore Ornithology***.

20.5.4 Sensitivity and Value of Receptors

86. As described in ***section 20.5.1***, there are three main surface water drainage catchments in the onshore development area. The value and sensitivity of each of these receptors has been set at a catchment level and applied to all watercourses within that catchment (***Table 20.12***). Any parts of the surface drainage network that are not included in Ordnance Survey datasets are

therefore considered to be part of the nearest downstream watercourse. The sensitivity of each surface water receptor has been defined based on the geomorphological (i.e. physical habitat), hydrological and water quality characteristics described in ***section 20.5.1***. The value has been defined with reference to the ecological value of the receptors and any connected habitats, including the presence of designated sites (***section 20.5.3***).

87. As described in ***section 20.5.2***, the onshore development area is underlain by a single body of groundwater. The value of this receptor has been defined on the basis of recorded water quality and the use of the watercourse, and is defined in ***Table 20.12***.

Table 20.12 Sensitivity and Value of Receptors

Receptor	Sensitivity	Justification of sensitivity	Value	Justification of value
Coastal fringe	Negligible	There are no permanent surface drainage features in this area.	Negligible	There are no permanent surface drainage features in this area.
Hundred River	Low	Extensively modified low-energy watercourse with limited geomorphological diversity. Generally good water quality, but impaired by low concentrations of dissolved oxygen and high concentrations of phosphates.	High	Supports ten-spined stickleback *Pungitius pungitius* and three-spined stickleback *Gasterosteus aculeatus*, which are not priority species. No priority plants or invertebrates have been recorded. However, the watercourse is hydrologically connected to water-dependent habitats within the Leiston – Aldeburgh SSSI and Sandlings SPA.
Leiston Beck	Low	Extensively modified low-energy watercourse with limited geomorphological diversity. Generally good water quality, but impaired by low concentrations of dissolved oxygen and high concentrations of phosphates.	High	No priority plants, invertebrates or fish have been recorded. However, the watercourse is hydrologically connected to water-dependent habitats within the Sizewell Marshes SSSI, Minsmere – Walberswick Heaths and Marshes SSSI and SAC, and Minsmere – Walberswick SPA.
Friston Watercourse	Low	Extensively modified fresh watercourse with limited geomorphological diversity, draining into a tidal creek and estuary with extensive mudflats. Generally good water quality, but impaired by high concentrations of dissolved inorganic nitrogen.	High	No priority plants, invertebrates or fish have been recorded. However, the watercourse is hydrologically connected to water-dependent habitats within the Alde – Ore Estuary SSSI and SPA and Alde – Ore and Butley Estuaries SAC.
Groundwater	High	Groundwater quantity under pressure from abstractions from groundwater and connected surface waters. Groundwater quality under pressure from diffuse source pollution from pastoral agriculture and public water supply.	High	Designated as a Principal Aquifer with high vulnerability. SPZII underlies the western end of the onshore development area. Close to SPZI.

20.5.5 Anticipated Trends in the Baseline Condition

20.5.5.1 Surface Waters

88. The baseline review presented in ***section 20.5.1*** demonstrates that, although the surface drainage catchments in the onshore development area support high quality natural habitats, the geomorphology of many surface watercourses has been modified as a result of land drainage and flood risk management pressures. This section also demonstrates that surface water quality across the onshore development area is predominantly good, although several watercourses are adversely affected by the supply of phosphate fertilisers.

89. 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 in turn could result in changes to the geomorphology of the river systems, with increased geomorphological activity (e.g. channel adjustment) occurring in response to storm events. 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.

90. 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. Additional information on climate-related impacts on flood risk is provided in ***Appendix 20.3***.

20.5.5.2 Groundwater

91. Groundwater quality is affected by the combined pressures of intensive land use and highly permeable soils, which have resulted in substantial leaching of nitrate to groundwater historically. However, increased regulation of agricultural chemicals and catchment-wide initiatives to reduce pressures on groundwater to achieve compliance with the WFD suggest that baseline groundwater quality is likely to improve in the future. However, any improvements are likely to become apparent only over the long term.

92. As part of Defra's Water Abstraction Plan (2017), the Environment Agency will review and amend all existing abstraction licenses by 2027. It is anticipated that abstraction will decrease and approximately 90% of surface water bodies and 77% of groundwater bodies will meet the required standards by 2021. Pressures on groundwater levels could therefore decrease in the future. However, predicted climate changes are likely to result in a future increase in temperature and therefore increased demands on water supply, which could, therefore, have a detrimental effect on groundwater resources and groundwater abstraction.

20.6 Potential Impacts

20.6.1 Potential Impacts during Construction

93. Four potential impacts on water resources and flood risk receptors resulting from the construction stage have been identified. These are:

- Direct disturbance of surface water bodies;
- Increased sediment supply;
- Accidental release of contaminants; and
- Changes to surface water runoff and flood risk.

94. These impacts are discussed in detail in the subsequent sections.

20.6.1.1 Impact 1: Direct Disturbance of Surface Water Bodies

20.6.1.1.1 Impacts Prior To Mitigation

95. The onshore cable route will need to cross the Hundred River, and therefore has the potential to directly alter the geomorphology, hydrology and physical habitat value of the watercourse. The watercourse would be crossed using a trenched technique, whereby temporary dams (composed of sand bags, straw bales and ditching clay, or another suitable technique) would be installed upstream and downstream of the crossing point. The cable trench would then be excavated in the area of dry river bed between the dams, with river flow maintained through the use of a temporary pump, pipe or flume. Based on available baseline information no further crossings of main rivers or ordinary watercourses are required along the onshore cable route. In the event that additional watercourses are identified, the crossings will be managed in a similar proportionate manner to the Hundred River crossing.

96. The installation of the cable trench will directly disturb the bed and banks of the watercourse and could potentially result in the direct loss of natural geomorphological features (and associated physical habitat niches) and geomorphological instability (e.g. due to enhanced scour and increased sediment supply). The onshore cable route construction programme will take approximately 24 months. However, this would be a temporary impact provided that the bed and banks are reinstated to their original level, position, planform and profile.

97. The presence of temporary dams could potentially result in reduced flow and sediment conveyance (particularly of coarse sediment), create upstream impoundment, affect patterns of erosion and sedimentation, impede river continuity, increase turbidity and potentially encourage fine sedimentation on a short section of the bed upstream. Changes to flow conditions could also result

in a reduction in the dissolved oxygen concentrations supported in the watercourses upstream of the impoundment. These activities could therefore reduce the physical habitat value of the watercourse for aquatic plants, invertebrates and fish species locally. These impacts are considered to be temporary (i.e. confined to the duration of construction) and would be reversed once the temporary impounding structures were removed (i.e. as a result of natural bed scour and sediment transport processes, which would remobilise any accumulations of unconsolidated fine sediments once the normal flow regime has been reinstated).

98. In addition, a temporary bridge or culvert would be required to allow the haul road to cross the watercourse adjacent to the cable crossing point (for the purposes of this assessment, it is assumed that the worst case scenario would be a culvert rather than a clear span bridge). The installation and removal of this temporary structure within the dewatered reach of the river would directly disturb the bed and banks of the watercourse and result in the direct loss of natural geomorphological features within the footprint of the structure. This impact would be reversible once the temporary structure has been removed and the bed and banks reinstated.

99. The temporary dams could also act as a barrier to the movement of fish and other aquatic organisms (including migrating eels and spawning fish). However, impacts are only anticipated when barriers are in place in the channel (i.e. during trenching and the installation of temporary crossing structures), and river continuity would be restored once temporary barriers were removed. The temporary crossing would be designed to ensure that fish passage was unimpeded.

100. There will be no impact on the coastal fringe, Leiston Beck, Friston Watercourse and groundwater receptors as there are no watercourse crossings or mechanisms for direct disturbance.

101. The impacts on each receptor resulting from direct disturbance are summarised in ***Table 20.13***.

20.6.1.1.2 Additional Mitigation Measures

102. The following additional measures, as secured within the CoCP and detailed within the OCoCP submitted with this DCO application, would be applied to reduce the impacts associated with the trenched crossing of the Hundred River:

- In order to ensure that there are no adverse impacts resulting from the installation of temporary dams, the Applicant will seek (in so far as practicable) to minimise the amount of time that temporary dams are in place, flumes, pipes or pumps would be adequately sized to maintain flows downstream of the obstruction whilst minimising upstream impoundment and avoiding changes to flood risk. Scour protection would be used to protect the bed downstream of the dam from higher energy flows at the outlet of the flumes, pipes or pumps. A fish rescue would be undertaken in the area between the temporary dams prior to dewatering. Water levels will be monitored during construction and additional measures employed to maintain conveyance (e.g. use of additional pumps or removal of temporary dams) if water level changes could adversely affect flood risk;

- The temporary bridge or culvert for the haul road would be adequately sized to avoid impounding flows. If a culvert is used, the invert level of the structure will be installed below the natural bed of the channel so that sediment transport and the movement of fish (including eels and elvers) and aquatic invertebrates can be maintained;
- Cable ducts would typically be installed 2m below the bed of the watercourse (sufficient to account for climate-related changes in fluvial flows and erosion). This would be dependent upon local geology and geomorphological risks (e.g. bed scour and channel instability) and avoid exposure during periods of higher energy flow where the bed could be mobilised;
- Vegetation would not be removed from the banks unless necessary to undertake the works; any vegetation removal would be restricted to the smallest practicable footprint; and
- Localised improvements to the geomorphology and in-channel habitats will be considered where the watercourse is crossed using open cut techniques, in consultation with stakeholders. This will include sympathetic reinstatement of banks (e.g. by replacing re-sectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse). Note that any improvements would be restricted to within the onshore cable corridor of the proposed East Anglia ONE North project.

103. The precise working methodology will be agreed through discharge of DCO requirements post-consent and through an application for an environmental permit from the Environment Agency (e.g. a Flood Risk Activities Permit for works directly affecting a main river and its floodplain, if required).

20.6.1.1.3 Impacts Following Mitigation

104. Following the implementation of these additional mitigation measures, the potential for impacts associated with the trenched crossing of the Hundred River would be reduced to a negligible magnitude of effect. Given the low sensitivity and high value of the receptor, the residual impact resulting from the direct disturbance of surface water bodies would therefore be **minor adverse** (***Table***

20.13). There are no impacts on the coastal fringe, Leiston Beck, Friston Watercourse and groundwater.

Table 20.13 Impacts Resulting from the Direct Disturbance of Surface Water Bodies

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	There will be no watercourse crossings within the contributing catchment.	No impact	-	-	-
Hundred River	Low	High	One trenched crossing over the main watercourse will be required. This will include temporary dams, and a temporary bridge or culvert. However, any changes are considered to be temporary and reversible once the temporary structures have been removed and the bed and banks have been reinstated.	Low	Moderate adverse	Negligible	Minor adverse
Leiston Beck	Low	High	There will be no watercourse crossings within the Leiston Beck catchment.	No impact	-	-	-
Friston Watercourse	Low	High	There will be no watercourse crossings within the Friston Watercourse catchment.	No impact	-	-	-
Groundwater	High	High	There are no mechanisms for groundwater to be impacts by the direct disturbance of surface water bodies.	No impact	-	-	-

20.6.1.2 Impact 2: Increased Sediment Supply

20.6.1.2.1 Impacts Prior To Mitigation

105. Construction activities in the onshore development area will involve earthworks and create areas of bare ground by removing surface vegetation cover. These construction activities could increase the potential for the erosion of soil particulates, resulting in an increase in the supply of fine sediment (e.g. clays, silts and fine sands) to surface watercourses through surface runoff and the erosion of exposed soils.

106. Increased sediment supply could affect the geomorphology of the watercourse by increasing turbidity in the water column and encouraging enhanced deposition of fine sediment on the bed of the channel. Furthermore, increased sediment loads could potentially smother existing bed habitats, reduce light penetration and reduce dissolved oxygen concentration, adversely affecting stream biota (e.g. macrophytes, aquatic invertebrates and fish) and adversely affecting the quality of in-channel habitats.

107. Site preparation, ground excavations and other construction activities which have the potential to increase sediment supply will take place across onshore development area. The scale of the potential impact upon a sub-catchment is likely to be proportional to the area of each catchment that would be disturbed during construction. This has been calculated based on the worst case parameters set out in ***Table 20.2***, including:

- The area of onshore cable route and haul road within each catchment;
- The number of jointing bays within each catchment;
- The number of HDD temporary working areas (including the landfall) within each catchment;
- The number of CCS within each catchment; and
- The area of onshore substation and National Grid infrastructure, CCSs and permanent access route within each catchment.

108. The results of these calculations are shown in ***Table 20.14***.

Table 20.14 Estimated Maximum Area of Disturbed Ground in Each Water Receptor

Receptor	Estimated Total area of disturbed ground during construction[2]	
	m^2	%
Coastal fringe	64,200	15.65
Hundred River	242,800	0.93

[2] All areas and percentages are based on the total area of each catchment at the downstream limit

Receptor	Estimated Total area of disturbed ground during construction[2]	
	m^2	%
Leiston Beck	83,500	0.52
Friston Watercourse	250,700	4.16
Groundwater	642,000	0.04

109. However, the proposed East Anglia ONE North project will include a range of embedded mitigation measures (see ***Table 20.3***) to reduce the potential for an increase in the supply of fine sediment, including minimising the area of open ground at any one time, storing and reinstating topsoil and using hardstanding in mobilisation areas (***section 20.3.3***). This means that the exposed working area which has the potential to supply sediment will be restricted in each catchment at any one time. The impacts on each receptor resulting from direct disturbance are summarised in ***Table 20.15***.

20.6.1.2.2 Additional Mitigation Measures

110. In addition to the sediment management measures embedded into the design of the working activities (including development of a detailed CoCP, as secured under the requirements of the draft DCO, which would include a suite of sediment management measures; see ***Table 20.3***), the following mitigation measure, as secured within the CoCP and detailed within the OCoCP submitted with this DCO application, will be put in place to prevent the release of sediment into surface watercourses:

- Buffer strips of vegetation will be retained adjacent to the Hundred River and Friston Watercourse, where possible. Where surface vegetation has been removed, it will be reseeded to prevent future runoff (excluding arable crops).

20.6.1.2.3 Impacts Following Mitigation

111. The additional mitigation measures will reduce sediment supply to watercourses from the working area and are an important and integral part of best practice construction methodology to help ensure that sediment supply is not increased. The magnitude of the effect is therefore predicted to reduce to negligible in the Hundred River and Friston Watercourse catchments; it would remain negligible in the Leiston Beck catchment. The residual impact resulting from the direct disturbance of surface water bodies would therefore be **minor adverse** in the Hundred River, Leiston Beck and Friston Watercourse catchments (***Table 20.15***). There are no impacts on the coastal fringe or groundwater.

Table 20.15 Impacts Resulting from Increased Sediment Supply

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	An area of approximately 64,200m^2 would be disturbed by construction activities in this catchment. Although this accounts for approximately 16% of the catchment, there are no significant surface drainage features in the area and therefore no mechanism for impact on surface water receptors.	No impact	-	-	**-**
Hundred River	Low	High	An area of approximately 242,800m^2 would be disturbed by construction activities in this catchment. This accounts for approximately 1% of the total surface drainage catchment. Although this is a small proportion of the total catchment, activities will take place within and adjacent to the watercourse. This means that there is a direct route for any sediment generated to easily enter the surface drainage system through surface runoff without natural attenuation. Furthermore, the embedded measures outlined in ***Table 20.3*** will minimise sediment generation from construction activities along the onshore cable route.	Low	Moderate adverse	Negligible	**Minor adverse**
Leiston Beck	Low	High	An area of approximately 83,500m^2 would be disturbed by construction activities in this catchment. This accounts for approximately 0.5% of the total surface drainage catchment. The small proportion of the catchment affected	Negligible	Minor adverse	Negligible	**Minor adverse**

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
			and the distance between the onshore development area and the surface watercourses mean that any sediment generated is likely to be naturally intercepted before it can enter the surface drainage system. Furthermore, the embedded measures outlined in ***Table 20.3*** will minimise sediment generation from construction activities along the onshore cable route.				
Friston Watercourse	Low	High	An area of approximately 250,700m^2 would be disturbed by construction activities in this catchment. This accounts for approximately 4% of the total surface drainage catchment. However, the embedded measures outlined in ***Table 20.3*** will minimise sediment generation from the onshore substation locations.	Low	Moderate adverse	Negligible	**Minor adverse**
Groundwater	High	High	There are no mechanisms for groundwater to be impacted by an increase in sediment supply to surface water bodies.	No impact	-	-	-

20.6.1.3 Impact 3: Accidental Release of Contaminants

20.6.1.3.1 Impacts Prior to Mitigation

112. There is the potential for the accidental release of lubricants, fuels and oils from construction machinery through spillage, leakage and in-wash from vehicle storage areas after rainfall and direct release from construction machinery working in and adjacent to surface watercourses. There is also the potential for accidental release of foul waters (from welfare facilities) and construction materials (including concrete and inert drilling fluids) into the surface waters and connected groundwaters during construction.

113. If a significant leakage or spillage occurs, there is the potential for adverse impacts upon water quality if contaminants enter the surface drainage network or percolate into groundwater. These water quality impacts have the potential to adversely affect ecology (see ***section 22.6.1.7 of Chapter 22 Onshore Ecology*** for impacts on the ecology of watercourses) if pollutant concentrations are sufficiently high.

114. Construction activities which disturb the ground (including excavation, piling and underground trenchless crossings of obstructions such as roads and railways) could potentially introduce contaminants into the underlying groundwater bodies (particularly shallow aquifers). These activities could therefore adversely affect the quality of the underlying groundwater (including the Principal Aquifer and any secondary aquifers) and could potentially impact upon any licensed and unlicensed abstractions within it.

115. The scale of the potential impact upon a surface catchment or body of groundwater is likely to be proportional to the area of each catchment that would be affected during construction (i.e. the total footprint of construction activities as shown in ***Table 20.14***). The impacts on each receptor resulting from the accidental release of contaminants are summarised in ***Table 20.16***.

20.6.1.3.2 Additional Mitigation Measures

116. The embedded measures to intercept drainage described in ***Table 20.3*** will help to mitigate the accidental release of contaminants by preventing the immediate discharge of contaminated water from the onshore cable corridor into the surface drainage network. Furthermore, the potential for impacts associated with the accidental release of fuels, oils, lubricants, construction materials, foul waters and other contaminants will be reduced by the following additional measures, as secured within the CoCP and detailed within the OCoCP submitted with this DCO application:

- Buffer strips of vegetation will be retained adjacent to the Hundred River and Friston Watercourse, where possible, to intercept surface runoff and any dissolved or particulate contaminants associated with it; and
- Cable installation activities will be designed to ensure that they will not affect groundwater in any significant manner. Excavations will be shallow (approximately 1.2m under the ground surface, although they may be slightly deeper beneath watercourse and service crossings) and significantly above the level of the Principal Aquifer. If subsurface works are required in SPZ1 or SPZ2, or in the vicinity of an unlicensed abstraction, the construction methodology will stipulate that the best available techniques are used for any installations, to be agreed in advance with the Environment Agency. Furthermore, a hydrogeological risk assessment meeting the requirements of Groundwater Protection Principles and Practice (GP3) (Environment Agency 2017) will be undertaken for any trenchless crossing locations in SPZ2 or SPZ3 or in the vicinity of an unlicensed abstraction. If significant risks are identified, alternatives to cross the SPZ will be considered.

20.6.1.3.3 Impacts Following Mitigation

117. Following the implementation of these additional mitigation measures, the potential for accidental release of contaminants from construction activities is reduced to an effect of negligible magnitude within the Hundred River and Friston Watercourse catchments. The effect would remain negligible in the Leiston Beck and the groundwater body. The residual impact resulting from the accidental release of fuels, oils, lubricants, foul waters and construction materials would therefore be **minor adverse** in the Hundred River, Leiston Beck and Friston Watercourse catchments and underlying groundwater (***Table 20.16***). There will be no impacts upon surface water receptors in the coastal fringe.

Table 20.16 Impacts Resulting from the Accidental Release of Fuels, Oils, Lubricants, Foul Waters and Construction Materials

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	An area of approximately 64,200m^2 would be disturbed by construction activities in this catchment. Although this accounts for approximately 16% of the catchment, there are no significant surface drainage features in the area and therefore no mechanism for impact on surface water receptors.	No impact	-	-	**-**
Hundred River	Low	High	An area of approximately 242,800m^2 would be affected by construction activities in this catchment. This accounts for approximately 1% of the total surface drainage catchment. Although this is a small proportion of the total catchment, activities will take place within and adjacent to the watercourse. This means that there is a direct route for any contaminants generated to easily enter the surface drainage system through surface runoff without natural attenuation. Furthermore, the embedded measures outlined in ***Table 20.3*** will minimise contaminant generation from construction activities along the onshore cable route.	Low	Moderate adverse	Negligible	**Minor adverse**
Leiston Beck	Low	High	An area of approximately 83,500m^2 would be affected by construction activities in this catchment. This accounts for approximately 0.5% of the total surface drainage catchment. The small proportion of the catchment affected and the distance between the onshore development area and the surface watercourses mean that any contaminants generated are likely to be naturally attenuated before they can	Negligible	Minor adverse	Negligible	**Minor adverse**

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
			enter the surface drainage system. Furthermore, the embedded measures outlined in ***Table 20.3*** will minimise contaminant generation from construction activities along the onshore cable route.				
Friston Watercourse	Low	High	An area of approximately 250,700m^2 would be affected by construction activities in this catchment. This accounts for approximately 4% of the total surface drainage catchment. However, the embedded measures outlined in ***Table 20.3*** will minimise contaminant generation from the onshore substation locations. Furthermore, construction activities will not be undertaken immediately adjacent to the watercourse.	Low	Moderate adverse	Negligible	**Minor adverse**
Groundwater	High	High	An area of approximately 642,000m^2 would be affected by construction activities. This accounts for approximately 0.04% of the total groundwater body. This means that any adverse impacts are likely to be spatially limited. Furthermore, the embedded measures outlined in ***Table 20.3*** will minimise contaminant generation from construction activities along the onshore cable route and at the onshore substation locations. However, it is acknowledged that a more significant impact could occur if an individual groundwater abstraction (e.g. a private water supply) were to be directly affected by subsurface activities.	Medium	Major adverse	Negligible	**Minor adverse**

20.6.1.4 Impact 4: Changes to Surface Water Runoff and Flood Risk

20.6.1.4.1 Impacts Prior to Mitigation

118. The construction activities associated with the onshore development area (including transition bays, onshore cable route and onshore substation and National Grid infrastructure have the potential to alter surface water flows and drainage patterns by:

- Altering existing flow paths and changing the distribution of surface drainage across development sites and along the onshore cable route through changes to the ground surface and placement of temporary stockpiles;
- Reducing infiltration and increasing surface runoff as a result of soil compaction by construction vehicles;
- De-watering the cable trench and removal of the water through infiltration or discharge into the surface drainage network;
- Increasing the proportion of impermeable surfaces in a catchment and therefore reducing infiltration. The development of surface infrastructure also has the potential to change surface flows and infiltration rates as a result of changes to land use (i.e. by increasing the proportion of impermeable surfaces in a drainage catchment) and alter site runoff characteristics;
- Temporary changes to surface flows as a result of the trenched crossing of the Hundred River during construction (see ***section 20.6.1.1***), particularly if the capacity of any pumps, pipes, flumes and temporary watercourse crossing (bridge or culvert) is exceeded; and
- Changes to subsurface flow patterns resulting from changes to infiltration rates, surface flows and the installation of impermeable subsurface infrastructure.

119. The construction of the proposed East Anglia ONE North project therefore has the potential to increase surface water runoff, which could adversely affect the hydrology and geomorphology of the surface drainage network (e.g. as a result of increased discharge resulting in bed and bank scour, and the in wash of greater volumes of fine sediment due to increased surface runoff, as discussed in ***section 20.6.1.1***). This could also affect in-channel habitats (see ***section 22.6.1.7 of Chapter 22 Onshore Ecology*** for impacts on the ecology of watercourses).

120. Any changes in surface flows could also increase flood risk in the onshore development area, particularly third party land and property in areas within Flood Zones 2 or 3. The onshore development area passes largely through agricultural land, with some residential and agricultural buildings located in proximity to the onshore development area. Third party land and property could therefore be

affected along the length of the onshore development area as a result of alterations to surface water flows, run off and drainage patterns.

121. The area of direct impact within the construction footprint (as shown in ***Table 20.14***) and the number of watercourse crossings are used as a proxy for the assessment of potential changes to surface water runoff and flood risk within each surface drainage catchment. Note that more detailed information regarding potential flood risk impacts are provided in ***Appendix 20.3***.

122. It is important to note that the changes to surface water runoff and flood risk assessed in detail for each catchment below are expected to be relatively localised, and would not be sufficient to cause a major accident or disaster.

123. The proposed East Anglia ONE North project will include embedded mitigation measures to control surface runoff during the construction phase, including the creation of drainage channels to intercept water from the cable trench and onshore cable corridor. These measures, which are described in more detail in ***section 20.3.3***, will help to control the release of surface waters from onshore development activities and prevent changes to surface runoff and flood risk. With the embedded measures in place, the magnitude of effect is considered below.

124. The impacts on each receptor resulting from increased surface water runoff are summarised in ***Table 20.17***.

20.6.1.4.2 Additional Mitigation Measures

125. In addition to the embedded mitigation measures to intercept site drainage that are described in ***section 20.3.3***, the potential for impacts associated with changes to surface water runoff and flood risk will be reduced by the following additional measure, as secured within the CoCP and detailed within the OCoCP submitted with this DCO application:

- Existing land drains along the onshore cable route and at the onshore substation and National Grid substation will be reinstated following construction (or rerouted if underneath permanent above-ground developments). A specialised drainage contractor will undertake surveys to locate drains and create drawings both pre- and post-construction, and ensure appropriate reinstatement. The pre-construction SWDP will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land.

20.6.1.4.3 Impacts Following Mitigation

126. Following the implementation of this additional mitigation measure, the potential for increased surface runoff and flood risk is reduced to an effect of negligible

magnitude within the Hundred River and Friston Watercourse catchments. The effect will remain negligible in the Leiston Beck catchment and underlying groundwater. The residual impact resulting from the increase in surface runoff and flood risk would therefore be **minor adverse** in the Hundred River, Leiston Beck and Friston Watercourse catchments and underlying groundwater (***Table 20.17***). There will be no impacts surface water receptors in the coastal fringe.

Table 20.17 Impacts Resulting from Increased Surface Water Runoff and Flood Risk

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	Although approximately 13% of the catchment could be affected by construction activities, there are no significant surface drainage features in the area and therefore no mechanism for impact on surface water receptors.	No impact	-	-	-
Hundred River	Low	High	Approximately 1.27% of the total surface drainage catchment could be affected by construction activities with the potential to alter surface and subsurface flows. Furthermore, there will be a single watercourse crossing point in the catchment.	Low	Moderate adverse	Negligible	**Minor adverse**
Leiston Beck	Low	High	Approximately 0.65% of the total surface drainage catchment could be affected by construction activities with the potential to alter surface and subsurface flows. However, there will be no watercourse crossings in the catchment.	Negligible	Minor adverse	Negligible	**Minor adverse**
Friston Watercourse	Low	High	Approximately 5.59% of the total surface drainage catchment could be affected by construction activities with the potential to alter surface and subsurface flows. However, there will be no watercourse crossings in the catchment.	Low	Moderate adverse	Negligible	**Minor adverse**
Groundwater	High	High	Approximately 0.06% of the groundwater body could be affected by construction activities with the potential to alter surface and subsurface flows.	Negligible	Minor adverse	Negligible	**Minor adverse**

20.6.2 Potential Impacts during Operation

127. Two potential impacts on water resources and flood risk receptors resulting from the operational stage have been identified:

- Changes to surface water runoff, groundwater flows and flood risk; and
- Supply of fine sediment and other contaminants.

128. These impacts are discussed in detail in the subsequent subsections.

20.6.2.1 Impact 1: Changes to Surface Water Runoff, Groundwater Flows and Flood Risk

20.6.2.1.1 Impacts Prior to Mitigation

129. The permanent above-ground infrastructure, including the onshore substation, National Grid infrastructure and any new, permanent access tracks will result in permanent changes to land use. In most cases, the change in use from existing greenfield agricultural land use is likely to create a permanent increase in impermeable area. Changes in land use are detailed further within ***Chapter 21 Land Use***. Although permeable surface treatments will be used where possible, jointing bays along the onshore cable route, and the onshore substation and National Grid infrastructure are expected to comprise impermeable surfaces, with associated infrastructure such as roads also comprising impermeable surfaces. An increase in the proportion of impermeable surfaces in a sub-catchment will result in a corresponding decrease in local infiltration and an increase in surface runoff.

130. Furthermore, the presence of the buried infrastructure (including transition bays, jointing bays and cable ducting) along the onshore cable route will introduce a localised impermeable barrier that has the potential to impact upon subsurface flow routes in places and change the distribution of groundwater by changing subsurface flow patterns and forcing water to move upwards (i.e. towards the surface) or downwards (away from the surface).

131. There is therefore potential for changes in surface water runoff resulting from the increase in impermeable areas and changes to subsurface flows. These could be sufficient to impact upon the hydrology (e.g. by increasing surface water volumes and flow velocities) of the surface water system and result in permanent changes to geomorphology by increasing rates of bed and bank erosion and encouraging geomorphological adjustment. Any geomorphological changes could also impact upon in-channel habitat conditions for aquatic organisms (specific impacts are discussed in ***Chapter 22 Onshore Ecology***). Impacts on geomorphology and in-channel habitats are likely to be particularly marked if

drainage from a large area is discharged at a discrete location within the existing surface drainage network.

132. As well as impacts on geomorphology and in-channel habitats, changes to surface drainage patterns could also increase flood risk to third party land and property, especially if the discharge of any drainage is not sufficiently controlled. Furthermore, watercourse crossing locations have the potential to increase flood risk elsewhere should they not be reinstated to pre-construction channel capacities (i.e. any reductions in channel capacity could increase local flood risk).

133. Any changes in the proportion of groundwater contained in surface waters (e.g. due to an increase in surface runoff, or an increase or decrease in groundwater upwelling) could potentially alter water levels and chemistry. There is also potential for the presence of the buried cable ducting throughout the onshore cable route to impact upon the level of recharge and the distribution of groundwater within the aquifers that underlie the onshore development area (including shallow aquifers and deeper Principal Aquifers). Any changes to the quantity and quality of groundwaters could potentially impact upon groundwater-dependent terrestrial ecosystems and licensed and unlicensed groundwater abstractions. However, given the shallow depths (between 1.2m and 3m) and small scale of the below-ground infrastructure, significant changes to groundwater flow patterns are not expected to arise.

134. The scale of the potential impact upon a sub-catchment is likely to be proportional to the area of permanent infrastructure in each catchment during operation. This was estimated based on the area of the onshore cable corridor, onshore substation, National Grid infrastructure and permanent access roads within each catchment (***Table 20.18***).

Table 20.18 Maximum Area of Permanent Development in Each Water Receptor

Catchment	Total area of permanent development[3]	
	m^2	%
Coastal fringe	2,200	0.54
Hundred River	10,000	0.04
Leiston Beck	4,000	0.02
Friston Watercourse	96,600	1.60
Groundwater	112,800	0.01

[3] All areas and percentages are based on the total area of each catchment at the downstream limit

135. As detailed in ***section 20.3.3***, the proposed East Anglia ONE North project will include embedded mitigation measures to reduce the potential for impact. The SWDPwill include details of SuDS measures to be included such as attenuation ponds which will, as a minimum, provide storage up to and including the 1 in 100-year storm event. Assuming a development lifetime of 25 years an increase in peak rainfall intensity of 20% will be included with the drainage design to accommodate increases in flow resulting from climate change. Following consultation with the Environment Agency and LLFA and engineering design work, attenuation ponds (as part of the SuDS) will be included at the onshore substation and National Grid substation to provide sufficient attenuation to greenfield runoff rates into the closest watercourse or sewer connection. The attenuation pond for the onshore substation will be designed to attenuate flows up to the 1:200 year event (i.e. better than the 1:100 year plus climate change allowance) and will aim to reduce the outflow rate by 20% compared with the existing runoff rate. The reduced discharge rate as a result of the construction of the surface water drainage system / SuDS measures will provide a betterment in terms of runoff from the site. This is detailed further within the OLEMS, as secured under the requirements of the draft DCO and submitted with this DCO application. The attenuation pond for the National Grid substation will be designed to attenuate flows up to the 1:100 year event plus an allowance for climate change as a minimum.

136. Management measures of operational stage surface water drainage will be detailed and secured in the LMP produced post-consent to discharge requirements of the draft DCO.

137. The impacts on each receptor resulting from increased surface water runoff, altered subsurface flows and changes to flood risk are summarised in ***Table 20.19***.

20.6.2.1.2Additional Mitigation Measures

138. In addition to the embedded mitigation measures to intercept site drainage from operational infrastructure that are described in section ***20.3.3*** (including an attenuation pond at the onshore substation that will be designed to attenuate flows up to the 1:200 year event and thus reduce outflows by 20%, and an attenuation pond for the National Grid substation which will attenuate flows to at least the 1:100 year plus climate change allowance), the potential for impacts associated with changes to surface water runoff and flood risk will be reduced by the following additional measure, as secured within the CoCP and detailed within the OCoCP submitted with this DCO application:

- Existing land drains along the onshore cable route and at the onshore substation and National Grid infrastructure substations will be reinstated following construction (or rerouted if underneath permanent above-ground developments) By using a specialised drainage contractor to undertake surveys to locate drains and create drawings both pre- and post-construction, and ensure appropriate reinstatement; and

- As identified within the OLEMS, the Applicant has committed to further attenuation measures to the north of Friston.

139. It is also important to note that, as a worst case, the assessment assumes that 100% of the onshore substation and National Grid footprint will be impermeable. However, in reality, the onshore substation and National Grid substation design will include permeable surfaces where appropriate.

20.6.2.1.3 Impacts Following Mitigation

140. Following the implementation of this additional mitigation measure, the potential for increased surface runoff and flood risk during the operational phase is reduced to an effect of negligible magnitude in the Friston Watercourse catchment. The effect will remain negligible in the Hundred River and Leiston Beck catchments and underlying groundwater. The residual impact resulting from the increase in surface runoff and flood risk would therefore be **minor adverse** in the Hundred River, Leiston Beck and Friston Watercourse catchments (although attenuation measures at the substation location will deliver a degree of betterment over existing run off characteristics to downstream receptors in Friston Watercourse) and underlying groundwater (***Table 20.19***). There will be no impacts surface water receptors in the coastal fringe.

Table 20.19 Impacts Resulting from Increased Surface Water Runoff, Altered Groundwater Flows and Changes to Flood Risk During Operation

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	An area of approximately 2,200m^2 could be affected by permanent development activities, which accounts for approximately 0.5% of the parcel of land. However, there are no significant surface drainage features in the area and therefore no mechanism for impact on surface water receptors.	No impact	-	-	-
Hundred River	Low	High	An area of approximately 10,000m^2 could be affected by permanent development activities with the potential to alter surface and subsurface flows. This accounts for approximately 0.04% of the total surface drainage catchment.	Negligible	Minor adverse	Negligible	**Minor adverse**
Leiston Beck	Low	High	An area of approximately 4,000m^2 could be affected by permanent development activities with the potential to alter surface and subsurface flows. This accounts for approximately 0.02% of the total surface drainage catchment.	Negligible	Minor adverse	Negligible	**Minor adverse**
Friston Watercourse	Low	High	An area of approximately 96,600m^2 could be affected by permanent development activities with the potential to alter surface and subsurface flows. This accounts for approximately 1.60% of the total surface drainage catchment. The embedded	Negligible	Minor adverse	Negligible	**Minor adverse**

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
			mitigation of the SuDS basins may deliver a degree of betterment over existing run off characteristics to downstream receptors in Friston Watercourse.				
Groundwater	High	High	An area of approximately 112,800m^2 could be affected by permanent development activities with the potential to alter surface and subsurface flows. This accounts for approximately 0.01% of the total groundwater body.	Negligible	Minor adverse	Negligible	**Minor adverse**

20.6.2.2 Impact 2: Supply of Fine Sediment and Other Contaminants

20.6.2.2.1 Impacts Prior to Mitigation

141. The operation of the proposed East Anglia ONE North project, including planned and unplanned maintenance at the onshore substation, National Grid substation and along the onshore cable route, could result in the supply of fine sediment, fuels, oils and lubricants from the road network and other impermeable surfaces. This could potentially affect the geomorphology and water quality in the surface drainage network.

142. There is potential for an increase in sediment supply to surface waters during operation via mechanisms such as enhanced surface runoff from the permanent above-ground development (***section 20.6.2.1***), which could impact upon the geomorphology and surface water quality of the river water bodies, and consequently impact upon aquatic ecology.

143. Furthermore, there is potential for the supply of contaminants to surface waters during operation through surface runoff or accidental spillage or leakage of fuel oils or lubricants from vehicles during operational activities, which could impact upon surface water quality and that of connected groundwaters. This could have subsequent impacts upon aquatic ecology and the use of water resources for licensed and unlicensed abstractions.

144. As outlined in ***section 20.3.3***, foul drainage at the onshore substation and National Grid substation will be collected through a mains connection to the existing Local Authority sewer system if available, or collected in a septic tank and transported off site for disposal at a licensed facility. The specific approach will be determined during detailed design with consideration for the availability of mains connection and the number of visiting hours for site attendees during operation.

145. The potential for the contamination of groundwaters will be significantly reduced by using inert solid plastic insulation within the cables, rather than oil insulated cables, therefore removing the potential for fluid leakage from the cables during operation.

146. The area of above-ground infrastructure has been used as a proxy to indicate the extent to which operational activities may be required in each catchment. The impacts on each receptor resulting from the supply of fine sediment and other contaminants during operation are summarised in ***Table 20.20***.

20.6.2.2.2 Additional Mitigation Measures

147. The negligible impact along the onshore cable route means that there is no requirement to introduce any additional mitigation measures in the Hundred River

and Leiston Beck or Friston Watercourse catchments, or to prevent the direct contamination of groundwater.

20.6.2.2.3 Impacts Following Mitigation

148. The effect will remain negligible in the Hundred River, Leiston Beck and Friston Watercourse catchments and underlying groundwater. The residual impact resulting from the increase in surface runoff and flood risk would therefore be **minor adverse** in the Hundred River, Leiston Beck and Friston Watercourse catchments and underlying groundwater (***Table 20.20***). There will be no impacts surface water receptors in the coastal fringe.

Table 20.20 Impacts Resulting from the Supply of Fine Sediment and Other Contaminants during Operation

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
Coastal fringe	Negligible	Negligible	Permanent development would be 0.54% of the catchment, and there is no requirement to undertake routine maintenance (although some planned and unplanned activities may be necessary during the operational life of the proposed East Anglia ONE North project). Furthermore, there are no significant surface drainage features in the area and therefore no mechanism for impact on surface water receptors.	No impact	-	-	-
Hundred River	Low	High	Infrastructure along the cable route has a limited spatial extent (0.04% of the catchment), and there is no requirement to undertake routine maintenance (although some planned and unplanned activities may be necessary during the operational life of the proposed East Anglia ONE North project).	Negligible	Minor adverse	Negligible	**Minor adverse**
Leiston Beck	Low	High	Infrastructure along the cable route has a limited spatial extent (0.02% of the catchment), and there is no requirement to undertake routine maintenance (although some planned and unplanned activities may be necessary during the operational life of the proposed East Anglia ONE North project).	Negligible	Minor adverse	Negligible	**Minor adverse**
Friston Watercourse	Low	High	Although the spatial extent of infrastructure accounts for 1.60% of the catchment, the	Negligible	Minor adverse	Negligible	**Minor adverse**

Receptor	Sensitivity	Value	Assessment	Magnitude prior to mitigation	Significance prior to mitigation	Magnitude following mitigation	Residual impact
			embedded mitigation measures described in ***section 20.3.3*** will control the accidental release of foul drainage and surface water drainage from the operational East Anglia ONE North and National Grid substation locations.				
Groundwater	High	High	The potential for adverse impact will be significantly reduced through the use of inert solid plastic insulated cables in place of oil insulated cables, thereby removing the potential for fluid leakage into groundwater. There is no requirement to undertake routine maintenance and therefore no potential for groundwater contamination from plant along the cable route (although some planned and unplanned activities may be necessary during the operational life of the proposed East Anglia ONE North project). Furthermore, the embedded mitigation measures described in ***section 20.3.3*** will control the accidental release of foul drainage and surface water drainage (including potential contaminants from operational plant that could enter surface and groundwaters) from the operational East Anglia ONE North and National Grid substation locations.	Negligible	Minor adverse	Negligible	**Minor adverse**

20.6.3 Potential Impacts during Decommissioning

149. 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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.

20.7 Cumulative Impacts

20.7.1 Cumulative Impacts with the Proposed East Anglia TWO Project

150. The East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application phase. The proposed East Anglia TWO project has a separate DCO application which has been submitted at the same time as the proposed East Anglia ONE North project. The two projects share the same landfall location and onshore cable corridor and the two onshore substations are co-located, and connect into the same National Grid substation.

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

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

- Scenario 1 - the proposed East Anglia ONE North project and proposed East Anglia TWO project are built simultaneously; and
- Scenario 2 - the proposed East Anglia ONE North project and the proposed East Anglia TWO project are constructed sequentially.

153. 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 those developments which have been screened into the CIA (***section 20.7.2***). 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***.

154. Full assessment of scenario 1 and scenario 2 can be found in ***Appendix 20.2***. This assessment found that scenario 2 represented the worst case impacts for water resources and flood risk, because although most impacts would be no greater than those resulting from the proposed East Anglia ONE North project alone, impacts resulting from two distinct periods of watercourse disturbance are considered to be greater. A summary of those impacts can be found in ***Table 20.21***.

Table 20.21 Summary of Potential Impacts Identified for Water Resources and Flood Risk under Construction Scenario 2

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
Cumulative Construction Impacts with the proposed East Anglia TWO Project							
Impact 1: Direct disturbance of surface water bodies	Coastal fringe	Negligible	Negligible	No impact	-	Measures to minimise the impacts of temporary watercourse crossings, install infrastructure below the active bed of the channel, and reinstate the bed and banks.	-
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	No impact	-		**-**
	Friston Watercourse	Low	High	No impact	-		**-**
	Groundwater	High	High	No impact	-		**-**
Impact 2: Increased sediment supply	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to manage sediment and surface drainage.	**-**
	Hundred River	Low	High	Medium	Major adverse		**Minor adverse**
	Leiston Beck	Low	High	Low	Moderate adverse		**Minor adverse**
	Friston Watercourse	Low	High	Medium	Major adverse		**Minor adverse**
	Groundwater	High	High	No impact	-		-
Impact 3: Accidental release of contaminants	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to manage pollution control measures.	-
	Hundred River	Low	High	Medium	Major adverse		**Minor adverse**
	Leiston Beck	Low	High	Low	Moderate adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
	Friston Watercourse	Low	High	Medium	Major adverse		**Minor adverse**
	Groundwater	High	High	Medium	Major adverse		**Minor adverse**
Impact 4: Changes to surface water	Coastal fringe	Negligible	Negligible	No impact	-	Measures to minimise the impact of temporary culverts and manage construction drainage.	**-**
	Hundred River	Low	High	Medium	Major adverse		**Minor adverse**
	Leiston Beck	Low	High	Low	Moderate adverse		**Minor adverse**
	Friston Watercourse	Low	High	Medium	Major adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Cumulative Operational Impacts with the proposed East Anglia TWO project							
Impact 1: Changes to surface water runoff, ground water flows and flood risk	Coastal fringe	Negligible	Negligible	No impact	-	Use of a specialist drainage contractor	**-**
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	Low	Moderate adverse		**Minor adverse**
	Friston Watercourse	Low	High	Low	Moderate adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
Impact 2: Supply of fine sediment and other contaminants	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to manage sediment and surface drainage such as buffer strips	**-**
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	Low	Moderate adverse		**Minor adverse**
	Friston Watercourse	Low	High	Low	Moderate adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Cumulative Decommissioning Impacts with the proposed East Anglia TWO project							
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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.							

20.7.2 Cumulative Impact Assessment with Other Developments

155. The assessment of cumulative impacts has been undertaken here as a two stage process. Firstly, all impacts considered in ***section 20.6*** have been assessed for the potential to act cumulatively with other projects. Potential cumulative impacts are set out in ***Table 20.22***.

Table 20.22 Potential Cumulative Impacts

Impact	Potential for Cumulative Impact	Rationale
Construction		
Impact 1: Direct Disturbance of Surface Water Bodies	Yes	Cumulative direct impacts arising from two or more projects are possible. Impacts to surface water receptors e.g. geomorphology, hydrology and physical habitat value, may occur where project boundaries are located within the same catchment.
Impact 2: Increased Sediment Supply	Yes	Cumulative direct impacts arising from two or more projects are possible. Construction activities of projects within the same catchment could increase the potential for the erosion of soil particulates, resulting in an increase in the supply of fine sediment (e.g. clays, silts and fine sands) to surface watercourses through surface runoff and the erosion of exposed soils.
Impact 3: Accidental Release of Contaminants	Yes	Cumulative direct impacts arising from two or more projects are possible where they occur within the same catchment. There is the potential for the accidental release of lubricants, fuels and oils from construction machinery through spillage, accidental release of foul waters (from welfare facilities), leakage and in-wash from vehicle storage areas after rainfall and direct release from construction machinery working in and adjacent to surface watercourses. There is also the potential for accidental release of construction materials (including concrete and inert drilling fluids) into the surface waters and connected groundwaters during construction.
Impact 4: Changes to Surface Water Runoff and Flood Risk	Yes	Cumulative direct impacts arising from two or more projects are possible. Changes to surface water flows and drainage patterns may occur where project boundaries are located within the same catchment.
Operation		
Impact 1: Changes to Surface Water Runoff, Groundwater Flows and Flood Risk	Yes	Cumulative direct impacts arising from two or more projects are possible. There is the potential for changes in surface water runoff resulting from the increase in impermeable areas and changes to subsurface flows, where project boundaries are located within the same catchment.

Impact	Potential for Cumulative Impact	Rationale
Impact 2: Supply of Fine Sediment and Other Contaminants	Yes	Cumulative direct impacts arising from two or more projects are possible. There is potential for an increase in sediment supply to surface waters during operation via mechanisms such as enhanced surface runoff from the permanent above-ground development if projects occur in the same catchment. There is also potential for the supply of contaminants to surface waters during operation through surface runoff or accidental spillage or leakage of fuel oils or lubricants during operational activities, which could impact upon surface water quality and that of connected groundwaters.
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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.		

156. 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 20.6.*** Where there is an overlap, an assessment of the cumulative magnitude of effect is provided.

157. Following a review of projects which have the potential to overlap temporally or spatially with the proposed East Anglia ONE North project, two developments have been scoped into the CIA. ***Table 20.23*** provides detail regarding the projects.

158. The full list of projects for consideration has been developed in consultation with the Local Planning Authority. The remainder of the section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

Table 20.23 Summary of Projects Considered for the CIA in Relation to Water Resources and Flood Risk

Project Name	Status	Development Period	[4]Distance from East Anglia ONE North Onshore Development Area	Project Definition	Level of Information Available	Included in CIA	Rationale
Sizewell C New Nuclear Power Station	PEIR formally submitted 04.01.19.	Application expected in 2020. Construction expected to commence in 2021.	1.4km	A new nuclear power station at Sizewell in Suffolk. Located to the north of the existing Sizewell B Power Station Complex, Sizewell C New Nuclear Power Station would have an expected electrical capacity of approximately 3,260 megawatts (MW). Full PEIR available: https://www.edfenergy.com/download-centre?keys=&tid=1380&year%5Bvalue%5D%5Byear%5D=	Tier 5[5]	Yes	Cumulative impacts could arise where construction and permanent operational activities take place within the Leiston Beck and Hundred River catchments.
Sizewell B Power Station Complex	Planning application formally submitted 18.04.19. Awaiting Decision.	Construction expected to commence in 2022. Expected construction timetable of 53 months. Peak construction is expected in 2022,	1.4km	The demolition and relocation of facilities at the Sizewell B Power Station Complex. In outline, demolition of various existing buildings (including the outage store, laydown area, operations training centre and technical training facility), and erection of new buildings, including a visitor centre, and the construction of new access road, footpath and amended junction at Sizewell Gap; and associated landscaping and earthworks/recontouring.	Tier 4[6]	Yes	Cumulative impacts could arise where construction and permanent operational activities take place within the Leiston

[4] Shortest distance between the considered project and East Anglia ONE North– unless specified otherwise
[5] Based on criteria set out in ***section 5.7.2*** of ***Chapter 5 EIA Methodology***
[6] Based on the definition of Tier 4 outlined in ***section 5.7.2*** of ***Chapter 5 EIA Methodology***

Project Name	Status	Development Period	[4]Distance from East Anglia ONE North Onshore Development Area	Project Definition	Level of Information Available	Included in CIA	Rationale
		completion of construction expected in 2027.		Full planning application available: https://publicaccess.eastsuffolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=PQ5NVGQXJJ100			Beck catchment.

159. Potential cumulative impacts between the proposed East Anglia ONE North project, proposed East Anglia TWO project, the Sizewell C New Nuclear Power station project and the Sizewell B Power Station Complex project could potentially arise in surface drainage catchments and groundwater bodies where activities from the projects occur. Cumulative impacts have therefore been considered in relation to groundwater and the following surface water receptors:

- Leiston Beck: This catchment would contain a small proportion of the onshore development area, the Sizewell B Power Station Complex development, and the majority of the Sizewell C New Nuclear Power Station development (including the Main Development Site, rail extensions and rail terminal); and
- Hundred River: This catchment would contain part of the onshore development area and National Grid infrastructure. The catchment would also contain part of the Sizewell C Green Rail Extension Route.

20.7.2.1 Cumulative Impacts during Construction

20.7.2.1.1 Cumulative Impact 1: Direct Disturbance of Surface Water Bodies

160. The proposed East Anglia ONE North project and proposed East Anglia TWO project will result in the direct disturbance of the Hundred River, with a single trenched watercourse crossing and temporary haul road crossing structure being installed on the river near Aldringham. The proposed East Anglia ONE North project and proposed East Anglia TWO project will not result in the direct disturbance of watercourses within any other surface drainage catchments, including the Leiston Beck in which the majority of the Sizewell C Main Development Site and the entire Sizewell B Power Station Complex Project will be located. Although a small area on the eastern side of the Hundred River catchment to the west of Leiston may be affected by the proposed Sizewell C Green Rail Route, there will be no direct disturbance of the watercourse or its principal tributaries as a result of this project.

161. This means that although there is potential for a cumulative impact to occur as a result of multiple phases and areas of disturbance occurring on the same watercourse as a result of the East Anglia ONE North and East Anglia TWO projects, there will be no further direct disturbance of watercourses in the Hundred River catchment resulting from the proposed Sizewell B Power Station Complex and Sizewell C New Nuclear Power Station developments and therefore no potential for cumulative impacts with these projects.

20.7.2.1.2 Cumulative Impact 2: Increased Sediment Supply

162. Construction activities could increase the potential for the erosion and entrainment of soil particulates, resulting in an increase in the supply of fine

sediment (e.g. clays, silts and fine sands) to surface watercourses through surface runoff and the erosion of exposed soils.

163. Construction activities associated with the proposed East Anglia ONE North project, the proposed East Anglia TWO project, the Sizewell B Power Station Complex project and the Sizewell C New Nuclear Power Station Main Development Site, Rail Extensions and Rail Terminal overlap in the Leiston Beck catchment. Furthermore, a small proportion of the construction activities for part of the Green Rail Extension Route will also take place within the Hundred River catchment. Therefore, there is the potential for a cumulative impact to occur in these catchments as a result of increased sediment supply during the construction phases of these projects.

164. The residual impact on increased sediment supply resulting from the proposed East Anglia ONE North project and East Anglia TWO during construction (under scenario 2) would be minor adverse in the Leiston Beck and Hundred River catchments, following the implementation of embedded and additional mitigation. An area of approximately 83,500m^2 of the Leiston Beck catchment would be disturbed by construction activities (accounting for approximately 0.5% of the total surface drainage catchment). Furthermore, an area of approximately 242,800m^2 of the Hundred River catchment would be disturbed by construction activities. This accounts for approximately 1% of the total surface drainage catchment. The small proportion of the catchments affected and the distance between the majority of construction activities within the onshore development area and the surface watercourses mean that any sediment generated is likely to be naturally intercepted before it can enter the surface drainage system.

165. Although the Sizewell B Power Station Complex and Sizewell C New Nuclear Power Station developments would disturb a greater proportion of the Leiston Beck catchment, each of the four projects is likely to adopt similar best practice mitigation measures which would avoid, reduce, or offset the direct effects of increased sediment supply. These will include a suite of best practice pollution control measures, the retention of buffer strips adjacent to watercourses, and avoiding storage of materials close to watercourses for the proposed East Anglia ONE North project and similar construction-stage drainage and sediment runoff-control measures for the different components of the Sizewell B Power Station Complex and Sizewell C New Nuclear Power Station developments. These measures are considered highly likely to reduce the significance of effect to an acceptable level. As a result of this mitigation, the cumulative effect is not likely to increase in magnitude. The cumulative impact of increased sediment supply is therefore considered to be minor adverse as the proposed construction works for the Sizewell B Power Station Complex and Sizewell C New Nuclear Power

Station developments are not anticipated to exacerbate the impact of increased sediment supply to the Leiston Beck or Hundred River catchments.

166. Further to this, there is no pathway for increased sediment supply to impact on groundwater as a result of the proposed East Anglia ONE North project, therefore no cumulative impact is predicted for this receptor and the residual impact will remain as **minor adverse**.

20.7.2.1.3 Cumulative Impact 3: Accidental Release of Contaminants

167. As stated in ***section 20.7.2.1.2***, construction activities for the proposed East Anglia ONE North project, the proposed East Anglia TWO project, the Sizewell B Power Station Complex project and the Sizewell C New Nuclear Power Station project will overlap in the Leiston Beck catchment and, to a much lesser extent, the Hundred River catchment.

168. There is therefore the potential for the accidental release of lubricants, fuels and oils from construction machinery through spillage, leakage and in-wash from vehicle storage areas after rainfall and direct release from construction machinery working in and adjacent to surface watercourses in these catchments. There is also the potential for accidental release of foul waters (from welfare facilities) and construction materials (including concrete and inert drilling fluids) into the surface waters and connected groundwaters during construction. These construction activities have the potential to have an adverse impact upon water quality if contaminants enter the surface drainage network or percolate into groundwater.

169. The residual impact resulting from the accidental release of fuels, oils, lubricants, foul waters and construction materials is assessed as being minor adverse in the Leiston Beck and Hundred River catchments and underlying groundwater, following the implementation of embedded and additional mitigation measures as part of the proposed East Anglia ONE North project.

170. Despite the potential for a cumulative impact to arise from the overlapping of these construction (and demolition in the case of Sizewell B) projects, each project would adopt best practice mitigation measures which would avoid, reduce or offset the effects of accidental release of contaminants to surface or ground water bodies. Therefore, the cumulative impact is not considered to increase from the **minor adverse** effect anticipated as a result of the proposed East Anglia ONE North project alone assessment.

20.7.2.1.4 Cumulative Impact 4: Changes to Surface Water Runoff and Flood Risk

171. Due to the geographical overlap within the Leiston Beck and, to a lesser extent, Hundred River catchments of the proposed East Anglia ONE North project, the proposed East Anglia TWO project, the Sizewell B Power Station Complex

project and the Sizewell C New Nuclear Power Station project there is the potential for a cumulative impact on surface water and runoff and flood risk during construction. Construction activities for these two projects will overlap in the Leiston Beck and Hundred River catchments. However, only approximately 0.5% of the total surface drainage area of the Leiston Beck catchment and 1% of the Hundred River catchment would be affected by the East Anglia ONE North construction activities. Therefore, the residual impact on changes to surface water runoff and flood risk during construction within the Leiston Beck catchment is minor adverse.

172. The proposed East Anglia ONE North project will include embedded mitigation measures to control surface runoff during the construction phase, including the creation of drainage channels to intercept water from the cable trench and onshore cable corridor. Furthermore, land drains along the cable route will be reinstated following construction. The Sizewell B Power Station Complex project and Sizewell C New Nuclear Power Station project are also expected to incorporate a similar range of measures to prevent changes to surface water runoff and flood risk during the construction (or demolition in the case of several activities proposed at Sizewell B) phase.

173. Considering the localised nature of any potential impact and the implementation of best practice mitigation measures across all four projects, it is anticipated that the cumulative impact would not increase from the **minor adverse** anticipated on the proposed East Anglia ONE North project alone assessment.

20.7.2.2 Cumulative Impacts during Operation

20.7.2.2.1 Cumulative Impact 1: Changes to Surface Water Runoff, Groundwater Flows and Flood Risk

174. An increase in the proportion of impermeable surfaces in a sub-catchment will result in a corresponding decrease in local infiltration and an increase in surface runoff. Furthermore, the presence of the buried cable ducting along the onshore cable route will introduce a localised impermeable barrier that has the potential to impact upon subsurface flow routes and change the distribution of groundwater by changing subsurface flow patterns and forcing water to move upwards (i.e. towards the surface) or downwards (away from the surface).

175. The operational phases of the Sizewell B Power Station Complex project, Sizewell C New Nuclear Power Station, the proposed East Anglia ONE North project and the proposed East Anglia TWO project could cumulatively alter surface runoff, groundwater flows and flood risk due to the geographical overlap of the projects within the Leiston Beck and, to a lesser extent, Hundred River catchments.

176. However, the area affected by permanent development from the proposed East Anglia ONE North project accounts for approximately only 0.02% of the Leiston Beck catchment and 0.04% of the Hundred River catchment, which means that any changes resulting from the proposed East Anglia ONE North project are considered to be of negligible magnitude and minor adverse significance. The implementation of best practice mitigation measures to prevent changes in runoff during the operational stage adopted across all four projects would avoid, reduce or offset the effects of increased surface runoff and altered groundwater flows. These mitigation measures in conjunction with the small scale and localised impact predicted within the Leiston Beck and Hundred River catchments from the proposed East Anglia ONE North project are therefore anticipated to result in a **minor adverse** cumulative impact.

20.7.2.2.2 Cumulative Impact 2: Supply of Fine Sediment and Other Contaminants

177. The operation of the proposed East Anglia ONE North project and proposed East Anglia TWO project, including planned and unplanned maintenance could result in the supply of fine sediment, fuels, oils and lubricants from the road network and other impermeable surfaces. This could potentially affect the geomorphology and water quality in the surface drainage network.

178. Due to the geographical overlap of the proposed East Anglia ONE North project and the Sizewell B Power Station Complex project and Sizewell C New Nuclear Power Station within the Leiston Beck and Hundred River catchments, there is the potential for cumulative impacts to occur during the operational phase of works.

179. However, the small area affected by the proposed East Anglia ONE North project within the Leiston Beck and Hundred River catchments (0.02 and 0.04%, respectively) and the best practice mitigation measures implemented across all projects during operation, the cumulative impact anticipated is not considered to increase from the **minor adverse** impact predicted for the proposed East Anglia ONE North project.

20.7.3 Cumulative Impacts during Decommissioning

180. 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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.

20.8 Inter-relationships

181. A summary of the likely inter-related effects arising from the proposed East Anglia ONE North project on water resources and flood risk is provided in ***Table 20.24***.

Table 20.24 Inter-relationships for Water Resources and Flood Risk

Inter-relationship all Phases and Linked Chapter	Section where Addressed	Rationale
Chapter 18 Ground Conditions and Contamination	***Sections 20.5.5*** and ***20.7***	Impacts upon groundwater bodies: Potential impacts on ground conditions could affect the quality and quantity of groundwater and hydrologically-connected surface waters.
Chapter 22 Onshore Ecology	***Sections 20.5.5*** and ***20.7***	Surface water related impacts upon designated sites and habitats: Potential impacts on the condition of designated surface water habitats could impact upon the ecological receptors supported by these features.

20.9 Interactions

182. 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. The areas of interaction between impacts are presented in ***Table 20.25***, along with an indication as to whether the interaction may give rise to synergistic impacts. This provides a screening tool for which impacts have the potential to interact. ***Table 20.26*** then provides an assessment for each receptor (or receptor group) related to these impacts in two ways.

183. Firstly, the impacts are considered within a development phase (i.e. construction, operation or decommissioning) to see if, for example, multiple construction impacts could combine. Secondly, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across development phases. The significance of each individual impact is determined by the sensitivity of the receptor and the magnitude of effect; the sensitivity is constant whereas the magnitude may differ. Therefore, when considering the potential for impacts to be additive it is the magnitude of effect which is important – the magnitudes of the different effects are combined upon the same sensitivity receptor. If minor

impact and minor impact were added this would effectively double count the sensitivity.

184. The receptors considered in the water resources and flood risk assessment are:

- Groundwater.
- Surface water.

Table 20.25 Interactions Between Impacts on Water Resources and Flood Risk

Potential Interactions between Impacts				
Construction stage impacts				
	Impact 1: Direct disturbance of surface water bodies	**Impact 2: Increased sediment supply**	**Impact 3: Accidental release of contaminants**	**Impact 4: Changes to surface water runoff and flood risk**
Impact 1: Direct disturbance of surface water bodies	-	Yes	Yes	Yes
Impact 2: Increased sediment supply	Yes	-	Yes	Yes
Impact 3: Accidental release of contaminants	Yes	Yes	-	No
Impact 4: Changes to surface water runoff and flood risk	Yes	Yes	No	-
Operation stage impacts				
	Impact 1: Changes to surface water runoff, ground water flows and flood risk		**Impact 2: Supply of fine sediment and other contaminants**	
Impact 1: Changes to surface water runoff, ground	-		Yes	

Potential Interactions between Impacts		
water flows and flood risk		
Impact 2: Supply of fine sediment and other contaminants	Yes	-
Decommissioning stage impacts		
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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.		

Table 20.26 Potential Interactions Between Impacts on Water Resources and Flood Risk

	Highest level significance				
Receptor	**Construction**	**Operation**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Groundwater	Minor adverse	Minor adverse	Minor adverse	**No greater than individually assessed impact** *Construction* *Impact 1 Direct disturbance of surface waters* and *Impact 2 Increased sediment supply* are assessed as having no impact, therefore there is no potential for interaction of these impacts. *Impact 3 Changes in surface water run-off and flood risk* and *Impact 4 Accidental release of contaminants* will be managed to a not significant level; therefore, there is no pathway for the interaction of impacts. *Operation* *Impact 1 Changes in surface water run-off and flood risk* and *Impact 2 Accidental release of contaminants* will be managed to a not significant level; therefore, there is no pathway for the interaction of impacts.	**No greater than individually assessed impact** For the landfall and onshore cable route *Changes in surface water run-off and flood risk* and *Accidental release of contaminants* will be managed to a not significant level; therefore, there is no pathway for the interaction of impacts for all phases. There will then be a permanent footprint throughout the project operational lifetime which will be negligible magnitude at most for groundwater due to the scale of infrastructure proportionate to the catchment area. Drainage plans provided by the Landscape Management Plan (LMP) provide the operational lifetime management required for the onshore substation and National Grid infrastructure including management of *Changes in surface water run-off and flood risk* and *Accidental release of contaminants*

	Highest level significance				
Receptor	**Construction**	**Operation**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Surface water	Minor adverse	Minor adverse	Minor adverse	**No greater than individually assessed impact** *Construction* There are no impacts on the Coastal Fringe Receptor For all other receptors the impacts (*Impacts 2-4*) are considered to have low or negligible magnitude of effect, with impact significance dependent upon the sensitivity of the receptor. Given that the magnitudes are low or negligible and that each impact will be managed with standard and best practice methodologies it is considered that there would either be no interactions or that these would not result in greater impact than assessed individually. *Operation* There are no impacts on the Coastal Fringe Receptor For all other receptors *Impact 1 Changes in surface water run-off and flood risk* and *Impact 2 Accidental release of contaminants* will be managed to a not significant level; therefore, there is no pathway for the interaction of impacts.	**No greater than individually assessed impact** For the landfall and onshore cable route *Changes in surface water run-off and flood risk* and *Accidental release of contaminants* will be managed to a not significant level; therefore, there is no pathway for the interaction of impacts for all phases. There will then be a permanent footprint throughout the project operational lifetime which will be negligible magnitude at most for all receptors due to the scale of infrastructure proportionate to the surface catchment areas. Drainage plans provided by the Landscape Management Plan (LMP) provide the operational lifetime management required for the onshore substation and National Grid infrastructure including *Changes in surface water run-off and flood risk* and *Accidental release of contaminants*

20.10 Summary

185. A summary of the findings of the ES for water resources and flood risk is presented in ***Table 20.27***. In accordance with the assessment methodology, this table should only be used in conjunction with the additional narrative explanations provided in ***section20.6***. This demonstrates that, post mitigation, all impacts have a maximum residual impact of minor adverse. There will therefore be no impacts resulting from the proposed East Anglia ONE North project that are considered to be significant in EIA terms (i.e. moderate or major adverse).

186. A summary of potential cumulative impacts for water resources and flood risk is presented in ***Table 20.27***.

Table 20.27 Potential Impacts Identified for Water Resources and Flood Risk

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
Construction							
Impact 1: Direct disturbance of surface water bodies	Coastal fringe	Negligible	Negligible	No impact	-	Measures to minimise the impacts of temporary watercourse crossings, install infrastructure below the active bed of the channel, and reinstate the bed and banks.	-
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	No impact	-		**-**
	Friston Watercourse	Low	High	No impact	-		**-**
	Groundwater	High	High	No impact	-		**-**
Impact 2: Increased sediment supply	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to manage sediment and surface drainage.	**-**
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Friston Watercourse	Low	High	Low	Moderate adverse		**Minor adverse**
	Groundwater	High	High	No impact	-		**-**
Impact 3: Accidental release of contaminants	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to	**-**
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
	Leiston Beck	Low	High	Negligible	Minor adverse	manage pollution control measures.	**Minor adverse**
	Friston Watercourse	Low	High	Low	Moderate adverse		**Minor adverse**
	Groundwater	High	High	Medium	Major adverse		**Minor adverse**
Impact 4: Changes to surface water runoff and flood risk	Coastal fringe	Negligible	Negligible	No impact	-	Measures to minimise the impact of temporary culverts and manage construction drainage.	**-**
	Hundred River	Low	High	Low	Moderate adverse		**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Friston Watercourse	Low	High	Low	Moderate adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Operation							
Impact 1: Changes to surface water	Coastal fringe	Negligible	Negligible	No impact	-	Use of a specialised drainage contractor	-
	Hundred River	Low	High	Negligible	Minor adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
runoff, ground water flows and flood risk	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Friston Watercourse	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Impact 2: Supply of fine sediment and other contaminants	Coastal fringe	Negligible	Negligible	No impact	-	Additional construction best practice measures to manage sediment and surface drainage such as buffer strips	**-**
	Hundred River	Low	High	Negligible	Minor adverse		**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Friston Watercourse	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
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. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left in situ or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning							

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
and agreed with the regulator. 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.							
Cumulative Construction Impacts with Other Developments							
Impact 1: Direct disturbance of surface water bodies	Hundred River	Low	High	Low	Moderate adverse	Measures to minimise the impacts of temporary watercourse crossings, install infrastructure below the active bed of the channel, and reinstate the bed and banks.	**Minor adverse**
	Leiston Beck	Low	High	No impact	-		**-**
	Groundwater	High	High	No impact	-		**-**
Impact 2: Increased sediment supply	Hundred River	Low	High	Low	Moderate adverse	Additional construction best practice measures to manage sediment and surface drainage.	**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	No impact	-		**-**
Impact 3: Accidental release of contaminants	Hundred River	Low	High	Low	Moderate adverse	Additional construction best practice measures to manage pollution control measures.	**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
Impact 4: Changes to surface water	Hundred River	Low	High	Low	Moderate adverse	Measures to minimise the impact of temporary culverts and manage construction drainage.	**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Cumulative Operation Impacts with Other Developments							
Impact 1: Changes to surface water runoff, ground water flows and flood risk	Hundred River	Low	High	Negligible	Minor adverse	n/a	**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**
Impact 2: Supply of fine sediment and other contaminants	Hundred River	Low	High	Negligible	Minor adverse	n/a	**Minor adverse**
	Leiston Beck	Low	High	Negligible	Minor adverse		**Minor adverse**
	Groundwater	High	High	Negligible	Minor adverse		**Minor adverse**

Potential Impact	Receptor	Sensitivity	Value	Magnitude	Significance	Mitigation Measures	Residual Impact
Cumulative Decommissioning Impacts with Other Developments							
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. An Onshore Decommissioning plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left in situ or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. 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. 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.							

20.11References

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