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East Anglia THREE

Chapter 21

Water Resource and Flood Risk

Environmental Statement
Volume 1
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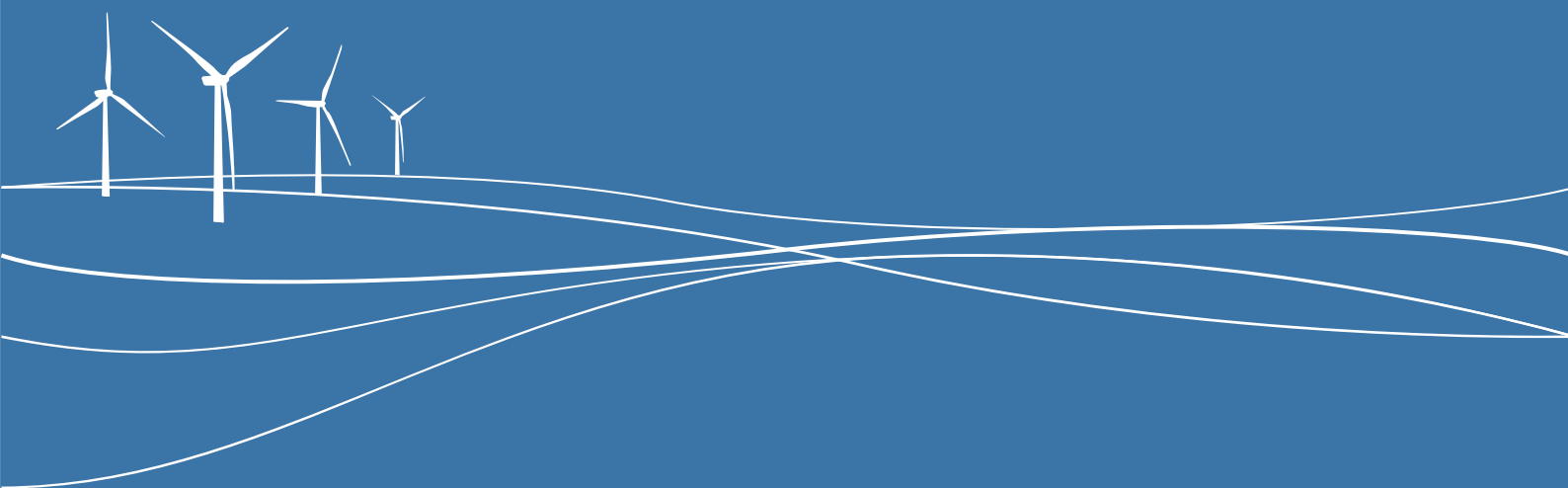

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21 WATER RESOURCE AND FLOOD RISK

21.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the potential impacts of the proposed East Anglia THREE project on water resources and flood risk. It provides an overview of existing groundwater and surface fresh water (all inland water bodies, including rivers, streams, ditches and lakes) conditions. The chapter focuses on both water quality and water levels and flows and an assessment of the potential impacts to these receptors from construction, operation and decommissioning activities. The presence of potential contamination is considered in the context of hazard posed to controlled waters (groundwater and surface water) as a result of activities proposed during construction, operation and decommissioning phases.

2. The chapter provides an assessment of the potential impacts of installing the onshore cables and substation(s) for the proposed East Anglia THREE project and considers cumulative impacts of existing and proposed projects. Further information regarding the general approach taken towards impact assessment is discussed in Chapter 6 Environmental Impact Assessment Methodology. Consistent with this approach topic specific receptor sensitivity and magnitude of effect definitions have been provided within section 21.4. It should be noted that this chapter has the potential to interact with other chapters of the ES and supporting documents, these are covered as follows:

   - Chapter 8 Marine Water and Sediment Quality;
   - Chapter 19 Soils, Geology and Ground Condition;
   - Chapter 23 Ecology; and
   - The Outline Code of Construction Practice (OCoCP).

3. The onshore electrical transmission works for the proposed East Anglia THREE project and the accesses fall within the same area covered by the assessment of East Anglia ONE, therefore, the data collected for that project will inform the baseline for this assessment.

21.2 Consultation

4. Consultation undertaken to date is provided in *Table 21.1*. The consultation includes responses from consultees in relation to the proposed East Anglia THREE project. *Appendix 21.1* considers the consultation undertaken for East Anglia ONE

Preliminary Environmental Information Report (PEIR) (RSK 2012a) and Phase 2 Consultation (RSK 2012b), which are also considered relevant to the proposed East Anglia THREE project given that the onshore cable route is shared with East Anglia ONE.

Table 21.1 Consultation Responses

Consultee	Date / Document	Comment	Response / where addressed in the ES
Planning Inspectorate	Scoping Opinion December 2012	The Planning Inspectorate welcomes the provision of a Flood Risk Assessment (FRA) and recommends on-going consultation with the EA and relevant local authorities. The FRA should form an appendix to the ES. Paragraph 660 of the Scoping Report identifies that there are existing flood defence walls at the Deben crossing; the potential impacts of the proposed development on flood defences should be considered within the FRA. The FRA should detail whether any flood protection measures are needed for the joining bays.	A FRA has been produced for the proposed East Anglia THREE project. This is presented in *Appendix 21.2* of the ES.
Planning Inspectorate	Scoping Opinion December 2012	The Applicant's attention is drawn to the comments of East Suffolk Internal Drainage Board (see Appendix 2 of this Opinion) regarding the need to consider the potential effects of the proposed development on all watercourses and drainage systems, not just the rivers specifically identified in section 3.1.4 of the Scoping Report.	The impacts of all watercourse crossings are addressed in section 21.6 and are also considered within the FRA in *Appendix 21.2*.
Planning Inspectorate	Scoping Opinion December 2012	A methodology for ongoing water monitoring during the construction and operational phases of the development should be discussed as part of the EIA.	The requirement for groundwater and / or surface water quality and / or level and flow monitoring has been identified on the basis of the significance of any potential impacts to sensitive receptors.
Planning Inspectorate	Scoping Opinion December 2012	Potential impacts on the public sewer network should be addressed, including the need to address easements and impacts arising from vibration during the construction	Utilities are discussed in Chapter 22 Land Use.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		works.	
Planning Inspectorate	Scoping Opinion December 2012	Mitigation measures should be addressed and the Planning Inspectorate advises that reference should be made to other regimes (for example, pollution prevention managed by the EA). On-going monitoring should also be addressed and agreed with the relevant authorities to ensure that any mitigation measures are effective.	Mitigation was discussed with stakeholders during the PEIR consultation and has been addressed in the ES. *Appendices 5.1 and 5.2* provide examples of mitigation and management plans that would be developed for the proposed East Anglia THREE project.
Planning Inspectorate	Scoping Opinion December 2012	Groundwater is the potential pathway for discharge of liquids to surface and coastal waters. The EIA should comprehensively assess the potential impact upon groundwater during the construction phase and must include, inter alia, the use and storage of hazardous substances, dewatering, discharge, drainage, physical disturbance of sub surface and dealing with sediment fines.	This has been addressed in section 21.6.1 of the ES chapter.
Planning Inspectorate	Scoping Opinion December 2012	Appropriate cross-reference should be made between the geology chapter, the water resources and flood risk assessment and land use sections in the ES in relation to any potential contaminated land and run-off. In the light of the works proposed, cross reference should also be made to the section on marine water and sediment quality in order to address the potential impacts of sediment along the foreshore.	This has been addressed through references to the Chapter 23 Ecology, Chapter 19 Soils, Geology and Ground Conditions and Chapter 8 Marine Water and Sediment Quality chapters.
Water Management Alliance on behalf of East Suffolk Internal Drainage Board (ESIDB))	Scoping Opinion December 2012	When preparing their final environmental assessments, the applicant will need to ensure that they consider the potential effects of their works on all watercourses and drainage systems, not just the rivers that are mentioned in the "Water Resource and Flood Risk" section of each report.	Noted. This chapter considers all watercourses identified to date, and watercourses identified in further site visits have been considered. A schedule of Water Crossings is provided in *Appendix 21.5.*

Consultee	Date / Document	Comment	Response / where addressed in the ES
Suffolk County Council (SCC)	Scoping Opinion December 2012	It is not clear whether any flood protection measures are needed for the proposed joining bays (paragraph 139). This is particularly relevant to any on the north shore of the Deben. We would not wish to see prominent structures in the landscape thus flood protection must be designed accordingly.	Jointing bay infrastructure at the Deben would be designed to allow for flooding and will not be prominent in the landscape.
Private Landowner	Informal consultation May 2014	The consultees property is very close to the route of the cables The consultees' water supply is from a private well situated next to the house. The House is not on mains water. The cable route crosses the aquifers thought to be supplying water to the well there is concern that these may be affected when laying the cables?	The onshore cable route avoids existing infrastructure. Potential impacts to aquifers are assessed in section 21.6.1.3 Impacts to Groundwater.
ICS Education LLP	PEIR Response July 2014	ICS Education LLP owns the Bawdsey Manor Estate which lies between the development site and the Deben Estuary. There is already serious coastal erosion in this area and property is threatened. ECES Education expressed concern that the works proposed for the landfall site will further threaten our property by contributing to the destruction of the minimum sea defences which exist. Horizontal drilling proposed may undermine the red crag cliff at the landfall location.	Potential impacts during construction are considered in section 21.6.1. There is no horizontal directional drilling (HDD) proposed as part of the East Anglia THREE project. Full details on the construction techniques proposed are found in Chapter 5 Description of Development.
Local resident	PEIR Response July 2014	The proposed storage area is situated uphill to the west of his property - run-off of rainwater causing flooding.	Potential impacts to surface water are assessed in section 21.6.1.4.
Anglian Water Services Ltd	PEIR Response July 2014	AWS have no objection to the project in principle. AWS has numerous waste water and potable water pipelines which cross the development at different points. These assets cannot be interfered with. AWS will require sufficient protective provisions within the DCO for the protection of these	Potential impacts to utilities are considered within Chapter 22 Land Use.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		assets. AWS will also require within the DCO that any works, diversion, etc are applied for and conducted in accordance with the provisions of the Water Industry Act 1991.	
Local resident	PEIR Response July 2014	The PEIR does not account of the issue of water runoff from the converter station and the affect the increased water runoff will have on land downstream. Also how it will deal with interference to field drainage on neighbouring land not directly affected by the cable installation process. The construction process will be extended and directly interfere with field drains and where these are not correctly re-instated cause significant damage to soil structure and fertility.	Embedded mitigation measures in relation to surface water runoff are presented in section 21.3.3. Potential impacts to surface water are assessed in section 21.6.1.4. Full details on the construction techniques proposed for the cable installation are found in Chapter 5 Description of Development.
Local residents	PEIR Response July 2014	The Owners of properties within the cable route are concerned that the laying of the cable could pose a risk to the continuity of supply of the private water supply serving the premises.	Potential impacts are assessed in section 21.6.1.
Local residents	PEIR Response July 2014	Concern about water run-off from the expanded site at Bramford Power Station.	Potential impacts to surface water are assessed in section 21.6.1.4. Full details on the construction techniques proposed for the cable installation are found in Chapter 5 Description of Development.
ESIDB	PEIR Response July 2014	The proposed development could have a number of impacts – both short and long-term – on drainage and flood risk in this area. The development could impede the Board's operations by: • Endangering the stability of a drain bank due to increased loading; • The stopping up of drains to prevent flows through the	Potential impacts are assessed in section 21.6.1. A separate FRA is included within *Appendix 21.2*. Full details on the construction techniques proposed for the cable installation are found in Chapter 5 Description of Development.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		working area; • The installation of new cable ducts under or alongside watercourses; • Flow path creation through the bedding/surround material used for cable installations • If the development will result in any discharges to a watercourse.	
ESIDB	PEIR Response July 2014	Local soils are also known to be quite unstable, and therefore significant works may be required for several years following cable installation to ensure that the watercourse banks will remain stable. The Board's surveyor in this catchment has also highlighted the frequency at which the marshes affected by these works flood, and how these marshes have shrunk over the years, leaving one or two bridges "high and dry". Consideration for the possible need for the cables to be relayed in the future to address any problems that arise from land shrinkage.	Potential impacts to soils and ground conditions are considered within Chapter 19 Soils, Geology and Ground Conditions.
ESIDB	PEIR Response July 2014	The application acknowledges some of the issues where prior approval will be needed from the Board. However, there are other items not listed in that document where the Board's consent will also be needed.	Noted. All appropriate drainage consents would be obtained prior to the start of any works on site.
ESIDB	PEIR Response July 2014	Given that the proposals affect areas at high risk of flooding and where effective land drainage is critical to allow the continued use of land and properties, the Board feels that the need to gain all appropriate drainage consents before the start of any works on site needs to be given a high priority when considering and determining this application	Noted. All appropriate drainage consents would be obtained prior to the start of any works on site.
Environment Agency (EA)	PEIR Response July 2014	Method statements for EA approval should include, but are not limited to;	Noted. Watercourse crossings will be limited

Consultee	Date / Document	Comment	Response / where addressed in the ES
		• Not reducing capacity or restricting flows; • Appropriate restoration incorporating riverine habitat improvements where possible; • Ensuring no sediment is released downstream during works; • And appropriate timing of the works. For example, open-cut trenching must avoid key spawning and egg development times for both trout and coarse fish (mid November – July inclusive). Under the 1975 Salmon & Freshwater Fisheries Act, spawning fish have protection from pollutants released into the watercourse (including silt and other materials). • WFD status and objectives for each waterbody should be considered when the method statements are prepared. A WFD Assessment may be required. The cable route passes through some areas of Flood Zone 3. We acknowledge that where possible spoil will be stored outside of the floodplain but that this will not always be possible. We note that spoil is to be stored at a minimum of 5m from the watercourses as a means of preventing silt run-off entering watercourses.	to where accesses cross waterbodies. There will be no open trenching required. Method Statements will be agreed with the Environment Agency pre-construction. The OCoCP has high level methodologies included.
EA	PEIR Response July 2014	It is clear from the FRA that the drainage scheme is intended to be designed in accordance with SuDS principles. However, further location-specific assessment will be required at the detailed design stage. Requirement 23 (Surface and foul water drainage) in the draft DCO does not currently adequately address this. We recommend that a robust and specific surface water management requirement is included, which clearly	Requirement 18 of the draft DCO for the proposed East Anglia THREE project surface and foul water drainage for all development stages of the project. All appropriate drainage consents would be obtained prior to the start of any works on

Consultee	Date / Document	Comment	Response / where addressed in the ES
		states what will be required for the management of surface water from the convertor station site. The following may be deemed appropriate: • Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydrogeological context of the development, has been submitted to and approved in writing by the local planning authority. • The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.	site.
Playford Parish Council	PEIR Response July 2014	The proposed site is on farmland to the North of Playford village. In wet weather the proposed site is heavily affected with severe rainwater runoff. This is a real concern as the depot site may well aggravate the levels of runoff onto local roads, creating additional traffic hazards.	Potential impacts to surface water are assessed in section 21.6.1.4.
Local resident	PEIR Response July 2014	Secondary depot in Playford. The existing farmland already suffers from severe rainwater runoff, causing flooding lower down the road and this is unlikely to be improved by major groundwork being undertaken to install and use the site.	Potential impacts to surface water are assessed in section 21.6.1.4. A separate FRA is included within *Appendix 21.2*.
Deben Estuary Partnership	PEIR Response July 2014	Cable route across flood cells adjacent to the river crossing We note that cabling is waterproof but inspection pits, while benefitting from a waterproof cover, are not constructed to withstand prolonged, adverse flood conditions.	Any risk to the proposed East Anglia THREE project as a result of flooding has been considered within the Flood Risk Assessment in *Appendix 21.2*.

21.2.2 Statement of Common Ground (East Anglia ONE)

5. A Statement of Common Ground (SoCG) specific to the proposed East Anglia THREE project is to be developed in advance of the Development Consent Order (DCO) Examination. The East Anglia ONE SoCG will be used as a basis for the East Anglia THREE SoCG, and is used as a reference point for the assessment. The proposed East Anglia THREE project utilises the same onshore cable route and substation(s) location as East Anglia ONE, therefore the approach used by East Anglia ONE and the data sources used are an appropriate starting basis for the assessment of the proposed East Anglia THREE project.

6. The SoCG was produced for East Anglia ONE in July 2013 for Water Resource and Flood Risk. Consultees included Suffolk County Council (SCC), Mid Suffolk District Council (MSDC), Suffolk Coastal District Council (SCDC), Environment Agency (EA) and East Suffolk Internal Drainage Board (ESIDB). The following sections outline the matters agreed in the SoCG. There were no disagreed matters which related to this chapter. Further details for this SoCG are provided in *Appendix 23.3*. The key points of the SoCG were as follows:

- The parties agreed with the results of the assessment of impacts on Water Resources and Flood Risk on East Anglia ONE.
- It was agreed that adherence to the requirements within the Development Consent Order (DCO) and OCoCP for East Anglia ONE would ensure the avoidance of significant impacts on Water Resources and Flood Risk from East Anglia ONE and satisfy the requirements of Water Framework Directive (WFD).
- It was agreed that there were no other outstanding matters that have not been agreed with respect to Water Resources and Flood Risk in relation to the DCO Application.

21.3 Scope

21.3.1 Study Area

7. For the purpose of this assessment, and to aid the baseline descriptions, the following study areas have been defined to assess the direct and indirect impacts associated with the project. These areas are shown on *Figure 21.1*, and are described as:

- Onshore electrical transmission works including access – this encompasses the landfall location, onshore cable route and substation(s) location, as outlined in

Chapter 5 Description of the Development. This area has been selected to be the largest area over which direct impacts would be experienced; and

- Study area – this incorporates a 1km buffer around the onshore electrical transmission works and access, where environmental receptors may be present but no physical works will take place, therefore only indirect impacts apply.

8. Potential sources of contamination within 250m of the onshore electrical transmission works as identified in Chapter 19 Soils, Geology and Ground Conditions will be considered in this chapter with regards to the potential risk to groundwater and surface water receptors.

9. Detailed engineering design, route refinement, and additional information were sought for the onshore cable route, Construction Consolidation Sites (CCS) and associated temporary works (area / access roads) during the EIA undertaken for East Anglia ONE. This assessment draws primarily on the information provided within the ES for East Anglia ONE as the landfall and onshore cable route are shared (see Chapter 5 Description of the Development). The ES for East Anglia ONE also identified the substation(s) locations for the East Anglia ONE, the proposed East Anglia THREE project and a future East Anglia Offshore Wind (EAOW) project.

21.3.2 Worst Case

10. There are two approaches for the onshore construction for the proposed East Anglia THREE project:

- Single Phase - a single phase of up to 1200MW installed in a single construction period); or
- Two Phased - two phases of up to 600MW each, with the start date of each phase of works separated by no more than 18 months).

11. Ducts (including all horizontal directional drilling (HDD) operations) for the onshore cables for the proposed East Anglia THREE project will be installed during the construction of East Anglia ONE.

12. Therefore, under the Single Phase approach, for construction of the proposed East Anglia THREE project the following works would be required:

- If the short duct method if used at the landfall, a ramp would be required to access the beach;
- Creation of one transition bay compound near to the landfall location;

- Installation of one transition bay compound to connect the offshore shore export cables and the onshore export cables;
- Installation of up to two jointing bays (assuming up to two cables are jointed in each bay) at up to 62 locations along the cable route;
- Creation of one jointing bay construction compound at up to 62 locations along the onshore cable route, each with a hardstanding area of 775m2 within a compound of 3,740m2.
- CCS – seven sites covering an aggregated area of up to 1.32ha;
- Access via existing roads and tracks and therefore haul road is required only where joints are placed in remote areas. A maximum of 18.05km of 5.5m width haul road is required. Temporary track matting may be required if ground conditions are very poor;
- Transport to site, cable pulling and jointing at up to 124 (each with 2 cables so 248 joints) jointing bays;
- Installation of up to 248 kiosks for cable maintenance; and
- Up to 300m of open trenching for cables from the end of pre-installed ducts to the substation(s);
- One substation within a 3.04ha compound;
- Up to 235m of open trenching for cables from the substation(s) to ducts pre-installed by National Grid; and
- Reinstatement of land.

13. Under a Two Phased approach the following works would be required:

- If the short duct method if used at the landfall, a ramp would be required to access the beach;
- Creation of two transition bay compounds (one during each Phase) near to the landfall location;
- Installation up to two transition bay compounds (one during each Phase) each to house up to two joints between the offshore export cables and the onshore export cables;

- Creation of two jointing bay construction compounds (one during each Phase) at up to 62 locations along the onshore cable route;
- Installation of up to two jointing bays (assuming two cables are jointed in each bay in each in Phase 1 and two jointed in each bay in Phase 2) at up to 62 locations along the cable route, each with a hardstanding area of 775m2 within a compound of 3400m2;
- CCS – seven sites covering an aggregated area of up to 1.32ha;
- Access via existing roads and tracks and therefore haul road is required only where joints are placed in remote areas. A maximum of 18.05km (of 5.5m width) haul road is required. Temporary track matting may be required if ground conditions are very poor. As a worst case scenario, it is assumed that all haul road will be removed and the ground reinstated on completion of Phase 1 and will be replaced and then removed again during Phase 2;
- Transport to site, cable pulling and jointing at up to 124 (62 during Phase 1 and 62 during Phase 2) (each with 2 cables so 248 joints) jointing bays;
- Installation of up to 248 kiosks for cable maintenance; and
- Up to 300m of open trenching for cables from the end of pre-installed ducts to the substation(s);
- Up to two substation(s) within a 3.04ha compound;
- Up to 235m of open trenching for cables from the substation(s) to ducts pre-installed by National Grid; and
- Reinstatement of land.

14. Full details of the Single Phase and Two Phased approaches are provided within Chapter 5 Description of the Development.

15. For each impact, the assessment utilises a worst case approach for both the Single Phase and Two Phased approach to construction described above. The design parameters that constitute worst case vary depending on the potential impact under consideration. *Table 21.2* below details the assumptions used.

16. The final routeing of cables connecting into the substation is not known at the current time. Therefore the pre-installed ducts will end just beyond the western boundary of the screening trees and bunding installed by East Anglia ONE to the east

of the East Anglia THREE substation. Therefore the final stretch of cables will be open trenched from the end of the ducts to the substation. This will be a maximum distance of 300m. Likewise, National Grid will install ducts to connect into the existing Bramford substation but these will end at the boundary of the National Grid land, therefore EATL will need to open trench up to the end of these ducts, a distance of up to 235m. In both cases the cables would be laid directly into trenches.

17. As discussed in Chapter 5 Description of the Development (section 5.6.6.2.2) East Anglia THREE Limited (EATL) will investigate opportunities to leave haul road in place between projects and/or phases to further minimise impacts, this would be dependent upon the agreement of individual landowners and the approval of the Local Planning Authorities. EATL consider that for water resource and flood risk it would be more disruptive for all receptors to install and remove haul road twice under the Two Phased approach due to the increased vehicle movements necessary, disturbance to the ground and potential water crossings, than to leave it in situ. In addition, given that locations where haul road would be left in place is dependent upon individual landowner decisions and Local Authority approval, at this stage it is not possible to determine where this may occur and which receptors would be affected. Therefore, this potential case is not assessed independently as it is considered that the impacts of leaving the haul road in situ between phases falls within the magnitude of effects assessed under the two construction approaches presented.

18. Only those design parameters with the potential to influence the level of impact are identified here. Therefore, if the design parameter is not described in the table below, it is not considered to have a material bearing on the outcome of the assessment.

19. The worst case scenarios identified here are also applied to the cumulative impact assessment (CIA). When the worst case scenarios for the project in isolation do not result in the worst case for cumulative impacts, this is addressed within the cumulative section of this chapter (see section 21.7).

Table 21.2 Worst Case Assumptions

Impact	Key design parameters forming worst case scenario	Rationale
Construction		
All impacts	Single Phase • Footprint = area of haul road, maximum 62 x jointing bay compounds (each 3740m^2 containing 775m^2 of hardstanding), 1 x transition bay	Values provided within Chapter 5 Description of the Development.

Impact	Key design parameters forming worst case scenario	Rationale
	compound, substation(s) compound and 7 CCS = 37.85ha • Depth of jointing pits = 2.5m • Permanent area loss at substation(s) station compound = 3.04ha • Total spoil = 121,241m^3 from jointing pits. • Total residual spoil for removal offsite = 4,404m^3 • Material to be stored onsite = 72,480m^3 • Duration of works = 29 weeks (including 10 weeks at landfall) along onshore cable route and 55 weeks at substation(s) Two Phased • Footprint = area of haul road (laid twice), maximum 124 x jointing bay compounds (each 3400m^2 containing 775m^2 of hardstanding), 2 x transition bay compounds, substation(s) compound and 7 CCS = 67.05ha • Depth of jointing pits = 2.5m • Permanent area loss at substation(s) compound = 3.04ha • Total spoil = 215,586m^3 from jointing pits. • Total residual spoil for removal offsite = 4,404m^3 • Material to be stored onsite = 83,547m^3 • onshore cable route - duration of works = 29 weeks, a gap of up to 49 weeks then further 29 weeks • Substation(s) - duration of works 55 weeks, a gap of 20 weeks then further 55 weeks	
Operation		
All impacts	*Both approaches* • Maximum total operational land take = 3.04ha (at substation compound) • No above ground features along the onshore cable route, apart from up to 248 kiosks (each 1m wide × 0.75m ×1m high to access jointing bays.	Values provided within Chapter 5 Description of the Development.
Decommissioning		
All impacts	*Both approaches* • Buried cable system: Cables de-energised and left in situ; • Jointing and transition bays left in situ • Substation(s) – decommissioned and dismantled	Values provided within Chapter 5 Description of the Development.

21.3.3 Embedded Mitigation

20. Mitigation measures relevant to water resources and flood risk which have been embedded into the project design are listed in *Table 21.3*. Some of these measures are those which have been already committed to by East Anglia ONE. These measures are highlighted in the table. General mitigation measures are provided first, and apply to all parts of the onshore electrical transmission works including access. Specific mitigation measures, which apply to the landfall, onshore cable route or substation(s), are described separately thereafter.

Table 21.3 Embedded Mitigation in relation to Water Resource and Flood Risk

Parameter	Mitigation measures embedded into the project design
General	
Pre-construction	A Code of Construction Practice (CoCP) will be developed and agreed with the relevant local planning authority. The CoCP will include best practice measures for avoiding the likelihood of spills and leakages, such as: • The storage of oils and fuel within designated areas above ground and in impervious storage bunds with a minimum of 110% capacity to contain any leakages or spillages. In addition storage areas will be regularly inspected to identify any leak or spills; • Limit refuelling activities to designated, impermeable surfaced areas and use drip traps where possible; • Check and maintain equipment regularly to ensure that leakages do not occur; • Have spill kits available on site at all times; • Ensure site inductions for all staff, to include the above procedures and the locations of spill kits; and • Implement regular audits as part of the EMS, and ensure that there are environmental specialists available to provide advice to reduce the likelihood of pollution incidents and advise in the event of an incident.
Construction	The construction of jointing bays and installation of cables into existing ducts would incorporate the following mitigation: • Refuelling activities will be undertaken at a minimum of 30m from any watercourse and not on steep slopes leading to a watercourse. • Adequate spill control measures will be in place, including drip trays, nozzles and absorbent pads. • Any spillages to ground or surface water will be recorded to the relevant statutory authority and reported as part of the incident notification procedures. • Construction works in relation to watercourses would be subject to detailed method statements to be developed in consultation with the Environment Agency and local authorities before commencing construction.
Landfall	
Construction	None

Parameter	Mitigation measures embedded into the project design
Onshore cable route	
Project design	Initial cable routeing and site selection to avoid key sensitive land uses where possible e.g. potentially contaminated sites, landfills, mineral extraction areas. (Undertaken by East Anglia ONE and reviewed and confirmed by East Anglia THREE)
Construction	The export cables will be installed in existing ducts that are located underground / below river bed to minimise potential impacts to flood risk receptors Jointing bays will be located at least 10m from watercourses and at a maximum depth of 2.5m
	Pollution prevention measures will be implemented in accordance to Environment Agency Pollution Prevention Guidance series, in particular • General guide to the prevention of water pollution: PPG1; • Working at construction and demolition sites: PPG6; • Works and maintenance near water: PPG5; • Dewatering of underground ducts and chambers: PPG20; and • Pollution incident response planning: PPG21.
Substation(s)	
Construction	Run-off from the substation(s) location will be limited, where feasible, through the use of infiltration techniques which can be accommodated within the area of works. Where the proposed run-off rate from the site exceeds the current rate, the additional run-off will be attenuated using Sustainable Drainage System (SuDS) storage techniques. The SuDS principles will be implemented so as to mimic the existing environment at the substation(s) site and will take into account the principles and provisions of the Outline Landscape and Ecological Management Strategy, considering synergies where possible.

21. In addition to the embedded mitigation outlined above, all construction, operational and decommissioning phase activities will be undertaken in line with best working practices, which will include:

- Adherence to best practices and guidance to ensure the risk of pollution is minimised including site management best practice, such as those set out in the Environment Agency's PPG notes, adopted during the construction and operational phases to prevent such spillages and leakages. These are detailed in section 21.4;
- Adherence to a CoCP; and
- Adherence to the Construction Design and Management (CDM) Regulations (2015) where applicable.

21.4 Assessment Methodology

21.4.1 Guidance

22. This assessment has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIP). The specific assessment requirements for water resources and flood risk in the NPS is detailed in the overarching statement for Energy EN-1 (DECC 2011a) and summarised in *Table 21.4* below.

Table 21.4 NPS assessment requirements

NPS requirement	NPS reference	ES reference
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.	EN-1 Section 5.15.2	The potential impacts to water resources and water quality are included within section 21.6. A WFD Compliance Assessment has been provided in *Appendix 21.3*.
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. • Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones around potable groundwater abstractions.	EN-1 Section 5.15.3	The existing environment is discussed in section 21.5 and potential impacts during construction and operation are discussed in Section 21.6. A WFD Compliance Assessment has been provided in *Appendix 21.3*.
Applications for energy projects of one hectare or greater in Flood Zone 1 in England or Zone A in Wales and all proposals for energy projects located in Flood	EN-1 Section 5.7.4 and 5.7.6	FRA has been undertaken for the proposed East Anglia

NPS requirement	NPS reference	ES reference
Zones 2 and 3 should be accompanied by a flood risk assessment (FRA). Further guidance can be found in the Practice Guide which accompanies Planning Policy Statement 25 (PPS25).		THREE project and is presented in *Appendix 21.2*.

23. In addition, this assessment has been undertaken in accordance with the following legislation (and amendments), where appropriate:

- The European Union (EU) Water Framework Directive (WFD) 2000/60/EC;
- Water Environment (Water Framework Directive) (England and Wales) Regulations (2003);
- Environmental Protection Act (1990);
- Environment Act (1995);
- Water Resources Act (1991);
- The Water Act (2003);
- The Flood and Water Management Act (2010);
- Water Industry Act (1991);
- Groundwater Regulations (1998);
- The Environmental Permitting (England and Wales) Regulations (2010);
- Private Water Supplies Regulations (2009);
- European Council (EC) Freshwater Fish Directive (2006/44/EC);
- Land Drainage Act (1991);
- Contaminated Land (England) Regulations (2006) SI 1380;
- Environmental Damage (Prevention and Remediation) Regulations (2009) SI 153;
- Priority substances Directive 2008/105/EC; and
- Environmental Protection (Duty of Care) Regulations (1991) SI 2839 (as amended).

24. This assessment has also been made with reference to the following statutory and non-statutory guidance:

- Department for Communities and Local Government National Planning Policy Framework (2012);
- Environment Agency Pollution Prevention Guidance (PPG) 1 General guide to the prevention of water pollution;
- Environment Agency PPG2: Above ground oil storage tanks;
- Environment Agency PPG5: Works in, near, or liable to effect watercourses;
- Environment Agency PPG6: Working at construction and demolition sites;
- Environment Agency PPG7: Refuelling activities;
- Environment Agency PPG20: Dewatering of underground ducts and chambers;
- Environment Agency PPG21: Pollution incident response planning;
- Environment Agency PPG22: Dealing with spills (April 2011);
- Environment Agency – Pollution Prevention Technical Information note, Major Pipelines, June 2011;
- CIRIA publication C532 Control of water pollution from construction sites (2001);
- CIRIA publication C650 Environmental good practice on site (2005);
- CIRIA publication C515 Groundwater Control – design and practice (2000);
- CIRIA publication C503 Environmental good practices – working on site (2000);
- CIRIA publication C502 Environmental good practices on site (2000);
- CIRIA publication C648 Control of water pollution from linear construction projects: technical guidance (2006);
- HSE Construction design and management (CDM) Regulations (2015); and
- Environment Agency, Groundwater Protection: Principles and practice (GP3) (August 2013).

21.4.2 Data sources

25. The data sources in *Table 21.5* have been used to characterise the existing environment and inform the baseline of the impact assessment.

Table 21.5 Data Sources Features

Data	Source	Year	Coverage	Confidence	Notes
Potentially contaminated sites	MSDC	2014	Study area	High	Locations of sites on the MSDC register of Contaminated Land or Potentially Contaminated Land
Land use information	Ordnance Survey	2015	Study area	High	1:25,000 scale OS mapping
	Google Maps	2013	Study area	High	Online aerial photography
Environmental Sensitivity data	RSK	2012	Study area	High*	Preliminary Risk Assessment East Anglia ONE onshore cable route and substation(s)
	Landmark Information Group	2011	Study area	High*	Envirocheck GIS files from Preliminary Risk Assessment
	EA	2013	Study area	High	'What's in your backyard' website
WFD data	EA	2015	Study area	High	Catchment Data Explorer
Flood Risk Mapping	EA	2013	Study area	High	EA Website
Geological mapping	British Geological Survey (BGS)	2001	1:50,000 Woodbridge & Felixstowe	High	Solid and Drift geology sheet 208 & 225
		2006	1:50,000 Ipswich	High	Solid and Drift geology sheet 207

Data	Source	Year	Coverage	Confidence	Notes
Geological memoirs		1961	Onshore electrical transmission works plus Study area	High	British Regional Geology, East Anglia and adjoining areas, 4th Edition
Surface and groundwater abstraction data	EA	2015	Onshore electrical transmission works plus Study area	High	Location of licensed abstractions (no records for abstractions that are not licensed by the Environment Agency (<20 m3/day abstraction))
Discharge consents	EA	2015	Onshore electrical transmission works plus Study area	High	Location of discharge consents

* Consultation with the Local Authorities confirmed that there have been no data changes since the background checks undertaken in 2011 (see *Table 21.1*).

21.4.3 Impact Assessment Methodology

26. Potential impacts arising from the construction and operation of the onshore infrastructure are identified and assessed taking into account the following elements of the environmental baseline and their sensitivities:

- Hydrology, including drains, ditches, ordinary watercourses, main rivers as well as ponds and lakes;
- Hydrogeology, including the type of aquifers and potential groundwater flow direction beneath the site and surrounding area; and
- The presence of groundwater Source Protection Zones (SPZ).

27. In order to fully understand the hazard posed to groundwater and surface water information from Chapter 19 Soils, Geology and Ground Condition, regarding the type of geology and potentially contaminative sources present within the study area, has been used to aid this assessment.

28. A flood risk screening assessment and watercourse assessment has been undertaken through a desk based study of available data (using the data sources listed in *Table 21.5*).

29. A Flood Risk Assessment (FRA) has been completed, building on the findings of that undertaken for East Anglia ONE, and conclusions have been incorporated into this Chapter. The FRA has examined the existing environment through a site visit, consultation with relevant bodies including the Environment Agency and the Local Lead Flood Authority (LLFA) and review of relevant documentation to identify potential sources of flooding.

21.4.3.1 Sensitivity

30. The general approach taken towards impact assessment is discussed in Chapter 6 Environmental Impact Assessment Methodology. Consistent with this approach, the sensitivity of each topic specific receptor has been considered based on the criteria presented in *Table 21.6*. The impact assessment has, therefore, been undertaken with reference to the definitions provided in *Tables 21.6*, *21.7* and *21.8*.

Table 21.6 Definitions of Receptor Sensitivity

Definition Sensitivity	Hydrogeology (Groundwater)	Hydrology (Surface Water)
High	Site within a groundwater Source Protection Zone (SPZ) 1 Principal Aquifer Groundwater flow contributes to an internationally designated site. Site within close proximity to a Private Water Supply abstraction (in an area where there are no other sources of potable water). Site within 50m of a major industrial abstraction.	Water body classed as high (ecological status) under the WFD. Site is within hydraulic continuity with an internationally designated site, such as an Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar Site. Site located within an area defined as a Flood Zone 3 by the Environment Agency (i.e. there is 0.5% chance of flooding from the sea or 1% chance of flooding from a river).
Medium	Secondary 'A' or undifferentiated Aquifer Groundwater flow contributes to a nationally designated site. Site within a SPZ 2. Close proximity to a Private Water Supply abstraction (but one where there is an alternative potable source)	Water body classed as good (ecological status) under the WFD. Site is within hydraulic continuity with a nationally designated site, such as a Site of Special Scientific Interest (SSSI). Site located within an area defined as a Flood Zone 2 by the Environment Agency (i.e. there is 0.1% chance of flooding from a river).
Low	Secondary 'B' Aquifer Limited groundwater – surface water interaction. No nearby licensed or un-	Water body classed as moderate (ecological status) under the WFD. Site is within hydraulic continuity with a locally designated site, such as a Local

Definition Sensitivity	Hydrogeology (Groundwater)	Hydrology (Surface Water)
	licensed water abstractions.	Nature Reserve (LNR). Site is located within a Flood Zone 1 by the EA (i.e. there is a < 0.1% chance of flooding from a river).
Negligible	Unproductive Strata No groundwater – surface water interaction. No nearby licensed or un-licensed water abstractions.	Water body classed as less than moderate (ecological status) under the WFD. Site is not within hydraulic continuity a sensitive receptor. Site within a Flood Zone 1 (i.e. there is a < 0.1% chance of flooding from a river).

21.4.3.2 Magnitude

31. The impact magnitude is assessed by considering the potential consequences (severity) of the impact occurring as detailed in *Table 21.7*.

Table 21.7 Example Definitions of the Magnitude Levels for a Generic Receptor

Receptor Criteria	Hydrogeology	Hydrology (Surface Water Quality)
High	Major change from the baseline conditions. Major permanent or long-term change to groundwater quality or available resource. The quality and / or quantity of the existing resource is impacted beyond repair. Changes to quality or water levels would have a significant impact upon ecological designated sites.	Impacts result in 'widespread' water quality deterioration resulting in deterioration of the WFD status of the water body. Significant change in water flow leading to damage to fisheries or sensitive habitats.
Medium	Changes to the local groundwater regime are predicted to have a slight impact on resource use but not derogate any existing abstractions. Minor impacts on local and regionally important ecological sites may result.	Impact to water quality limited in spatial extent so that it does not constitute deterioration in WFD water body status. Change in water flow but limited in temporal extent so that there is no damage to fisheries or sensitive habitats.
Low	Changes to groundwater quality, levels or yields would only have minor, short-term impact on existing resource use or ecology.	Impact to water quality limited in spatial and temporal extent so that it does not constitute deterioration in the WFD water body status. No measurable change in flow.

Criteria	Receptor	
	Hydrogeology	Hydrology (Surface Water Quality)
Negligible	Negligible change to groundwater baseline conditions approximating to a 'no change' situation.	No discernible change in water quality. No measurable change in flow.

21.4.3.3 Impact significance

32. Following the identification of receptor sensitivity and magnitude of the effect, it is possible to determine the significance of the impact. A matrix as presented in *Table 21.8* will be used wherever relevant.

33. The impact significance is then determined by considering magnitude in relation to the sensitivity of the receptor impacted, as demonstrated by the matrix presented in *Table 21.8*.

Table 21.8 Impact Significance Matrix

Sensitivity	Magnitude				
	High	**Medium**	**Low**	**Negligible**	**No change**
High	**Major**	**Major**	**Moderate**	**Minor**	**No impact**
Medium	**Major**	**Moderate**	**Minor**	**Negligible**	**No impact**
Low	**Moderate**	**Minor**	**Minor**	**Negligible**	**No impact**
Negligible	**Minor**	**Negligible**	**Negligible**	**Negligible**	**No impact**

34. Where an impact has been assessed as major or moderate, this has been deemed to be significant for the purpose of the EIA. Where an impact has been assessed as minor, negligible or no impact, this has been deemed as not significant in terms of the EIA.

35. Embedded mitigation and existing commitments to good practice are discussed in section 21.3.3, and are referred to throughout the impact assessment. The impact assessment takes into account the embedded mitigation before coming to a conclusion of the potential impact to a receptor. If any additional mitigation is required, this is included within the impact assessment in section 21.6, and a description of any residual impact post-mitigation is provided.

21.4.4 Cumulative Impact Assessment (CIA)

36. For a general introduction to the methodology used for the CIA, please refer to Chapter 6 Environmental Impact Assessment methodology. This chapter will focus on those cumulative impacts that are specific to water and flood risk.

37. The further details of the methods used for the cumulative impact assessment, see section 21.7.

21.4.5 Transboundary Impact Assessment

38. There are no transboundary impacts in relation to water resources and flood risk.

21.5 Existing Environment

39. The characterisation of the existing environment is undertaken using data sources listed in *Table 21.5* plus other relevant literature.

21.5.1 Hydrogeology

21.5.1.1 Geology

21.5.1.1.1 Superficial Deposits

40. The geology within the study area is described in Chapter 19 Soils, Geology and Ground Conditions, which in summary indicates that superficial deposits beneath the area of the onshore electrical transmission works are either absent or sporadic from the landfall to Great Bealings. Where they do exist they comprise mostly of sand and gravels from the Kesgrave Catchment Subgroup. From Great Bealings westwards towards the substation(s) superficial deposits become more prevalent comprising chalky till (Lowestoft Formation) over the Kesgrave sands and gravels.

41. Deposits within river valleys change to reflect the riverine and transitional environment comprising sandy, silty clay (Alluvium) or Marine and Coastal Zone mud deposits.

21.5.1.1.2 Bedrock

42. The bedrock geology beneath the onshore electrical transmission works generally comprises the following formations in succession from the ground surface:

- Red Crag Formation;
- Coralline Crag Formation;
- London Clay Formation;
- Lambeth Group and Thanet Sand Formation (undifferentiated); and

- Chalk Group.

43. At landfall Red Crag is present in places at the ground surface and is evident in the sea cliffs. As the onshore electrical transmission works move west the crag formations diminish leaving London Clay and the Lambeth Group and Thanet Sand Formation (undifferentiated) at or near the surface. These too diminish as the onshore electrical transmission works move west and from Claydon the chalk becomes exposed at ground surface, especially in River Gipping valley area.

21.5.1.2 Aquifer Designations

44. The majority of the superficial drift deposits in the region are defined by the Environment Agency as Secondary A aquifers. These are described as deposits with permeable layers which have the capability to support water supplies at a local rather than strategic scale and provide an important source of base flow to rivers.

45. The till from the Lowestoft Formation and London Clay formations within the region are defined as unproductive strata. These are deposits with low permeability, and have a negligible significance for water supply or base flow to rivers.

46. The dominant bedrock beneath all areas of site, albeit at depth in most places, is the Cretaceous Chalk which is defined by the Environment Agency as a Principal Aquifer. This rock has secondary permeability (fracture flow), can provide a high level of water storage and supports water supply and base flow to rivers.

47. Overlying the Chalk Principal Aquifer across the majority of the eastern section of the cable route is the Red Crag formation, which is described by the Environment Agency as a Secondary A aquifer. As published by the BGS (2000), the development of the Crag Aquifer is limited due to:

- The unconsolidated nature and poor sorting of deposits;
- The variable and unpredictable yields;
- High iron concentration in the groundwater; and
- Problems with relatively high concentrations of manganese and nitrate.

48. Where the Thames Group and Harwich Formations are present along the route the aquifer designation is classed by the Environment Agency as unproductive strata.

49. A summary of the aquifer designations for each stratum is presented in *Table 21.9* below.

Table 21.9 Summary of Environment Agency Aquifer Designations

	Stratum	Description	Aquifer Designations
Superficial Deposits	Alluvium	Variably sandy, silty clay	Secondary A Aquifer
	Marine and Coastal Zone Deposits: Mud	Mud	Unproductive Strata
	Head	Stony sandy clay and clayey sand	Secondary A Aquifer
	River Terrace Deposits (undifferentiated)	Sand and gravel	Secondary A Aquifer
	Glaciofluvial Deposits	Sand and gravel	Secondary A Aquifer
	Lowestoft Formation	Stony, sandy clay	Unproductive Strata
	Kesgrave Catchment Subgroup	Sand and gravel	Secondary A Aquifer
Bedrock	Red Crag Formation	Sand	Secondary A Aquifer
	Coralline Crag Formation	Calcrenite (sand)	Secondary A Aquifer
	London Clay Formation (Thames Group)	Clay	Unproductive Strata
	Harwich Formation	Clay	Unproductive Strata
	Lambeth Group and Thanet Sand Formation	Clay, sand and silt	Secondary A aquifer
	Chalk Formation	Chalk	Principal Aquifer

50. The vulnerability of the Principal Aquifer to pollution is at its lowest where it is protected by the overlying (unproductive) London Clay Formation or Harwich Formation. Where Secondary A Aquifers directly overlie the Principal Aquifer (i.e. Crag Aquifers or Lambeth Group and Thanet Sand Formations), these are assumed to slow down but not prevent the transmission of contaminants and are considered to be in hydraulic connectivity with the Principal Aquifer.

51. Where the Chalk outcrops with no superficial or other bedrock deposits overlying, especially in the area around the River Gipping valley, Claydon, the risk to the Principal Aquifer is at its greatest.

21.5.1.3 Groundwater Quality

52. The onshore electrical transmission works extends through two groundwater bodies as delineated as part of the WFD, namely the Waveney and East Suffolk Chalk and Crag water body (GB40501G400600) and the Felixstowe Peninsula Crag and Chalk water body (GB40501G4018000).

53. The Environment Agency's Catchment Data Explorer[1]states that the Waveney and East Suffolk Chalk and Crag water body is currently at Poor Quantitative Status as a result of an unfavourable water balance and Poor Chemical Status as a result of diffuse pollution pressures and potential impacts on a Drinking Water Protected Area (DrWPA). DrWPAs are water bodies (e.g. rivers, reservoirs, canals for Surface Water or aquifers) where 'raw' water is abstracted for human consumption at a rate of at least $10m^3$/day or over 50 people are served.

54. The Felixstowe Peninsula Crag and Chalk water body is currently at Good Quantitative Status and Poor Chemical Status on the basis of failure of the general chemical assessment. This test is based on a review of the Environment Agency's groundwater chemical data to determine whether there is a widespread exceedance in a range of hazardous substances and non-hazardous pollutants.

21.5.1.4 Groundwater Abstractions

55. The Environment Agency has defined Source Protection Zones (SPZs) for groundwater sources which are used for public drinking water. There are three SPZ Zone 1 areas crossed by the onshore electrical transmission works at:

- Playford (circa Grid Ref 6210,2480);
- Akenham (circa Grid Ref 6150,2490); and
- North of Bramford (circa Grid Ref 6211, 2475).

56. The remainder of the onshore electrical transmission works to the west of Great Bealings lies within an Outer zone (Zone 2). There are no SPZs to the east of Woodbridge.

57. These zones are identified to protect active water abstraction points from the impact of contaminative sources. Zone 1 represents a 50 day travel time to the abstraction and Zone 2 is defined by a 400 day travel time.

[1] http://environment.data.gov.uk/catchment-planning/ viewed on 21 May 2015

58. The current licensed groundwater abstractions within 500m of the onshore electrical transmission works as provided by the Environment Agency is shown in *Appendix 21.4* and in *Figure 21.3*. There are 17 groundwater abstractions listed. No rates of flow were provided for any of the locations listed below.

59. Consultation with the local authorities has confirmed that they do not hold any records for abstractions that are not licensed by the Environment Agency (<20 m^3/day abstraction).

21.5.2 Hydrology

60. The topography of the onshore electrical and transmission works is relatively flat and low lying. The area is drained predominantly by the River Deben and River Orwell catchments. The land within the onshore electrical transmission works, between the landfall and Newbourne is actively managed through man-made drainage channels, which are managed by East Suffolk Drainage Board.

61. The major watercourses which intersect the onshore cable route are:

- River Deben;
- Kirton Creek;
- Martlesham Creek;
- Lark and Fynn; and
- The River Gipping.

62. The Suffolk coastal area contains both fluvial and estuarine systems with associated creek networks and marshlands. The location of the planned onshore cable route in relation to main crossed river crossings and catchments is shown on *Figure 21.4*. Three main river catchments are crossed by the onshore cable route, the River Deben catchment, the Fynn and Lark catchment and the River Gipping catchment.

63. The River Deben catchment is approximately 184km^2 and the source can be found west of the town of Debenham in the district of Mid Suffolk. The river winds south-east to the town of Wickham Market and then changes direction and runs south-west to Woodbridge. From Woodbridge the river is estuarine in character with marsh and tidal mud flat on either side of the channel. Embankments are located to the eastern side of Woodbridge and in downstream locations. There are also a number of floodgates found in the Woodbridge area; these are generally located where access and infrastructure intersect the line of flood defence. Two WFD water bodies in the catchment will be crossed by the cable route; the Deben Estuary

(GB520503503900) and the Bucklesham Mill River (GB105035040280). The Deben Estuary is heavily modified and is at Moderate Ecological Potential as a result high levels of dissolved inorganic nitrogen and zinc. The Bucklesham Mill River is at Poor Ecological Status as a result of pressures on fish and hydromorphology. Both water bodies are at Good Chemical Status.

64. The Fynn and Lark catchment is approximately 80km^2 and flows east before its outfall into the Deben Estuary just south of Martlesham. The River Lark flows between Martlesham and Woodbridge before outfalling to the Deben Estuary. There are a number of minor tributaries in the catchment, including the Hasketon watercourse. The catchment is divided into three water bodies; the Fynn (GB105035040330), the Lark (GB105035040360), and the Lark- Fynn (downstream of confluence) (GB105035040300). These are all at moderate status as a result of pressures on fish and hydromorphology.

65. The River Gipping flows in a south-easterly direction from Stowmarket until it reaches the River Orwell at Ipswich. The catchment is divided into several water bodies, two of which will be crossed by the cable route. The River Gipping (downstream of Stowmarket) (GB105035046280) is a heavily modified water body that is at Moderate Ecological Potential as a result of low dissolved oxygen concentrations and high phosphates. The Somersham Watercourse (GB105035040310) is also heavily modified, although it is currently at Good Ecological Potential. Both water bodies are also at Good Chemical Status.

66. The latest 2015 Environment Agency Flood Zone Mapping (*Figure 21.5*) indicates that the onshore cable route would cross all Flood Zones in various locations, principally associated with flooding from tidal events and fluvial events around the River Deben, Martlesham Creek and the River Gipping. Other more isolated Flood Zones are present (refer to *Figure 21.5*).

67. Finer scale information on the hydrology within the onshore cable route will be confirmed during the walkover and included in the final ES.

21.5.2.1 Surface Water Quality

68. Environment Agency data provided on the 'What's in your backyard' (WIYBY) website[2] identifies three river reaches that have historically been monitored. *Table 21.10* below summarises the details for each.

[2] http://maps.environment-agency.gov.uk/wiyby viewed on 25 May 2015

Table 21.10 Summary of Surface Water Quality Monitoring Points

Year	Sample Point Name	Grid Ref	Chemistry	Biology	Phosphate Levels	Nitrate Levels
2009	Bucklesham Mill – Kirton Sluice	625000, 243200 to 629000, 241400	Good	N/A	Low	Excessively high
2009	Lark – Otley, Great Bealings Bridge	621300, 255800 to 622900, 248900	Fairly good	N/A	Very high	Excessively high
2009	River Gipping – Blakenham Mill, B1113 Road Bridge	611800, 250900 to 612800, 249600	Good	Very Good	High	Very high

69. The Environment Agency WIYBY website identifies the area between Tuddenham St Martin and Bramford as being either within a Surface Water Safeguard zone or an 'At Risk' Surface Water Protected Drinking area. The surface water between Claydon and Bramford is considered to be at risk. The area between Tuddenham St Martin and Claydon is located within a Safeguard Zone, where measures are planned or in place to deliver the objectives of the WFD.

21.5.2.2 Surface Water Abstractions

70. The current licensed surface water abstractions within 500m of the onshore electrical transmission works was provided by the Environment Agency and are shown in *Appendix 21.4* and in *Figure 21.3*. There are 17 surface water abstractions listed.

21.5.2.3 Discharge Consents

71. The current discharge consents within 1000m of the onshore electrical transmission works was provided by the Environment Agency and are shown in *Appendix 21.4* and in *Figure 21.3*. There are 137 licensed discharge consents listed, most relate to the release of treated sewage into freshwater streams.

21.5.3 Designated Sites

72. Three statutory designated sites are crossed by the onshore cable route (*Figure 21.6*). These are Bawdsey Cliff Site of Special Scientific Interest (SSSI), Deben Estuary Ramsar and Special Protection Area (SPA) and SSSI and Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB). The status of these statutory designated nature conservation areas is important, as the direct and indirect impacts

of the proposed East Anglia THREE project would differentially affect these sites due to varying levels of sensitivity. Reference should be made to Chapter 23 Terrestrial Ecology for more detail on the designated sites. The Deben Estuary and Suffolk Coast and Heaths AONB are designated for their ecological interest and, in relation to this topic, wetland environments. Bawdsey Cliffs SSSI is designated under Earth Heritage for geological interests and therefore is not discussed further in this chapter (see Chapter 19 Soils, Geology and Ground Condition for further information).

73. One non-statutory designated site known as Newbourne Springs (Grid Ref 6270, 2430) County Geodiversity Site (CGS) lies within the study area approximately 1km south of the onshore electrical transmission works. The site is part of a line of natural springs along the boundary of the Red Crag and London Clay where groundwater emerges all year round and feeds into the stream down gradient. The site is managed by the Suffolk Wildlife Trust.

74. With regards to nature conservation value, the Deben Estuary is considered internationally important, Suffolk Coast and Heaths is considered to be of national importance and Newbourne Springs is considered locally important. Chapter 23 Terrestrial Ecology provides further detail on these designated sites, including the elements of the sites that afford the respective designation.

75. *Figure 21.6* shows the location of the designated sites in relation to the onshore electrical transmission works and study area.

21.6 Potential Impacts

76. Reference should be made to Chapter 5 Description of the Development, for full details of the activities proposed during the construction phase. However, in summary, the activities considered likely to impact on water resource and flood risk are:

- Installation of onshore cables including landfall transition bay and cable jointing locations;
- Construction of an onshore substation(s), associated infrastructure and landscaping;
- Creation of temporary construction compounds / laydown areas;
- Temporary upgrade of existing access tracks, construction of new access tracks and haul roads;
- Stockpiling of topsoil and subsoil;

- Re-use of excavated soil in jointing bays;
- Disposal of excess spoil offsite to a suitably licenced facility; and
- Removal and reinstatement of existing drainage systems.

21.6.1 Potential Impacts During Construction

21.6.1.1 Impact 1: Impacts to Statutory Designated Sites

21.6.1.1.1 Landfall

77. The landfall lies within the Suffolk Coast and Heaths AONB, although there are no wetland habitats of concern at this location. Therefore, for the proposed East Anglia THREE project, there would be **no impact** with regards to water resources and flooding.

21.6.1.1.2 Onshore Cable Route

78. Two statutory designated sites, the Deben Estuary Ramsar, SPA and SSSI and Suffolk Coast and Heaths AONB, are crossed by the onshore electrical transmission works and could potentially be affected directly or indirectly by the construction activities.

79. Under both approaches, the Deben Estuary, Martlesham Creek and wetland areas of the AONB will be crossed using HDD techniques as part of the East Anglia ONE project, avoiding direct impact upon the designated areas prior to cable installation. Therefore, for the proposed East Anglia THREE project, there would be **no impact**. The potential exists for indirect impacts to adversely affect the wetland areas of the AONB through spillages and leakages of contaminative materials, such as oils and fuels (e.g. from construction machinery and cable pulling equipment). Reference should be made to *Table 21.3* for mitigation measures relating to spills and leaks. Further detail is provided in the OCoCP.

21.6.1.1.3 Substation(s)

80. The substation(s) does not lie within any designated sites therefore under either a Single Phase or a Two Phased approach there would be **no impact** to statutory designated sites.

21.6.1.2 Impact 2: Non-Statutory Designated Sites

21.6.1.2.1 Landfall, Onshore Cable Route and Substation(s)

81. Only one non-statutory designated site lies within the study area (Newbourne Springs CGS) approximately 1km south of the onshore electrical transmission works. Due to its distance from the onshore electrical transmission works **no impact** is anticipated from the construction activities.

21.6.1.3 Impact 3: Impact to Groundwater

21.6.1.3.1 Landfall

82. The dominant geology at landfall is the Red Crag Formation which is classed as a Secondary A Aquifer. There are no SPZs at the landfall nor are there any licensed private groundwater abstractions. The local authority does not hold any records for abstractions that are not licensed by the Environment Agency (<20 m^3/day abstraction), so their presence cannot be ruled out. On the basis that the Red Crag is a Secondary A Aquifer, its sensitivity is considered to be medium.

Single Phase and Two Phased

83. The only intrusive works that would comprise the excavation of transition bays and limited excavation associated with hard standing and access improvements, as ducts would already be in place for the cable installation. The magnitude of the impact of the construction works at landfall is therefore considered to be negligible and the significance of the impact would be **negligible**.

21.6.1.3.2 Onshore Cable Route and Substation(s)

84. The geology beneath the onshore electrical transmission works from landfall to Great Bealings predominantly comprises granular sand and gravel type material within the Kesgrave Catchment Subgroup, Alluvium or Red Crag. All these deposits are classed as Secondary A Aquifers. This area does not lie within a groundwater SPZ although three private abstraction licences lie within the Great Bealings area, licensed for agricultural purposes. The sensitivity of the groundwater in this area is considered to be medium.

85. From Great Bealings westwards towards the substation(s) the surface geology comprises mostly chalky till (clay) with Alluvium and locally exposed Chalk in the Gipping Valley. The till (Lowestoft Formation) is classed as an Unproductive Strata, whilst the Chalk is classed as a Principal Aquifer. The Onshore Cable Route passes through three SPZs. The sensitivity of the groundwater from Great Bealings westward is considered to be high.

Single Phase

86. The impact of the excavation works from the landfall to Great Bealings is considered to have a low magnitude of impact, given that any changes to groundwater quality would only have a short term impact. As such, the significance of impact is considered to be **minor adverse.**

87. From Great Bealings to the substation(s), despite the presence of SPZs, the level of activity means that any changes to groundwater quality would be of negligible

magnitude. Therefore the significance of the impact is considered to be a **minor adverse** impact.

Two Phased

88. The impact of the excavation works from landfall to Great Bealings is considered to have a low magnitude of impact, given that any changes to groundwater quality would only have a short term impact. As such, the significance of impact is considered to be **minor adverse.**

89. From Great Bealings to the substation(s), despite the presence of SPZs, the level of activity means that any changes to groundwater quality would be of negligible magnitude. Therefore the significance of the impact is considered to be a **minor adverse** impact.

21.6.1.4 Impact 4: Impacts to Surface Water

90. The construction phase has the potential to affect surface water and watercourses in the following ways:

- Increase sediment loading;
- Disturbance and transmission of contaminated sediments; and
- Change in water quality through spills and leaks; and
- Changes to the flow patterns, sediment transport and direct disturbance of bed and banks due to construction of new watercourse crossings.

21.6.1.4.1 Landfall

91. All watercourses would be crossed and ducted prior to cable installation. There are no watercourses at the landfall and therefore there would be **no impacts**.

21.6.1.4.2 Onshore Cable Route

Single Phase and Two Phased

92. All watercourses would be crossed and ducted as part of East Anglia ONE, prior to cable installation for the proposed East Anglia THREE project. However, new access routes may require the upgrade of existing watercourse crossing points (e.g. small bridges and culverts) and this would be determined during detailed design. Crossing methods would be selected to minimise impacts on flows, sediment transport, bed and bank conditions and water quality. Crossing techniques may require damming and over pumping, which will minimise the potential for ingress of sediment and contaminants. Any impacts will be temporary and of low magnitude due to the small scale nature of the works and short duration of works. The exact methodology used

to upgrade the crossings would be decided by the main works contractor in conjunction with the statutory authority. Method statements would be agreed with the statutory authority prior to any watercourse crossings taking place. Any impact resulting from this activity would therefore be **negligible**.

93. Jointing bays would be located at least 10m from watercourses and excavated to a maximum depth of 2.5m. Therefore it is considered unlikely that there is a pathway for impact to groundwater levels and quality and surface water flows and quality during construction. In addition pollution prevention measures will be implemented in accordance to Environment Agency Pollution Prevention Guidance series (see *Table 21.3*). Therefore there would be **no impact**.

21.6.1.4.3 Substation(s)

94. There are no watercourses at the substation(s). The proposed surface water drainage scheme will be designed to meet the requirements of the National Planning Policy Framework (NPPF) by managing construction runoff to existing greenfield runoff rates and preventing sediment laden runoff entering nearby streams. On this basis, there would be **no impact** to surface water flows or levels at the substation(s) site either under a Single Phase or a Two Phased approach**.** In order to mitigate potential risks to surface water quality at the substation(s), mitigation as outlined in *Table 21.3* would be adhered to.

21.6.2 Potential Impacts During Operation

95. This section describes the potential impacts arising during the operational phase of the proposed East Anglia THREE project. Reference should also be made to Chapter 5 Description of the Development for full details of the operational phase.

96. The differences between the Single Phase and the Two Phased approach of cable installation are related to the construction phase, and therefore the impact assessment for operation is the same regardless of approach.

21.6.2.1 Impact 1: Impact to Groundwater and Surface Water

21.6.2.1.1 Landfall and onshore cable route

92. Routine maintenance works would be required during the operational phase; however, this access would be via jointing bays or kiosks, and any excavation will be limited to the area around those, and therefore would result in minimal disturbance. In addition jointing bays will be located at least 10m from watercourses. Therefore it is believed unlikely that there is any pathway for impact to surface water flows and quality from routine maintenance.

97. The jointing bays will include a concrete slab at a maximum depth of 2.5m below ground level. This will prevent the ingress of contaminants into the underlying groundwater. The shallow depth of the installation means that there are no potential mechanisms for impact on deeper groundwater. Shallow groundwater flows could be affected by the introduction of an impermeable concrete barrier. However, the small scale of the structure (which will have a height of 1.3m and a width of 3m, buried below the ground surface) means that and changes to groundwater low pathways and levels will be highly localised. This means that it is unlikely that there are any pathways for impact on groundwater levels and quality as a result of cable operation and routine maintenance.

93. In the event of a cable failure, it may be necessary to re-excavate the cable trench and replace / repair the faulty cable along limited stretches. All cables would be located within ducts, therefore if cables need to be removed there would be no direct interaction with the watercourses. Works would be based around jointing bays which would be located 10m away from any watercourses. Therefore for major water crossings it is considered that there is **no pathway** for impact during operation.

98. Mitigation would also be employed to ensure spills and leaks are avoided or contained as described in *Table 21.3*.

21.6.2.1.2 Substation(s)

99. There are no watercourses at the substation(s) location and therefore there would be no direct impacts on surface waters. Mitigation would also be employed to ensure spills and leaks are avoided or contained as described in *Table 21.3.* In addition note that the design of the substation(s) compound will incorporate a sustainable drainage system (SuDS) and runoff will be managed to maintain greenfield runoff rates. In addition, there will be sufficient site attenuation for rainfall up to 1 in 100 year probability events, plus a 30% allowance for climate change. The SuDS would also incorporate measures to intercept sediment and filter out contaminants before they can enter surface waters.

21.6.3 Potential Impacts During Decommissioning

100. This section describes the potential impacts of the decommissioning of the onshore electrical transmission works with regards to impacts on water resources and flood risk. The decommissioning of the project would be controlled by the requirements in the Development Consent Order. The approach provided below provides a high level likely approach which could be taken.

21.6.3.1.1 Landfall and Onshore Cable Route

101. It is anticipated that the onshore cable would be decommissioned (de-energised) and the cables, transition and jointing bays left in-situ. Kiosks will be removed and cables will be cut below ground level. Therefore there would be **no impact** for any receptor upon decommissioning.

21.6.3.1.2 Substation(s)

102. In relation to the substation(s), the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined later within the project lifetime, but are expected to include:

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

103. Whilst details regarding the decommissioning of the substation(s) are currently unknown, considering the worst case scenario, which would be the removal and reinstatement of the current land use at the site, it is anticipated that the impacts would be similar those during construction. These impacts are listed in *Table 21.13*.

21.7 Cumulative Impacts

104. Potential cumulative impacts to groundwater and surface water could arise from interaction with other developments within the vicinity of the proposed East Anglia THREE project either temporally or spatially. With regards to the potential impact to water resources and quality cumulative impacts consideration should be given to projects located within the same groundwater and surface water catchments. However, given that the majority of the potential impacts to water resources and flooding with regards to the onshore electrical transmission works are of a temporary nature, the cumulative impact assessment should only consider developments are likely to have significant impacts during a similar period as this

development. With regard to the receptors assessed in this chapter a potential for cumulative impact would only occur if those same receptors are affected. Whilst there may be additive cumulative impacts at the wider regional scale (e.g. several developments may affect the same drainage systems may be affected) these activities would be managed and mitigated in a similar way to impacts described above for the proposed East Anglia THREE project and there would be few impacts.

105. A full list of projects that have been scoped into the cumulative impact assessment is provided in *Table 21.14*. These cover major known developments in the vicinity of the onshore electrical transmission works. The two key projects which have been identified as potentially causing cumulative impacts are the consented East Anglia ONE and a future EAOW project which share the landfall and onshore cable route and converter and substation(s) locations with the proposed East Anglia THREE project. These projects also propose to locate substations within close proximity of the substation(s) for the proposed East Anglia THREE project.

Table 21.11 Summary of Projects considered for the CIA in Relation to Water Resource and Flood Risk

Project	Status	Construction / operation period	[3]Approx. Distance from Direct Impacts Study Area (km)	Project definition	Project data status	Included in CIA	Rationale
East Anglia ONE	Consented	2018 –2019 / 25 years	0	Offshore Windfarm Project Project description available	Complete/high	Yes	Construction would not overlap. Operational & decommissioning impacts only
Future EAOW project	Pre-application	Unknown	0	Offshore Windfarm Project Outline project data only	Incomplete/low	Yes	Construction would not overlap. Operational & decommissioning impacts only
Sizewell C	Pre-application	Unknown	24.7	Nuclear Power Station No project detail available	Low	No	No spatial overlap with onshore electrical transmission works, too distant to impact same receptors
Bramford-Twinstead	Pre-application	Unknown	0	Outline only	Complete/high	No	May adjoin substation(s) location
SITA (EfW plant)	Operational	Unknown	0.5	Energy From Waste Plant Project description	Complete/high	No	Would be operational before construction commences. No overlap

[3] Shortest distance between the considered project and the proposed East Anglia THREE project – unless specified otherwise.

Project	Status	Construction / operation period	[3]Approx. Distance from Direct Impacts Study Area (km)	Project definition	Project data status	Included in CIA	Rationale
				available			with onshore electrical transmission works
SnOasis	Planning permission granted	Unknown	0.7	Winter sport centre. Master plans available	Incomplete/low	No	No spatial overlap
Old Fisons site (land west of Paper Mill Lane)	Planning Application TBD	Unknown	0.7	Business park and housing scheme. Master plans available	Complete/high	No	No spatial overlap
Adastral park	Planning permission granted	Unknown	0.8	Business park and housing scheme. Master plans available	Complete/high	No	No spatial overlap
Ipswich Garden Suburb	Identified in adopted Core Strategy	Primarily after 2020	3	Urban development north of Ipswich. Master Plan at consultation phase.	Incomplete / medium	No	Greenfield site. No spatial overlap with landfall, onshore cable route or substation(s) location. Due to distance recreational pressure will focus on Orwell Estuary and not Deben Estuary.
Progress Power, Eye,	Planning	Construction 2017-18, operation by	28	Gas fired power	Complete/ high	No	No overlap with landfall, Onshore Cable Route or

Project	Status	Construction / operation period	[3]Approx. Distance from Direct Impacts Study Area (km)	Project definition	Project data status	Included in CIA	Rationale
Suffolk	permission granted	2019.		station development. http://infrastructure.planningportal.gov.uk/projects/eastern/progress-power-station/			converter station location. Likely to be constructed prior to the proposed East Anglia THREE project commencement
Land North Of Woods Lane, Melton, Suffolk	Conditionally Allowed	Unknown	2.7	Outline planning for a residential development for 180 dwellings (8.27ha in size) to include open space and provision of ecological habitat areas.	High	No	No overlap with landfall, onshore cable route or substation(s) location.

21.7.1 Potential Cumulative Impacts During Construction

106. The East Anglia ONE project would undertake major preparatory works for the proposed East Anglia THREE project and a future EAOW project; therefore cumulative impacts could arise from cable pulling and jointing operations (construction of jointing bays) and the construction of the substation(s). For the cumulative impacts therefore, East Anglia ONE would have the greatest magnitude of impact with subsequent projects having smaller and more localised overall impact magnitudes (at the jointing bays, access points to these and at the substation(s) locations).

107. The onshore footprint, which includes the electrical transmission works and accesses, would be reinstated after construction of East Anglia ONE (with the exception of the permanent structures at the converter station / substation(s) locations).

108. The majority of schemes listed in *Table 21.11* have no spatial overlap with the East Anglia THREE onshore electrical transmission works

21.7.1.1 Cumulative Impact 1: Impacts to Statutory Designated Sites

109. With regards to East Anglia One, the proposed East Anglia THREE project and a future EAOW project, at the landfall there are no wetland habitats within the Suffolk Coast and Heaths AONB and therefore no pathway for cumulative impacts.

110. The onshore cable routes crosses two statutory designated sites, however, all significant wetland habitats within the designated site will be crossed via HDD during the construction of East Anglia ONE, therefore there would be no direct impact and no pathway for cumulative impacts.

111. The substation(s) does not lie within any designated sites and there is **no pathway** for cumulative impacts.

112. As there are no pathways for cumulative impacts with the three proposed East Anglia Offshore Wind projects there is **no pathway** for cumulative impacts with any other projects on statutory designated sites.

21.7.1.2 Cumulative Impacts 2: Impacts at Non-Statutory Designated Sites

113. Only one non-statutory designated site lies within the study area and there would be no impact on that from the construction of East Anglia ONE, the proposed East Anglia THREE project or a future EAOW project (see section 21.6.1.2). As there are **no pathways** for cumulative impacts with the three East Anglia Offshore Wind projects there is no pathway for cumulative impacts with any other projects on non-statutory designated sites.

21.7.1.3 Cumulative Impact 3: Impacts to Groundwater

114. Potential impacts to groundwater caused by leakage of drilling fluid; trenching through potentially contaminated land; dewatering activities; and accidental spillages and leakages will be minimised by adherence to the CoCP and through adherence to mitigation measures outlined in *Table 21.3* for all three projects. These impacts will be confined to East Anglia ONE. There will therefore be **no impact** as a result of the construction activities during the proposed East Anglia THREE project.

21.7.1.4 Cumulative Impact 4: Impacts to Surface Water

115. Potential impacts to surface water quality caused by leakage of drilling fluid (during HDD) and accidental spills and leaks; sediment laden runoff generated during open-cut water crossings; and derogation of surface water flow in stretches of rivers which have licensed abstractions will be minimised by adherence to the CoCP and through adherence to mitigation measures outlined in *Table 21.3*. These impacts will be confined to East Anglia ONE. There will therefore be **no impact** as a result of construction activities during the proposed East Anglia THREE project.

21.7.2 Potential Cumulative Impacts During Operation

116. As discussed in section 21.6.2 potential impacts come from the requirement for any maintenance activity along the onshore cable route during the life of the projects. It is not possible to say where or when failures of the infrastructure requiring maintenance will occur, however, it is likely that maintenance activities (including excavation) would be focused around the jointing bay or kiosks (which would be sensitively located) and therefore the magnitude of any impact would be low and be highly localised and therefore create minimal disturbance. It is unlikely that failures would occur across multiple projects simultaneously and therefore it is considered that cumulative impacts during operation would not be above the **minor adverse** significance predicted in section 21.6.2

21.7.3 Potential Cumulative Impacts During Decommissioning

117. It is anticipated that the onshore cable would be decommissioned (de-energised) and the cables, transition and jointing bays left in-situ. The kiosks will be removed. Therefore there would be **no impact** for any receptor upon decommissioning.

118. For removal of the substation(s), impact for each would be **minor adverse** (see section 21.6.1). Given the absence of sensitive geological receptors at this location, cumulative impacts are not considered to be above this however decommissioning is likely to be phased to further reduce the significance of any potential impacts.

21.8 Inter-relationships

119. Parameters or "sources" that are considered to interact with receptors identified in this chapter are listed in *Table 21.12* below.

Table 21.12 Inter-relationships with soils, geology and ground conditions

Inter-relationship All Phases	Section where addressed	Linked Chapter
Marine Geology, Oceanography and Physical Processes	21.5, 21.6, 21.7	7
Marine Water and Sediment Quality	21.5, 21.6, 21.7	8
Ground Conditions	21.5, 21.6, 21.7	19
Land Use	21.5, 21.6, 21.7	22
Terrestrial Ecology	21.5, 21.6, 21.7	23

21.9 Summary

120. This section summarises the main findings from the impact assessment. This is outlined in *Table 21.13*.

121. Two statutory designated sites, the Deben Estuary Ramsar site, SPA and SSSI and Suffolk Coast and Heaths AONB, are crossed by the onshore electrical transmission works and could potentially be affected directly or indirectly by the construction activities. Under both approaches, the Deben Estuary, Martlesham Creek and wetland areas of the AONB will be crossed using HDD techniques as part of East Anglia ONE, which will avoid direct impact upon the designated areas prior to cable installation therefore there will be **no impact**.

122. Only one non-statutory designated site lies within the study area but due to its distance from the onshore electrical transmission works, **no impact** is anticipated from the construction activities.

123. The dominant geology at landfall is the Red Crag Formation which is classed as a Secondary A Aquifer. No SPZs are present at the landfall nor are there any licensed private groundwater abstractions.

124. The impact of the excavation works from the landfall to Great Bealings is considered to have a low magnitude of impact, given that any changes to groundwater quality would only have a short term impact. As such, the significance of impact is considered to be **minor adverse**. From Great Bealings to the substation(s), despite the presence of SPZs, the level of activity means that any changes to groundwater quality would be of negligible magnitude. Therefore the significance of the impact is considered to be a **minor adverse** impact.

125. In accordance with the embedded mitigation the storage of potentially contaminative materials would be away from the edge of any watercourses and compliant with Environment Agency Pollution Prevention Guidance series and the OCoCP.

126. Operationally there is **no pathway** for impact under either the Single Phase or Two Phased approaches.

127. It is anticipated that the onshore cable would be decommissioned (de-energised) and the cables and jointing bays left in-situ. For removal of the substation(s), impacts are likely to be similar to those identified during construction, **minor adverse**, but a phased approach could further reduce the significance of any potential impacts.

Table 21.13 Potential Impacts Identified for Water Resources and Flood Risk

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impacts to statutory designated site	Landfall / onshore cable route / substation(s)	No receptor	No pathway	No impact	No additional mitigation	No impact
Impacts to non-statutory designated sites	Landfall / onshore cable route / substation(s)	No receptor	No pathway	No impact	No additional mitigation	No impact
Impact to groundwater	Landfall	Medium	Negligible	Negligible	No additional mitigation	Negligible Not significant
	Onshore cable route / substation(s)	High	Negligible - Low	Negligible – Minor adverse	No additional mitigation	Negligible – Minor adverse Not significant
Impacts to surface water	Landfall	Crossings works completed prior to East Anglia THREE works	No pathway	No impact	No additional mitigation	No impact
	Onshore cable route	Low	No change - Negligible	No impact - Negligible	No additional mitigation	No impact- Negligible Not significant
	Substation(s)	Low (no watercourses)	No pathway (with use of SuDS to manage surface run-off)	No impact	With the use of SuDS to manage surface run-off (embedded mitigation) there is not anticipated to be any impact on surface water.	No Impact
Operation						

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact to groundwater and surface water	Landfall and onshore cable route	Low	No change	No impact	No additional mitigation	No Impact
	Substation(s)	Low (no watercourses)	No pathway (with use of SuDS to manage surface run-off)	No impact	With the use of SuDS to manage surface run-off (embedded mitigation) there is not anticipated to be any impact on surface water.	No Impact
Decommissioning						
As for construction						

21.10 References

Department of Energy and Climate Change (DECC) (2011a). Overarching NPS for Energy (EN-1) [Online]. Available at: <http://infrastructure.planningportal.gov.uk/legislation-and-advice/national-policy-statements/>. Accessed 11/04/14.

Department of Energy and Climate Change (DECC) (2011b). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/37048/1940-nps-renewable-energy-en3.pdf>. Accessed 11/04/14.

Environment Agency Website (2014). 'What's in your backyard'. Available at: <http://maps.environment-agency.gov.uk/wiyby>. Accessed 24/04/14

Environment Agency (2015) Interactive Flood Map for Planning (Rivers and Sea). Available at: http://maps.environment-agency.gov.uk/. Accessed 25/04/14

Environment Agency Pollution Prevention Guidelines (PPGs) (various dates). Available at: <http://www.environment-agency.gov.uk/netregs/links/63893.aspx>

- PPG 1 General guide to the prevention of water pollution;
- PPG2: Above Around Oil Storage Tanks;
- PPG5: Works in, near or liable to effect watercourses;
- PPG6: Working at Construction and Demolition Sites;
- PPG7: Refuelling Facilities;
- PPG 21: Pollution Incident Response Planning; and
- PPG22: Dealing with spills

Jones, H.K., Morris, B.L., Cheney, C.S., Brewerton, L.J., Merrin, P.D., Lewis, M.A., McDonald, A.M., Coleby, L.M., Talbot, J.C., McKenzie, A.A., Bird, M.J., Cunningham, J. and Robinson, V.K. (2000). The physical properties of minor aquifers in England and Wales. British Geological Survey Technical Report, WD/00/4. Environment Agency R&D Publication 68

Ordnance Survey Map Data for pipeline route

RSK (2011). East Anglia ONE Offshore Windfarm Scoping Report. Procured Landmark, Envirocheck data survey

RSK (2012a). East Anglia ONE PEIR

RSK (2012b). Phase 2 Consultation

RSK (2013). East Anglia ONE Offshore Windfarm Environmental Statement, Volume 3, Chapter 20 Ground Conditions and Contamination Appendices (Preliminary Risk Assessment East Anglia ONE Onshore Cable Route and substation)

Chapter 21 Ends Here