East Anglia ONE North Offshore Windfarm

Chapter 27

Human Health

Environmental Statement
Volume 1

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Author: Royal HaskoningDHV
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Prepared by:	Checked by:	Approved by:
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Glossary of Acronyms

AC	Alternating Current
AHAH	Access to Health Assets and Hazards
AIS	Air Insulated Switchgear
ALARP	As Low As Reasonably Practicable
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Areas
AQO	Air Quality Objective
BPM	Best Practice Measures
CCS	Construction Consolidation Site
CIA	Cumulative Impact Assessment
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazards
CTMP	Construction Traffic Management Plan
dB(A)	A-weighted Decibels
DC	Direct Current
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DTI	Department of Trade and Industry
EEA	European Economic Area
EIA	Environmental Impact Assessment
ELF	Extremely Low Frequency
EMF	Electromagnetic field
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
GHz	Gigahertz
GIS	Gas Insulated Switchgear
ha	Hectares
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HPA	Health Protection Agency
HVAC	High Voltage Alternating Current
Hz	Hertz
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEMA	Institute of Environmental Management and Assessment
IMD	Index of Multiple Deprivation
IPC	Infrastructure Planning Commission
JSNA	Joint Strategic Needs Assessment
km	Kilometres
LEP	Local Enterprise Partnership
LSOA	Lower Super Output Area
NATS	National Air Traffic Services

NEET	Not in Education or Employment
NPS	National Policy Statement
NRPB	National Radiological Protection Board
ONS	Office of National Statistics
PEIR	Preliminary Environmental Information Report
PHE	Public Health England
PID	Public Information Day
PM	Particulate Matter
PPG	Pollution Prevention Guidance
PRoW	Public Rights of Way
SAGE	Stakeholder Advisory Group on Extremely Low Frequency Electric and Magnetic Fields
SSC	Suspended Sediment Concentrations
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
µT	Microteslas
V	Volts
V/m	Volts per metre
WHO	World Health Organisation

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
HDD temporary working area	Temporary compounds which will contain laydown, storage and work areas for HDD drilling works.
Jointing bay	Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers within the onshore cable route housing electrical earthing links.
Mitigation areas	Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.
National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission

National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North project Development Consent Order but will be National Grid owned assets.
National Grid overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
Onshore cable corridor	The corridor within which the onshore cable route will be located.
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.
Onshore preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre–planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.
Onshore substation	The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia ONE North project.
Transition bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

27 Human Health

27.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the potential human health effects associated with the proposed East Anglia ONE North project.

2. This chapter meets the requirements of the Environmental Impact Assessment (EIA) Regulations 2017 in providing reasoned conclusions for the identification and assessment of any likely significant effects of the proposed East Anglia ONE North project on human health. This chapter follows best practice guidance (Cave et al. 2017), in considering health effects with regards to the general population and vulnerable population groups. Populations are considered at both regional and local levels. This chapter was produced by Royal HaskoningDHV in collaboration with Ben Cave Associates.

3. This chapter follows the World Health Organisation (WHO) definition of health as a state of physical, mental and social wellbeing, as well as the absence of disease or infirmity. Similarly, it also considers issues of wellbeing as a state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to their, her or his community.

4. The context of people's lives determines their health. Therefore, both the WHO and Public Health England (PHE) consider that health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants include the social and economic environment, the physical environment, and individual characteristics or behaviours.

5. The focus of the chapter is on community health and wellbeing and not on occupational health and safety. The term 'health' is used to describe 'human health' and 'wellbeing' unless specifically referenced otherwise.

6. This chapter informs and has been informed by other relevant chapters of this ES. These include:

- ***Chapter 18 Ground Conditions and Contamination;***
- ***Chapter 19 Air Quality;***
- ***Chapter 20 Water Resources and Flood Risk;***
- ***Chapter 21 Land Use and Agriculture;***
- ***Chapter 25 Noise and Vibration;***
- ***Chapter 26 Traffic and Transport;***

- ***Chapter 29 Landscape and Visual Impact Assessment;*** and
- ***Chapter 30 Tourism, Recreation and Socio-Economics.***

7. This chapter collates the relevant information on health, including assessing the findings of other chapters within this ES in population health terms. This approach aims to assist in identifying proposed East Anglia ONE North project factors which may affect human health and wellbeing.

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

27.2 Consultation

9. Consultation is a key feature of the EIA process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent.

10. To date, consultation with regards to human health has been undertaken via the East Anglia ONE North Scoping Report (SPR 2017) and the Preliminary Environmental Information Report (PEIR) (SPR 2019). Feedback received through this process has been considered in preparing the ES where appropriate and this chapter has been updated for the final assessment submitted with the DCO application. The responses received from stakeholders with regards to the Scoping Report and PEIR, are summarised in ***Appendix 27.1***, including details of how these have been taken account of within this chapter.

11. Public consultation has been conducted through a series of Public Information Days (PIDs) and Public Meetings. PIDs have been held throughout Suffolk in November 2017, March 2018, June / July 2018 and February / March 2019. A series of stakeholder engagement events were also undertaken in October 2018 as part of phase 3.5 consultation. Details of the consultation phases are discussed further in ***Chapter 5 EIA Methodology***.

12. ***Table 27.1*** shows public consultation feedback pertaining to human health. Full details of the proposed East Anglia ONE North project consultation process are presented in the Consultation Report (document reference 5.1), which is provided as part of the DCO application.

Table 27.1 Public Consultation Responses Relevant to Human Health

Topic	Response / where addressed in the ES
Phase 1	
• None	-
Phase 2	
• Concerns over health and health related to noise impacts	Assessment of noise related health impacts given in ***section 27.6.1.1*** and ***Chapter 25 Noise and Vibration***
Phase 3	
• Stress and anxiety-related health impacts of local community • Impacts of EMF on human health	Assessment of potential stress impacts are given in ***section 27.6.*** Assessment of EMFs given in ***section 27.6.3.2***
Phase 3.5	
• Disruption and distress • Impacts of EMF on human health • Concerns over impact of EMF on pacemakers, concern that areas would be out of bounds • Cardiovascular disease associated with background noise causing stress • Increased demand on NHS services	Assessment of potential stress impacts are given in ***section 27.6.*** Assessment of EMFs given in ***section 27.6.3.2*** Potential impacts to access to services are assessed in ***section 27.6.1.5***.
Phase 4	
• Concern over impact of electromagnetic fields • Concern over traffic pollution resulting in health impacts • Reduced access to emergency services and healthcare • Concern over health impact of noise • Health impact of vibration • Health impact of dust • Loss of footpaths could reduce health and wellbeing	Assessment of EMFs given in ***section 27.6.3.2*** Assessment of potential impacts linked to traffic pollution are given in ***sections 27.6.1.1*** and ***27.6.1.2*** Potential impacts to access to services are assessed in ***section 27.6.1.5*** Assessment of noise and vibration related health impacts given in ***section 27.6.1.1*** and ***Chapter 25 Noise and Vibration*** Assessment of potential impacts linked to dust pollution are given in ***section 27.6.1.2*** Impacts on PRoW, including footpaths, is given in ***Chapter 30 Tourism, Recreation and Socio-Economics***

27.3 Scope

27.3.1 Spatial Scope

27.3.1.1 Study Areas

13. The onshore infrastructure for the proposed East Anglia ONE North project will include the following elements:

- Landfall location including cable ducts and transition bays;
- Onshore cable route which includes the cable trenches, construction consolidation sites (CCS), haul road and spoil storage areas;
- East Anglia ONE North substation (onshore substation); and
- National Grid infrastructure.

14. A full description of the proposed East Anglia ONE North project is provided in ***Chapter 6 Project Description***.

15. The onshore development area is within the East Suffolk Local Planning Authority (LPA). East Suffolk Council (ESC) comprises of Suffolk Coastal District Council (SCDC) and Waveney District Council (WDC), which merged in April 2019. To ensure a robust assessment, data from SCDC was used to inform this ES chapter, as this data will be representative of the relevant geographic region until such a time that it is superseded by data issued by ESC.

16. The following geographic area classifications have been used within this assessment:

- Site-specific;
- Local (Suffolk Coastal District);
- Regional (Suffolk County);
- National (England); and
- International.

17. The 'site specific' level considers localised effects with reference to routine statistics collected for Lower Super Output Areas (LSOAs)[1], see ***section 27.5*** on the baseline collection. Specific consideration is given to the following three most representative LSOAs as shown in ***Figure 27.1***:

- Suffolk Coastal 004A (representative of the population at landfall, and some of the onshore cable route); and

[1] LSOAs are a geography defined for the collection and publication of census data. The merger of SCDC and WDC into ESC will not affect the spatial extent of these areas.

- Suffolk Coastal 003A and 003E (representative of population either side of the onshore cable route, onshore substation and National Grid infrastructure).

18. Data from Suffolk Coastal 004C (shown in ***Figure 27.1***) is not used in this assessment. Suffolk Coastal 004C is not deemed representative of the onshore development area as the main population centres surrounding the onshore development area are within Suffolk Coastal 004A, 003A and 003E. This approach is consistent with that consulted upon through publication of the PEIR (SPR 2019).

19. Within the study areas the human health assessment defines fourteen population groups (described below). Defining these population groups allows a structured and consistent discussion in both the assessment and the cumulative assessment. Five of these population groups are geographically defined (***section 27.3.1.2***). An additional nine groups are defined as potentially vulnerable. Of these nine groups, two are considered relevant to the proposed project and are further broken down into four groups in relation to reasons that a population may be sensitive (***section 27.3.1.3***), other than due to proximity.

20. The study areas used in other chapters of this ES are of relevance, but do not necessarily define the boundaries of potential health effects. Consequently, this ES chapter uses study areas to broadly define representative population groups rather than to set boundaries on the extent of potential effects.

27.3.1.1.1 Offsite Highway Improvements

21. Offsite highway improvements may take place at three locations; the A1094 / B1069 junction, the A12 / A1094 junction and Marlesford Bridge. These works are part of the onshore preparation works which may take place prior to the commencement of main construction. Therefore, detailed assessment of these works does not form part of the assessment of construction impacts presented in ***section 27.6.*** These works are to allow larger construction vehicles to access and navigate certain parts of the public road network. Any modifications to roads would be undertaken in consultation with and in accordance with the requirements of the local Highways Authority in accordance with the requirements of the draft DCO. Further details of the works required are presented in ***Chapter 6 Project Description.***

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

23. The offsite highway improvements will not require a large quantity of plant and equipment and the works will have a small footprint, mostly within the existing highway boundary. Given the small footprint and temporary nature of these works, and the limited intrusive elements, along with adherence to best practice detailed in ***section 27.3.3,*** it is considered that the offsite highway improvements will not give rise to an impact to human health. These works will not have the potential to generate levels of construction dust that will have an impact on human health or generate levels of construction noise that will have an impact on human health. These small scale and temporary works are considered to not effect employment or perception of risk which are impacts associated with the construction of the onshore infrastructure as presented in ***section 27.6.2.***

27.3.1.2 Geographic Population Groups

24. Five population groups have been selected based on the geographic study areas:

- The population near landfall (site-specific);
- The population along the onshore cable route and near the onshore substation and National Grid infrastructure (site-specific);
- The population of Suffolk Coastal District (local);
- The population of Suffolk county (regional); and
- The population of England and beyond the borders of England (national and international).

27.3.1.3 Potentially Vulnerable Groups

25. Under Section 149 of the Equality Act, 2010, all public authorities must, in the exercise of their functions, “have due regard to the need to” eliminate conduct that is prohibited by the Act. Such conduct includes discrimination, harassment and victimisation related to the protected characteristics of the following nine Potentially Vulnerable Groups identified in Section 4 of the Act:

- Age;
- Disability;
- Gender reassignment;
- Marriage and civil partnership;
- Pregnancy and maternity;
- Race;
- Religion or belief;
- Sex; and
- Sexual orientation.

26. With regards to the proposed East Anglia ONE North project, the protected characteristics of 'Age' and 'Disability' are considered to be potentially vulnerable. These characteristics are broken down into four further population groups that are defined in relation to their potential sensitivity to changes associated with the proposed East Anglia ONE North project (beneficial or adverse):

- Children and young people;
- Older people (over 65 years old);
- People with existing poor health (physical and mental health); and
- People living in deprivation, including those on low incomes.

27. These groups are intentionally broadly defined to facilitate a consistent discussion across health issues and as a basis to considering cumulative effects. The assessment section discusses detail relevant to particular health issues. People falling into more than one group may be especially sensitive.

27.3.1.4 Temporal Scope

28. The temporal scope has been defined as follows:

- 'Very short term' relates to effects measured in hours, days or weeks (e.g. effects associated with cable laying activity past a particular dwelling);
- 'Short term' relates to effects measured in months (e.g. along the onshore cable route. Although the full construction of the onshore cable route is two years, any construction impact is deemed as short term as any disturbance or obstruction to access would be temporary due to the sequential nature of the construction works);
- 'Medium term' relates to effects measured in years (e.g. local employment during construction, requirements of the overall construction stage, such as workforce use of accommodation); and
- 'Long term' relates to effects measured in decades (e.g. the operational stage).

27.3.2 Topic Scope

29. The scope of issues considered by this ES chapter has been informed by the proposed East Anglia ONE North project Scoping Report (SPR 2017) and PEIR (SPR 2019), the Planning Inspectorate Scoping Opinion (Planning Inspectorate 2017), and Section 42 responses to the PEIR (SPR 2019) and has been developed to comply with the EIA Regulations 2017. PHE have been consulted on the methodology and agreed that it is appropriate for the assessment through communication on September 2018.

30. Following the Scoping Opinion, the scope of this ES chapter focuses on the onshore infrastructure associated with the proposed East Anglia ONE North project. Following the principles outlined in ***section 27.4.3.3*** (factors relating to likelihood) and ***section 27.4.3.4*** (factors relating to significance), the following potential effects to human health have been scoped out of further consideration:

- Potential Offshore Health Effects Scoped Out:
  - PHE note that operational windfarms should not produce emissions, pollutants, or waste products;
  - Landscape and visual impacts due to offshore wind turbines within the 35km limit of visual significance identified in Department of Trade and Industry (DTI) guidance[2] are not expected to have significant appreciable or significant effects on human health;
  - The potential for the offshore windfarm, or its support vessels, to pose a hazard to shipping and/or aviation are not expected to have significant appreciable or significant effects on human health (see ***Chapter 14 Shipping and Navigation***);
  - The presence of cable laying and support vessels close to the shore due to temporary nature of such activities;
  - The potential for bathing waters to be affected by sedimentation and/or fuel spills associated with the horizontal drilling of the cable route at the landfall due to the small quantities of sediment and low probability of occurrence (see ***Chapter 8 Water and Sediment Quality***); and
  - Effects due to the subsequent development of port facilities (this will be considered under a separate application).
- Potential Onshore Health Effects Scoped Out:
  - The effects resulting from manufacturing of the elements of the offshore windfarm. This is because:
    - The supply chain for the proposed East Anglia ONE North project has not been developed at this point so the health effects arising cannot be determined; and
    - Manufacturing would be subject to relevant health assessments by the relevant companies and covered by its own health and safety and public health legislation and standards;
  - The potential for negative health or social effects due to the workforce because:
    - Workers are likely to be UK based;
    - Workers will be of working age and in good health;

[2] '*Guidance on the Assessment of the Impact of Offshore Windfarms'* produced by the Department for Trade and Industry (DTI)

- In-migrant workers would be distributed across Suffolk in existing rental accommodation (such as hotels);
- It is expected that migrant workers would return to their homes over the weekend;
- Effects on local services because resident workers would continue to use their own registered GP; and
- A high standard of workforce conduct is mandated by the Applicant.

27.3.2.1 Potential Onshore Health Effects Scoped In

31. The following section sets out the topic scope for health issues that have been assessed in this chapter due to the potential for likely significant effects to human health. These effects will also be considered cumulatively within the proposed East Anglia ONE North project and with other projects.

32. The chapter assesses the potential for likely significant health effects to occur during construction and operation as described in ***Table 27.2.***

Table 27.2 Potential Sources of Impact Leading to Potential Health Effects

Potential Source	Potential pathway	Potential Receptor	Relevant ES chapter
Construction			
Noise from excavation machinery and associated movements	Temporary inconvenience	Site specific populations or any sensitive groups such as schools or residential homes	***Chapter 25 Noise and Vibration***
Dust generated during construction	Temporary inconvenience or inhalation of particulates	Site specific populations	***Chapter 19 Air Quality***
Exhaust emissions and particulates from machinery		Site specific populations and localised populations within Suffolk County	
Accidental spillage	Emissions to ground or surface water	Site specific populations	***Chapter 18 Ground Conditions and Contamination*** ***Chapter 20 Water Resources and Flood Risk***
Temporary disturbance or obstruction of roads and footpaths due to road transportation of	Loss of access to green space or diversions to access routes	Site specific populations and localised populations within Suffolk County	***Chapter 30 Tourism, Recreation and Socio-Economics***

Potential Source	Potential pathway	Potential Receptor	Relevant ES chapter
materials and equipment, workforce traffic, and construction areas	Disruption of access to services and amenities	Site specific populations and localised populations within Suffolk County	***Chapter 26 Traffic and Transport***
Construction and Operation			
Increases in employment and commercial opportunity	Increased wealth in populations	Population of Suffolk County and New Anglia Local Enterprise Partnership (LEP)	***Chapter 30 Tourism, Recreation and Socio-Economics***
Perception of risk	Uncertainty and anxiety of plans and potential impacts.	Populations specific to the indicative onshore substation area and immediate environs.	Detail included in this chapter.
Operation			
Noise from the onshore substation	Long term inconvenience	Site specific population at the onshore substation	***Chapter 25 Noise and Vibration***
Electromagnetic Fields from the underground cables, onshore substation, and National Grid Substation	Interaction with magnetic fields	Site specific population along the onshore cable route and at the onshore substation.	Detail included in this chapter.

27.3.3 Worst Case Scenarios

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

34. ***Table 27.3*** identifies those realistic worst case parameters of the onshore infrastructure that are relevant to potential impacts on human health during construction, operation and decommissioning phases of the proposed East Anglia ONE North project. Please refer to ***Chapter 6 Project Description*** for more detail regarding specific activities, and their durations, which fall within the construction phase.

35. As described in ***Chapter 5 EIA Methodology,*** there are two co-located onshore substation locations for either the proposed East Anglia ONE North project or the

proposed East Anglia TWO project. It should be noted that the draft DCOs for both the proposed East Anglia ONE North and East Anglia TWO projects have the flexibility for either project to use either onshore substation location. There is no difference in the scoped in and assessed impacts between the two onshore substation locations, therefore the 'project alone' assessment in ***section 27.6,*** and associated chapter figures***,*** have been presented on the intended development strategy of the proposed East Anglia ONE North project using the eastern onshore substation location.

Table 27.3 Realistic Worst Case Scenarios

Impact	Parameter	Notes
Construction		
Construction duration	The minimum realistic duration that the onshore works can be completed in, resulting in the highest traffic demand due to the intensity of activities, is 24 months (two years).	Vehicle movements have been calculated using this parameter and are detailed further in ***Chapter 26 Traffic and Transport***.
Construction Date	Earliest start of construction is mid 2023	Vehicle movements have been calculated using this parameter and are detailed further in ***Chapter 26 Traffic and Transport***.
Impacts related to the landfall	HDD temporary working area: 7,000m^2 (70m x 100m) Transition bay temporary working area (for 2 transition bays): 1,554m^2 (37m x 42m) Landfall Construction Consolidation Site (CCS) (x1): 7,040m^2 (88m x 80m)	Construction footprints are provided as a proxy for construction dust emissions
Impacts related to the onshore cable route	Onshore cable route: 290,912m^2 (9,091m x 32m) Jointing bay temporary working area: 570m^2 (30.6m x 18.6m). Total for 38 jointing bays: 21,660m^2 (570m^2 x 38) HDD (retained as an option to cross SPA / SSSI): Entrance pit temporary working area (x1): 6,300m^2 (90m x 70m) Exit pit temporary working area (x1): 2,700m^2 (90m x 30m) Onshore cable route large CCS (1): 16,500m^2 (165m x 100m). Onshore cable route medium CCS (2): 14,080m^2 total (88m x 80m per each medium CCS)	Construction footprints are provided as a proxy for construction dust emissions

Impact	Parameter	Notes
	Onshore cable route small CCS (2): 6,000m^2 total (60m x 50m per each small CCS) Total footprint of all onshore cable route CCS: 36,580m^2 Onshore cable route laydown area: 1,000m^2 Onshore cable route haul road between landfall and Snape Road (7,331m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 40,435m^2 Onshore cable route and substation access haul road (1,570m in length x 9m wide): 14,130m^2 Temporary access roads (957m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,231m^2	
Impacts related to the onshore substation	Onshore substation CCS: 17,100m^2 (190m x 90m) Permanent footprint (used as CCS during construction): 36,100m^2 (190m x 190m) Substation operational access road: 13,600m^2 (1,700m x 8m)	Construction footprints are provided as a proxy for construction dust emissions
Impacts related to the National Grid Infrastructure	National Grid CCS: 23,350m^2 National Grid operational substation (AIS technology) (used as a CCS during construction): 44,950m^2 (310m x 145m) Temporary pylon/mast temporary working area (x4): 10,000m^2 (2,500m^2 per each temporary pylon) Permanent pylon permanent footprint (x4): 1,600m^2 (400m^2 per each permanent pylon) Permanent pylon temporary working area (x4): 8,400m^2 (2,100m^2 per each permanent pylon) Overhead line realignment temporary working area: 5,000m^2 Cable sealing end/Cable sealing end (with circuit breaker) compounds permanent footprint: 10,000 m^2 (total for three compounds) Cable sealing end/Cable sealing end (with circuit breaker) compounds temporary working area: 30,000m^2 (for three compounds)	Construction footprints are provided as a proxy for construction dust emissions AIS technology is assessed as the worst case due to a larger footprint. Further details regarding GIS technology is provided in ***Chapter 6 Project Description.***

Impact	Parameter	Notes
	Temporary access road (for pylon works): (1,100m in length x 4.5m wide with additional 4m for passing places at approximately 90m intervals): 5,629m^2 Permanent access road to sealing end compound: 1,850m^2 (500m x 3.7m)	
Operation		
Impacts relating to the onshore cable route	Presence of underground onshore cables No above ground infrastructure	
Impacts related to the onshore substation and National Grid infrastructure	Presence of onshore substation. Refer to ***Chapter 25 Noise and Vibration Appendix 25.3*** for further details regarding sound power levels from various elements of onshore substation infrastructure	No significant noise sources associated with the National Grid infrastructure therefore not considered further. See ***Chapter 25 Noise and Vibration*** for further justification.
Impacts relating to traffic	It anticipated that the substation(s) would not be staffed. During the operational phase, vehicle movements would therefore be limited to occasional maintenance visits at the substation and annual routine integrity tests of the onshore cable route.	
Decommissioning		
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.		

27.3.4 Embedded Mitigation and Best Practice

36. The proposed East Anglia ONE North project has committed to a number of techniques and engineering designs/modifications inherent as part of the proposed East Anglia ONE North project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the proposed East Anglia ONE North project design is a type of primary mitigation and is an inherent aspect of the EIA process. Aspects of this relevant to human health effects are discussed in ***Table 27.4***.

37. A range of different information sources has been considered as part of embedding mitigation into the design of the proposed East Anglia ONE North

project. These include engineering requirements, feedback from the community and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice. For further details see ***Chapter 6 Project Description*** and ***Chapter 4 Site Selection and Assessment of Alternatives***.

Table 27.4 Embedded Mitigation Measures and Best Practice for Human Health

Parameter	Mitigation measures embedded into the project design
General	
Site Selection	The proposed East Anglia ONE North project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Key design principles from the outset were followed (wherever practical) and further refined during the EIA process. Ones relevant to this chapter include: • Avoiding proximity to residential dwellings; and • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures.
Construction	Use of relevant best practice and techniques (including pollution prevention) to avoid or reduce impacts which will affect the onshore development area. See the following assessments: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 19 Air Quality;*** • ***Chapter 20 Water Resources and Flood Risk;*** • ***Chapter 21 Land Use;*** • ***Chapter 25 Noise and Vibration;*** • ***Chapter 26 Traffic and Transport;*** • ***Chapter 29 Landscape and Visual Impact Assessment;*** and • ***Chapter 30 Tourism, Recreation and Socio-Economics.***
Perception of risk	Perceptions are influenced by availability of information and engagement in decision making process. The Applicant has implemented a thorough process of community engagement, including PIDs and stakeholder engagement. Information from these has informed the design development and updates have been provided to local communities throughout the planning process.
National Grid Substation and Onshore Substation (operational phase)	
Foul Drainage	Foul drainage at the onshore substations will be collected through a mains connection to the existing local authority sewer system (if a suitable connection is available) or collected in a septic tank located within the development boundary and transported off site for disposal at a licensed facility.

Parameter	Mitigation measures embedded into the project design
Pollution Prevention	All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. All refuelling will take place in a dedicated impermeable area, using a bunded bowser. The refuelling and fuel storage area will be located at least 10m from the nearest watercourse. Biodegradable oils will be used where possible. Spill kits will be available on site at all times. Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency.
EMF	It is the Applicant's policy to only design and install equipment that is compliant with the relevant exposure limits. To ensure this, all of the equipment for the proposed East Anglia ONE North project capable of producing EMFs will be assessed in accordance with the provisions of the UK Government's Code of Practice on Compliance, which is compliant with International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidance (ICNIRP 1998).

27.3.5 Monitoring

38. Post-consent, the final detailed design of the proposed East Anglia ONE North project will refine the worst-case parameters assessed in this ES. It is recognised that monitoring is an important element in the management and verification of the actual impacts based on the final detailed design. Where monitoring is proposed for human health, this is described in the OCoCP and Outline Construction Traffic Management Plan (OCTMP) submitted with this DCO application (document reference 8.1 and document reference 8.9, respectively). Final details of monitoring will be agreed post-consent with the Local Planning Authority and relevant stakeholders.

27.4 Assessment Methodology

27.4.1 Guidance

27.4.1.1 Legislation

39. The following legislative context has informed the assessment presented in this chapter.

40. The Health and Safety at Work Act 1974 (HM Government of Great Britain, 1974) places duties on employers to ensure, so far as is reasonably practicable: the health, safety and welfare at work of all their employees; and that persons not in their employment are not exposed to risks to their health or safety as a result of the activities undertaken. In both cases, the requirement for risks to be reduced to As Low As Reasonably Practicable (ALARP) is fundamental and applies to all activities within the scope of the Health and Safety at Work Act 1974.

41. The Control of Major Hazards Regulations 2015 relate to the management of threshold quantities of dangerous substances identified in the regulations.

42. The Health Protection Regulations 2010 came into force to complete the modernised legal framework for health protection in England. Three sets of regulations complement the updated Public Health (Control of Disease) Act 1984, which was substantially amended by the Health and Social Care Act 2008. These are:

- The Health Protection (Notification) Regulations 2010 (SI 2010/659);
- The Health Protection (Local Authority Powers) Regulations 2010 (SI 2010/657); and
- The Health Protection (Part 2A Orders) Regulations 2010 (SI 2010/658).

43. The Clean Air Act (1993) aims to reduce pollution from smoke, grit and dust and gives local authorities powers to designate smoke control areas (HM Government of Great Britain & Northern Ireland, 1993). The Air Quality Standards Regulations 2010 transpose into English law the requirements of Directives 2008/50/EC and 2004/107/EC on ambient air quality.

44. Part III of the Environmental Protection Act 1990 discusses control of emissions (including dust, noise and light) that may be prejudicial to health or a nuisance (HM Government of Great Britain & Northern Ireland 1990).

45. The International Convention for the Prevention of Pollution from Ships (MARPOL) includes regulations aimed at preventing and minimising, both accidental and operational, pollution from ships (International Maritime Organisation 1973).

46. The revised Bathing Water Directive 2006/7/EC safeguards public health and clean bathing waters (European Parliament and Council of the European Union (EU) 2006). Bathing waters are also protected under the Water Framework Directive 2000/60/EC (European Parliament and Council of the European Union 2000).

27.4.1.2 Policy Context

47. National Policy Statements (NPS) produced by the UK Government set the policy context for the development of new energy infrastructure in the UK. ***Table 27.5*** summarises the relevant health provisions of the NPS for Overarching Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011c), which informs the NPS for Renewable Energy (EN-3) (DECC 2011b); and the NPS for Electricity Networks (EN-5) (DECC 2011a). However, EN-5 has been included under EMF due to its specific guidance in this area.

Table 27.5 Review of National Policy Statements with Regards to Health Determinants

Section	Description	Coverage in the assessment
General		
EN-1, 4.10	Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest. It plays a key role in protecting and improving the natural environment, public health and safety, and amenity, for example by attaching conditions to allow developments which would otherwise not be environmentally acceptable to proceed and preventing harmful development which cannot be made acceptable even through conditions. Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health. In considering an application for development consent, the Infrastructure Planning Commission (IPC) [*now the Planning Inspectorate and the Secretary of State*] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. It should act to complement but not seek to duplicate them.	Potential discharges and emissions are considered in: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 19 Air Quality;*** and • ***Chapter 20 Water Resources and Flood Risk.***
EN-1, 4.13	As described in the relevant sections of this NPS and in the technology- specific NPSs, where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health.	Effects on human beings are considered in: • ***Section 27.6;*** and • ***Chapter 30 Tourism, Recreation and Socio-economics.***
Noise		
EN-1, 4.13	The direct impacts on health may include increased noise. The IPC will want to take account of health concerns when setting requirements relating to a range of impacts such as noise.	***Chapter 25 Noise and Vibration*** considers direct noise impacts.
EN-1, 5.11	The IPC should not grant development consent unless it is satisfied that the proposals will meet the following aims:	Potential noise effects are

Section	Description	Coverage in the assessment
	Avoid significant adverse impacts on health and quality of life from noise; Mitigate and minimise other adverse impacts on health and quality of life from noise; and Where possible, contribute to improvements to health and quality of life through the effective management and control of noise.	considered in ***section 27.6.1.1***
EN-1, 5.11	Excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of areas of value such as quiet places and areas with high landscape quality. The UK Government's policy on noise is set out in the Noise Policy Statement for England. It promotes good health and good quality of life through effective noise management. Similar considerations apply to vibration, which can also cause damage to buildings. In this section, in line with current legislation, references to "noise" below apply equally to assessment of impacts of vibration.	Potential health effects are considered in ***section 27.6.1.1*** and ***section 27.6.3.1***.
Air Quality		
EN-1, 4.13	The direct impacts on health may include increased air pollution, dust or odour.	***Chapter 19 Air Quality*** considers direct air quality impacts.
EN-1, 4.13	Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refuse consents or require specific mitigation under the Planning Act 2008.	Potential health effects are considered in ***section 27.6.1.2***.
Ground and / or Water Contamination		
EN-1, 4.13	The direct impacts on health may include increased hazardous waste and substances or increased water pollution.	Direct effects are considered in: • ***Chapter 8 Water and Sediment Quality;*** • ***Chapter 18 Ground Conditions and Contamination;*** • ***Chapter 20 Water Resources and Flood Risk***; and • Potential health effects are
EN-1, 5.14	UK Government policy on hazardous and non-hazardous waste is intended to protect human health and the environment by producing less waste and by using it as a resource wherever possible. Where this is not possible, waste management regulation ensures that waste is disposed of in a way that is least damaging to the environment and to human health.	
EN-1, 5.15	Infrastructure development can have adverse effects on the water environment, including groundwater, inland surface water, transitional waters and coastal waters. During the construction, operation and decommissioning stages, it can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment. There may also be an increased risk of spills and leaks of pollutants to the water	

Section	Description	Coverage in the assessment
	environment. These effects could lead to adverse impacts on health or on protected species and habitats and could, in particular, result in surface waters, groundwaters or protected areas failing to meet environmental objectives established under the Water Framework Directive.	considered in ***section 27.6***
Physical Activity		
EN-1, 4.13	New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to the use of open space for recreation and physical activity.	Effects on populations are considered in: • ***Chapter 30 Tourism, Recreation and Socio-economics***; and • Potential health effects are considered in ***section 27.6.1.4.***
EN-1, 5.10	The UK Government's policy is to ensure there is adequate provision of high quality open space (including green infrastructure) and sports and recreation facilities to meet the needs of local communities. Open spaces, sports and recreational facilities all help to underpin people's quality of life and have a vital role to play in promoting healthy living. Green infrastructure in particular will also play an increasingly important role in mitigating or adapting to the impacts of climate change.	
EN-1, 5.10	Applicants will need to consult the local community on their proposals to build on open space, sports or recreational buildings and land. Taking account of the consultations, applicants should consider providing new or additional open space including green infrastructure, sport or recreation facilities, to substitute for any losses as a result of their proposal. Applicants should use any up-to-date local authority assessment or, if there is none, provide an independent assessment to show whether the existing open space, sports and recreational buildings and land is surplus to requirements.	
Journey Times and / or Reduced Access		
EN-1, 4.13	The direct impacts on health may include increased traffic.	Direct effects are considered in ***Chapter 26 Traffic and Transport***. Potential health effects are considered in ***section 27.6.1.5***.
EN-1, 4.13	New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to transport or key public services.	
Employment		
EN-1, 4.2	To consider the potential effects, including benefits, of a proposal for a project, the IPC will find it helpful if the applicant sets out information on the likely significant social and economic effects of the development, and shows how any likely significant negative effects would be avoided or mitigated. This information could include matters such as employment, equality, community cohesion and well-being.	Employment is considered in ***Chapter 30 Tourism, Recreation, and Socio-economics.***

Section	Description	Coverage in the assessment
		Potential health effects are considered in ***section 27.6.2.1***.
Electromagnetic Fields (EMF)		
EN-1, 4.13	The direct impacts on health may include increased exposure to radiation.	Potential health effects are considered in ***section 27.6.3.2***. Exposure limits are discussed in ***section 27.4.1.3.1***.
EN-5 2.10	The International Commission on Non-Ionizing Radiation Protection (ICNIRP21) developed health protection guidelines in 1998 for both public and occupational exposure. These are expressed in terms of the induced current density in affected tissues of the body, "basic restrictions", and in terms of measurable "reference levels" of electric field strength (for electric fields), and magnetic flux density (for magnetic fields).	
EN-5 2.10	The balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease. The Health Protection Agency's Centre for Radiation, Chemical and Environmental Hazards keeps under review emerging scientific research and/or studies that may link EMF exposure with various health problems and provides advice to the Department of Health on the possible need for introducing further precautionary measures.	

27.4.1.3 Guidance

48. Planning Practice Guidance on Environmental Impact Assessment (EIA) (Ministry of Housing, Communities & Local Government 2017) explains the requirements of the Town and Country Planning (EIA) Regulations 2017. The guidance does not provide any additional information in relation to defining, scoping or assessing 'population and human health'. Regard has therefore been given to the advice provided in the Institute of Environmental Management and Assessment (IEMA), 2017: Health in Environmental Assessment, a primer for a proportionate approach (Cave et al. 2017a). PHE has also issued a briefing note on health in EIA for local public health teams (Cave et al. 2017b).

49. The approach to assessing health in EIA has also been informed by relevant UK guidance on Health Impact Assessment (HIA). In England, there is no overarching guidance for HIA. However, generic principles are evident in specialist guidance such as that by the Department of Health in relation to HIA of UK Government policy (Department of Health 2010), or that by the London Healthy Urban Development Unit in relation to urban planning (NHS Healthy Urban Development Unit 2015). The HIA guidance is used as useful contextual guidance in the production of this ES chapter which is intended to provide reasoned conclusions for the identification and assessment of any likely

significant effects of the proposed East Anglia ONE North project on human health in compliance with the EIA Regulations 2017.

50. Guidance published by the World Bank Group (World Bank Group 2015) advises that community health and safety hazards specific to wind energy include blade or ice throw, aviation impacts, marine navigation, electromagnetic interference and radiation, public access, and Abnormal Indivisible Load (AIL) transportation. Due to the proposed East Anglia ONE North project being located 31km from the coast (see ***Chapter 6 Project Description***), blade or ice throw and aviation issues are not considered to be a concern for local populations to the onshore development area. Aviation issues are not considered to be a concern for local populations as any potential radar related impacts require an implementation solution to be agreed with National Air Traffic Services (NATS) prior to construction (see mitigation in ***Chapter 15 Civil and Military Aviation and Radar***). Marine navigation is considered in ***Chapter 14 Shipping and Navigation***. AILs are considered in ***Chapter 26 Traffic and Transport***.

51. PHE released guidance in 2013 regarding the health effects of exposure to electric and magnetic fields; this guidance has been used to consider the effects of EMFs in ***section 27.6.3.2***. (PHE 2013a; 2013b).

52. In March 2004, the National Radiological Protection Board, NRPB (now part of PHE), published advice on limiting public exposure to EMFs. The advice was based on an extensive review of the science and a public consultation on its website and recommended the adoption in the UK of the EMF exposure guidelines published by the International Commission on Non-ionizing Radiation Protection (ICNIRP). The ICNIRP guidelines are based on the avoidance of known adverse effects of exposure to EMF at frequencies up to 300 GHz (gigahertz), which includes static magnetic fields and 50 Hz electric and magnetic fields associated with electricity transmission (McKinlay et al. 2004).

53. This human health assessment has had regard to the precautionary findings of the UK Stakeholder Advisory Group on Extremely Low Frequency Electric and Magnetic Fields (SAGE). SAGE was initiated by National Grid and was adopted by the Department of Health in order to provide advice to the UK Government (Stakeholder Advisory Group on ELF EMFs 2010).

27.4.1.3.1 EMF Exposure Limits

54. In March 2004, the NRPB provided new advice to the UK Government, replacing previous advice from 1993, and recommending the adoption in the UK of guidelines published in 1998 by the ICNIRP (ICNIRP 1998). The UK Government subsequently adopted this recommendation, saying that limits for public exposures should be applied in the terms of the 1999 EU Recommendation (EU

Council 1999). For static fields, the limits that apply are likewise those given in the 1999 EU Recommendation, in this case derived from 1994 ICNIRP guidelines. ***Table 27.6*** summarises the recommended values.

Table 27.6 Recommended Values for Power Frequencies

Public exposure level	Electric Fields	Magnetic Fields
Power frequency		
Basic restriction (induced current density in central nervous system)	2mA/m2	
Reference level (external unperturbed field)	5,000V/m	100μT
Field corresponding to the basic restriction	9,000V/m	360μT
Static		
Basic restriction	None	40,000μT

55. In recommending these levels, the NRPB considered the evidence for all suggested effects of EMFs. It concluded that the evidence for effects on the nervous system of currents induced by the fields was sufficient to justify setting exposure limits, and this is the basis of their quantitative recommendations (NRPB 2004). It concluded that the evidence for effects at lower fields, for example the evidence relating to childhood leukaemia (discussed further in ***Appendix 27.2***), was not sufficient to justify setting exposure limits, but was sufficient to justify recommending that the UK Government consider possible precautionary actions. Precautionary measures are considered in more detail below.

56. The EMF guidelines are documented in NPS EN-5 and practical details of their application are explained in the Code of Practice, 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice' published by the Department of Energy and Climate Change (DECC 2012). It is the electricity industry's policy to comply with the UK Government guidelines on EMF, and this Code of Practice forms an integral part of this policy.

57. The ICNIRP guidelines (ICNIRP 1998) are set so as to prevent external exposure to EMFs that could cause currents to be induced in the body large enough to cause effects on nerves, with a substantial safety margin. These induced currents can be expressed as a current density and it is on current density that the guidelines are based. The ICNIRP guidelines recommend that the general public are not exposed to levels of EMFs able to cause a current density of more than 2mA/m^2 within the human central nervous system. This recommendation is

described as the “basic restriction”. The external fields that have to be applied to the body to cause this current density have to be calculated by numerical dosimetry, since in-vivo measurements of current density are not practical.

58. The ICNIRP guidelines also contain “reference levels”. For the public, the reference level for electric fields is 5kV/m, and the reference level for magnetic fields is 100µT. The 1999 EU Recommendation (EU Council 1999) uses the same values as ICNIRP (ICNIRP 1998).

59. In the ICNIRP guidelines and the EU Recommendation, the actual limit is the basic restriction. The reference levels are not limits but are guides to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded, and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

60. The Code of Practice on compliance (DECC 2012) endorses this approach and gives the values of field corresponding to the basic restriction, stating:

> “*The 1998 ICNIRP exposure guidelines specify a basic restriction for the public which is that the induced current density in the central nervous system should not exceed 2mA* m^{-2}*. The Health Protection Agency specify that this induced current density equates to uniform unperturbed fields of 360µT for magnetic fields and 9.0kV* m^{-1} *for electric fields. Where the field is not uniform, more detailed investigation is needed. Accordingly, these are the field levels with which overhead power lines (which produce essentially uniform fields near ground level) shall comply where necessary. For other equipment, such as underground cables, which produce non-uniform fields, the equivalent figures will never be lower but may be higher and will need establishing on a case-by-case basis in accordance with the procedures specified by HPA. Further explanation of basic restrictions, reference levels etc is given by the Health Protection Agency.”*

61. The Code of Practice (DECC 2012) also specifies the land uses where exposure is deemed to be for potentially a significant period of time and therefore where the public guidelines apply. These land uses are, broadly, residential uses and schools.

62. Therefore, if the EMFs produced by an item of equipment are lower than 9kV/m and 360µT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with PHE recommendations and UK Government policy. If the fields are greater than these values, the equipment is still compliant with UK Government policy if the land use falls outside the

residential and other uses specified in the Code of Practice (DECC 2012) and it may still be compliant if the fields are non-uniform.

27.4.1.4 Health Priorities

63. Suffolk's Joint Health and Wellbeing Strategy 2012–2022 sets the long-term strategic framework for achieving this vision, and for improving health and wellbeing in Suffolk. The document has been refreshed several times, most recently for the 2019 – 2022 period (Suffolk County Council 2019). Health priorities from the Joint Health and Wellbeing Strategy for Suffolk, and the Suffolk Joint Strategic Needs Assessment (JSNA) (Suffolk Health and Wellbeing Board and Suffolk County Council 2015) have informed this human health assessment.

64. The Joint Health and Wellbeing Strategy Refresh 2019-2022 for Suffolk has updated the strategy priorities as follows:

- Priority 1: Every child has the best start in life;
- Priority 2: People of working age are supported to optimise their health and wellbeing;
- Priority 3: Older people in Suffolk have a good quality of life; and
- Priority 4: People in Suffolk have the opportunity to improve their mental health and wellbeing.

65. These priorities are to be achieved through specific areas of focus for each one, with four cross cutting principles across all the outcomes; prioritising prevention, reducing health inequalities, enabling resilient communities and working well together. The following focus areas of the original 2012 – 2022 Strategy have the potential to be impacted by the proposed East Anglia ONE North project:

- "*Physical and emotional health*" of children may be affected by noise, disturbance or air pollutants if these impacts are found to be significant. This may also be affected if access to playing fields or Public Rights of Way (PRoW) are significantly affected by the proposed East Anglia ONE North project;
- "*A good environment in which to live*" for older people as well as "*healthy living*" may be affected by noise, disturbance or air pollutants if these are found to be significant, as well as by any disruption to public spaces or rights or way;
- "*Improving outcomes for people with disabilities who have complex needs through working together effectively*" may be affected by potential traffic disturbance impacting on ability to access GPs, care homes, or households; and

- "*Early intervention and prevention including primary care mental health services*" to improve mental health and well-being may also be affected by traffic disruption and noise pollution.

66. Other than the addition of the working age population also requiring access to health care facilities, no further focus areas identified by the strategy refresh in 2019 have potential to be impacted by the proposed East Anglia ONE North project.

67. Both the strategy and the JSNA highlight areas that may be affected by the proposed East Anglia ONE North project. Young children and older people may be sensitive to noise and vibration impacts, especially at night when trying to sleep. The significance of potential impact sources is covered in ***Chapter 25 Noise and Vibration***.

68. Similarly, families with young children and the carers of the elderly may be impacted by traffic disturbances if they cannot easily reach facilities such as GPs, care homes, or day care. The significance of potential impact sources is covered in ***Chapter 26 Traffic and Transport***.

69. The districts that the proposed East Anglia ONE North project interacts with have plentiful open space and networks of PRoW which facilitate enjoyment of the open space. Reducing access to this may reduce people's ability or enthusiasm to undertake exercise and so maintain their health. The significance of potential impact sources is covered in ***Chapter 30 Tourism, Recreation and Socio-Economics***.

70. However, the proposed East Anglia ONE North project may also have positive impacts in relation to the priority areas. For example, an increase in local employment and training opportunities may provide skills for young people and income for households with children under five. In the long term, ensuring energy security through renewable generation may reduce electricity bills and allow more older people to afford sufficient energy throughout the winter.

27.4.2 Data Sources

71. There are no specific guidelines for the assessment of health impacts. The NPS EN-1 states that where a proposed project has an effect on human beings, the EIA should assess these effects for each element of that project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate.

72. Data sources relating to human health receptors are presented in the following chapters:

- ***Chapter 18 Ground Conditions and Contamination;***
- ***Chapter 19 Air Quality;***
- ***Chapter 20 Water Resources and Flood Risk;***
- ***Chapter 21 Land Use;***
- ***Chapter 25 Noise and Vibration;***
- ***Chapter 26 Traffic and Transport;***
- ***Chapter 29 Landscape and Visual Impact Assessment;*** and
- ***Chapter 30 Tourism, Recreation and Socio-Economics***.

73. This human health assessment is also informed by the following evidence sources, relevant data for which is summarised in the sections below:

- Scientific literature;
- Baseline conditions;
- Health priorities
- Project-specific consultation responses; and
- Policy context.

74. The review of evidence sources has been structured using the following seven themes that cut across the scope of construction, operational and decommissioning effects of the proposed East Anglia ONE North project:

- Noise;
- Air quality;
- Ground and/or water contamination;
- Physical activity;
- Journey times and/or reduced access;
- Employment; and
- EMF.

27.4.2.1 Scientific Literature

75. An evidence base of publicly available information has been used to support the scoping and assessment conclusions of this ES chapter. Evidence statements have been extracted from a review of abstracts and full articles published in English on PubMed[3] from the past five years. The literature review is not

[3] https://www.ncbi.nlm.nih.gov/pubmed

exhaustive and aims to provide a summary only of the key issues relevant to the scope of this assessment. This is provided in ***Appendix 27.2***.

27.4.2.2 Baseline Conditions

76. Health Profiles (Public Health England 2017a), Health Assets Profiles (Public Health England 2017b) from PHE and Wider Determinants of Health (Public Health England 2017c) from PHE have informed the local, regional and national baseline for assessment.

77. Office of National Statistics (ONS) and Nomis official labour market statistics (Nomis 2017) have also informed the baseline. Whilst more recent statistics have been collected for some socio-economic variables, the 2011 census is the latest published census data and is considered an appropriate baseline for use in this ES chapter as it provides consistent comparative data across the population groups used in the assessment. Details of the statistics used are provided in ***Appendix 27.3***.

78. The Index of Multiple Deprivation (IMD) 2015 has been consulted and referenced as appropriate, including sub-domains and underlying indicators (Department of Communities and Local Government 2015).

79. Data sources are provided in ***Table 27.7*** below.

Table 27.7 Data Sources Features

Data	Year	Coverage	Confidence	URL Link
Children living in low income families	2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/children%20in%20low%20income%20families#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/10101/age/169/sex/4
Child obesity in Year 6 of school	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/childhood%20obesity#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90323/age/201/sex/4
GCSEs achieved (5A* - C including English and Maths)	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/GCSE%20attainment#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92199/age/175/sex/4

Data	Year	Coverage	Confidence	URL Link
Current smokers as a proportion of the population	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/smokers#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92304/age/168/sex/4
Levels of breastfeeding initiation	2016 / 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/breastfeeding#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/20201/age/1/sex/2
Life expectancy for women (at birth) &	2015-2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/life%20expectancy#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90366/age/1/sex/2
Life expectancy for men (at birth)	2015 - 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/life%20expectancy#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/90366/age/1/sex/1
Rate of alcohol-related harm hospital stays (narrow) – per 100,000 of the population	2017 - 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/alcohol%20related%20harm#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/91414/age/1/sex/4
Emergency Hospital Admissions for Intentional Self-Harm – per 100,000 of the population	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/self%20harm#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/21001/age/1/sex/4
Rate of smoking related deaths	2015 - 2017	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/smoking%20mortality#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/113/age/202/sex/4
Estimated levels of adult excess weight	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/adult%20excess%20weight#page/3/gi

Data	Year	Coverage	Confidence	URL Link
				d/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/93088/age/168/sex/4
Estimated levels of adult smoking	2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/adult%20smoking#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92443/age/168/sex/4
The rate of people killed and seriously injured on roads (per 100,000 of the population)	2015 - 2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/killed%20and%20seriously%20injured%20on%20roads#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11001/age/1/sex/4
Rate of statutory homelessness (per 1,000 households)	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/statutory%20homelessness#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11501/age/-1/sex/-1
Rate of violent crime (including sexual violence) per 1,000 of the population	2017 / 2018	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/rate%20of%20violent%20crime#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11202/age/1/sex/4
Rates of long term unemployment	August 2016	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/unemployment#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/734/age/204/sex/4
Rate of early deaths (under 75) from cardiovascular diseases – per 1,000 of the population	2015-2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/cardiovascular#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/40401/age/163/sex/4
Rate of early deaths (under 75) from cancer – per 1,000 of the population	2015-2017	County and District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/cancer#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/40501/age/163/sex/4

Data	Year	Coverage	Confidence	URL Link
Annual Mean Concentration of human-made fine particulate matter	2016	District	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/particulate%20matter#page/1/gid/1/pat/6/par/E12000006/ati/101/are/E07000205/iid/92924/age/-1/sex/-1
State of Suffolk Report	2015	County	High	Suffolk Joint Strategic Needs Assessment https://www.healthysuffolk.org.uk/uploads/2015-State-of-Suffolk-Exec-Summary-Interactive.pdf
Suffolk Joint Health and Wellbeing Strategy (Strategy Refresh: 2019-2022)	2012	County	High	https://www.healthysuffolk.org.uk/uploads/SF777_-_JHWS_Report_Booklet_April_2019 1.pdf
Percentage of physically active adults	2017 / 2018	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/population%20active#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/93014/age/298/sex/4
Sports club membership: % of population 16+	2015/ 2016	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/sports%20club%20membership#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/92619/age/164/sex/4
Utilisation of outdoor space for exercise/health reasons	2015-2016	County	High	Public Health England Public Health Profiles https://fingertips.phe.org.uk/search/outdoor%20space%20for%20exercise#page/3/gid/1/pat/6/par/E12000006/ati/102/are/E10000029/iid/11601/age/164/sex/4
Population density	2010	District, County and Country	High	Office for National Statistics https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationdensitytables

27.4.3 Impact Assessment Methodology

27.4.3.1 General Approach

80. This section sets out the methods for the identification and assessment of any likely significant effects of the proposed East Anglia ONE North project on human health (as required by the EIA Regulations 2017). PHE have been consulted on

the methodology and agreed that it is appropriate for the assessment through email communication on September 2018.

81. Consistent with the objective of EIA (as set out in EIA Directive 2014/52/EC), the methods identify effects that provide, or are contrary to providing, a high level of protection to human health. This includes reasoned conclusions in relation to health protection, health improvement and/or improving services.

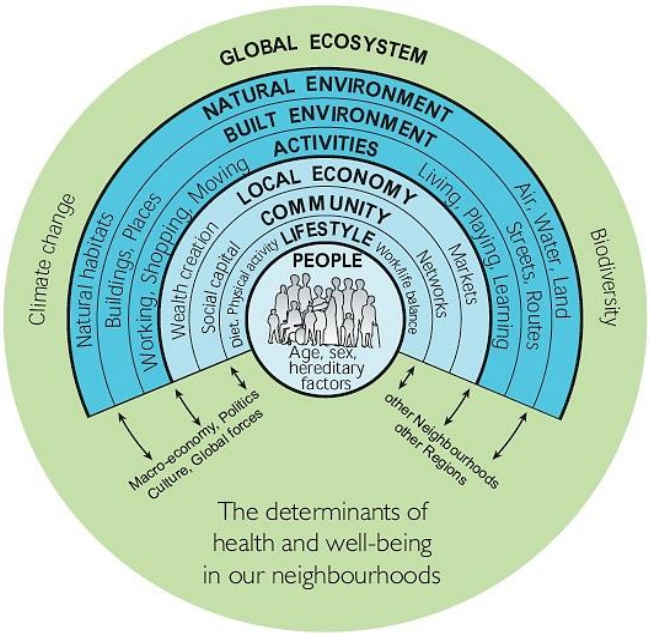

Plate 27.1 Wider Determinants of Health (Source: Based on the Dahlgren and Whitehead (1991) diagram as amended by Barton and Grant (2006) and advised by Cave et al. (2017))

82. The methods provide a framework to identify (at both scoping and assessment):

- The 'likelihood' of the proposed East Anglia ONE North project having an effect on health; and
- If an effect is likely, whether it may be 'significant' in the terms of the EIA regulations.

83. Effects are considered with regards the general population and vulnerable groups. Populations are considered at regional and local levels.

84. In line with best practice guidance from the WHO (WHO 2012) and PHE (PHE 2017c), "health determinants" (***Plate 27.1***) are considered to understand effects of human health and wellbeing. The methodology uses best practice published by the IEMA in line with the 'Health in Environmental Impact Assessment: A Primer for a Proportionate Approach' (Cave et al. 2017a).

27.4.3.2 Health Determinants

85. Human health can be influenced by a wide variety of direct and indirect factors, from controllable factors such as lifestyle to uncontrollable factors such as genetics. The influences and effects can be wide-ranging and are likely to vary between individuals. In determining 'physical, mental and social wellbeing', external contributory factors, known as 'determinants', are considered. Determinants are a reflection of a mix of influences from an individual's society and environment.

86. The 'wider determinants of health' model is used to conceptualise how human health spans environmental, social and economic aspects. This is illustrated in ***Plate 27.1***.

87. Influences that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility, and exposure.

27.4.3.3 Likelihood

88. The first issue considered in this assessment is the likelihood of the proposed East Anglia ONE North project having an effect. A likely effect should be both plausible and probable.

89. Plausible relates to there being a relevant source, pathway and receptor (see discussion of health pathways below).

90. Probable relates to a qualitative judgement to exclude those effects that could only occur under certain very rare conditions, except where these relate to the project's vulnerability to major accidents or disasters (as required by Part 1 paragraph 4(4) EIA Regulation 2017)[4].

91. The term 'health pathways' describe how a specific activity of the proposed East Anglia ONE North project could change a determinant of health and potentially result in a change in health outcomes (an effect). Health pathways are considered with regards the source, pathway, and impact as follows:

- A 'source' represents an activity or factor that could affect the health outcomes of a receptor population;
- A 'pathway' describes the method or route by which the 'source' could affect the 'receptor' (either causation or association); and

[4] ***Chapter 6 Project Description*** includes a section on Major Hazards and Disasters. This finds that there are no causal pathways between the project and major accidents.

- A ‘receptor’ is the recipient of an effect from the ‘source’, via the ‘pathway’.

92. ***Table 27.8*** shows how the Source-Pathway-Receptor model can be used to identify plausible health effects. Only plausible health effects are considered within the assessment.

Table 27.8 Use of a Source-Pathway-Receptor Model to Identify Plausible Health Effects

Source	Pathway	Receptor	Plausible health effect?	Rationale
×	✓	✓	No	There is not a clear source from where a potential health effect could originate.
✓	×	✓	No	The source of a potential health effect lacks a means of transmission to a population.
✓	✓	×	No	Receptors that would be sensitive and vulnerable to the health effect are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean an effect is a likely significant effect; the probability of the effect should be qualitatively considered, and a professional judgement reached on the significance of effects that are considered likely.

27.4.3.4 Significance

93. A determination of significance is required for compliance with the EIA Regulations 2017 when a potential effect of the proposed East Anglia ONE North project is likely (or relates to the project's vulnerability to major accidents or disasters).

94. The determination of significance has two stages:

- Firstly, the sensitivity of the receptor affected, and the magnitude of the plausible health effect upon it are characterised. This establishes whether there is a relevant population and a relevant change in health outcomes to consider; and
- Secondly, a professional judgement is made as to whether or not the change in a population’s health is significant. This judgement is based on the collection and presentation of data to evidence reasoned conclusions.

95. The final significance is provided based on a comparison of a number of factors following clear guiding questions, as set out below. This is a variation from the general approach set out in ***Chapter 5 EIA Methodology*** so as to be more relevant to impacts to human health and is as described in the Human Health

Method Statement (Royal HaskoningDHV 2018). PHE have been consulted and agree that this approach is appropriate for the assessment of significance for human health.

27.4.3.4.1 Sensitivity

96. ***Table 27.9*** sets out factors characterising sensitivity for human health. The table informs the professional judgement on scoring high, medium, low or negligible sensitivity. In line with best practice, a formulaic matrix approach to determining sensitivity has been avoided. The 'higher' and 'lower' sensitivity characterisations represent instructive positions on a spectrum that would also include more extreme, as well as intermediate, positions. Most situations have a mix of higher and lower characterising factors, so a balanced expert view of sensitivity is taken.

Table 27.9 Factors Characterising Population Sensitivity (Cave et al. 2017a)

	Inequalities	Deprivation	Health status	Life stage	Outlook
Higher sensitivity	High levels of inequalities or inequities.	High levels of overall deprivation or a high level of deprivation for a relevant sub-domain of the indices of multiple deprivation. High levels of poor access to financial, social or political resources.	High levels of poor health and/or disability (particularly multiple or complex long-term health conditions). High reliance on (or low capacity in) healthcare facilities, staff or resources.	Presence of dependants (particularly the elderly or children), pregnant women, shift workers or the economically inactive.	Strong views or high degrees of uncertainty led about a development. Population may anticipate risks to their health and thus be affected by not only actual changes, but also by the possibility of change.
Lower sensitivity	Low levels of inequalities or inequities.	Low levels of overall deprivation or a low level of deprivation for a relevant sub-domain of the indices of multiple deprivation. Good access to financial, social or political resources.	Low levels of poor health and/or low levels of disability. Low reliance on (or high capacity in) healthcare facilities, staff or resources.	Predominantly a working age population in steady good quality employment.	No indication that strong views are held about a development. People are well informed of the issues and potential effects.

97. The assessment characterises the relevant populations for each health issue. For each category, the text sets out detail on the one or more relevant factors from ***Table 27.9*** that informed the score.

27.4.3.4.2 Magnitude

98. ***Table 27.10*** sets out factors characterising magnitude for human health. The table informs the professional judgement on assigning scoring of large, medium, small or negligible magnitude. In line with best practice a formulaic matrix approach to determining magnitude has been avoided. The 'larger' and 'smaller' magnitude characterisations represent instructive positions on a spectrum that would also include more extreme, as well as intermediate, positions.

Table 27.10 Factors Characterising Magnitude (Cave et al. 2017a)

	Severity	Extent	Frequency	Reversibility	Exposure
Larger magnitude	Large change in the risk of developing a new health condition (or injury) or in the progression of an existing condition. Large change in symptoms, quality of life or day-to-day functioning. Large change in inequalities.	Most members of the relevant population affected or vulnerable. Substantial population displacement or influx.	Continuous or daily effects with chronic (long term) changes in health outcomes.	Permanent change in health outcomes once change ceases. Intergenerational effects.	A low (or high) concentration over a long time, or a high concentration over a short time. Low (or high) exposure to a large population or high exposure to a small population. A high degree of resource sharing with the development.
Smaller magnitude	Small change in the risk of developing a new health condition (or injury) or in the progression of an existing condition. Small change in symptoms, quality of life or day-to-day functioning. Small change in inequalities.	Few members of the relevant population. Little change in population.	Monthly or yearly affects with acute (short term) changes in health outcomes.	Change in health outcomes reverses once change ceases. No intergenerational effects.	A low concentration over a short time. Low exposure to a small population. A low degree of resource sharing with the development.

99. The assessment characterises the relevant changes in health outcomes for each health issue. For each professional judgement on magnitude, the text sets out detail on the one or more relevant factors from ***Table 27.10*** that informed the score.

27.4.3.4.3 Judgement Framework for Significance

100. A judgement of significance is made within the context of PHE's statement (***Table 27.1***) that *"significant impacts are unlikely to arise from installations which employ Best Available Techniques and which meet regulatory requirements concerning emission limits and design parameters."*

101. Therefore, a formulaic matrix approach to determining significance has been avoided. This is because attempting to categorise significance from negligible to major would require quantitative data to a level of detail that would be disproportionate to the likely impacts. Therefore, impacts are presented as either not significant or significant. If a health outcome is found to be significant then further assessment will be undertaken to understand the magnitude of significance.

102. Following the general approach described above, a source - pathway - receptor relationship is established followed by a consideration of magnitude and sensitivity. Finally, a professional judgement is made using a framework for reporting (guide questions set out in ***Table 27.11***) on a range of data sources to ensure reasoned and robust conclusions are reached.

Table 27.11 Human Health Guide Questions for Determining Significance (Cave et al. 2017a)

Evidence sources	Guide questions
Scientific literature	Is there a sufficient strength of evidence from sufficiently high quality studies to support an association between the proposed East Anglia ONE North project change, a relevant determinant of health and a relevant health outcome? Does the literature indicate thresholds or conditions for effects to occur? Are particular population groups identified as being particularly susceptible?
Baseline conditions	Are relevant sensitivities or inequalities identified in the scientific literature present? Does the baseline indicate that conditions differ from relevant local, regional or national comparators? Are their geographic or population features of the baseline that indicate effects could be amplified?
Health priorities	Have local, regional or national health priorities been set for the relevant determinant of health or health outcome (e.g. in Joint Strategic Needs Assessments or in Health and Wellbeing Strategies)?
Consultation responses	Has a theme of local, regional or national consultation responses related to the relevant determinant of health or health outcome?
Regulatory standards (if appropriate)	Is the change one that would be formally monitored by regulators? Are there regulatory or statutory limit values set for the relevant context? Has EIA modelling predicted change that exceed thresholds from the scientific literature or set by regulators? Are there relevant international advisory guideline limit values (e.g. by the World Health Organisation)?
Policy context	Does local, regional or national government policy raise particular expectations for the relevant proposed East Anglia ONE North project change, determinant of health or health outcome (e.g. levels should be as low as reasonably practicable)? Is there a relevant international policy context (e.g. treaties or conventions)?

103. The text of the assessment section provides a structured discussion that responds to each of these questions for each health issue. The discussion provides reasoned conclusions for the professional judgement as to whether in EIA terms an issue is significant, or not. Where appropriate, variation expressed in each evidence source has been reported. This approach is considered proportionate and in line with best practice for the consideration of human health in EIA.

104. Ultimately for human health, a likely significant health effect is one that should be brought to the attention of the determining authority, as the effect of the proposed East Anglia ONE North project is judged to provide, or be contrary to providing, a high level of protection to human health. This may include reasoned conclusions in relation to health protection, health improvement and/or improving services.

105. Where significant adverse effects are identified, mitigation has been considered to reduce the significance of such effects. Similarly, enhancements have been considered where significant and proportionate opportunities to benefit population health have been identified. The residual effects represent the output of iterative assessment, taking into consideration the mitigation and enhancement measures.

106. This assessment takes as its starting point the residual effects as assessed and determined in other relevant EIA topic chapters, as outlined in ***section 27.1***. This includes taking into account relevant embedded and standard good practice mitigation.

27.4.3.5 Population Conclusions

107. A population health approach has been used, as it would be disproportionate to reach conclusions on the potential health outcomes of individuals. To take account of potential inequalities, where appropriate, conclusions on a particular health issue have been reached for more than one population. For example:

- One conclusion for the general population (or for a defined area); and
- A second separate sub-population conclusion for relevant vulnerable group (as a single defined class of sensitivities for that issue).

27.4.4 Cumulative Impact Assessment

108. The ES chapter takes a different approach to the methodology used for the Cumulative Impact Assessment (CIA) described in ***Chapter 5 EIA Methodology***.

109. The cumulative assessment considers the inter-relationships between health effects both from within the proposed East Anglia ONE North project together with effects from other projects. These are considered for:

- Project geographies:
  - Landfall;
  - Cable route;
  - Onshore substation;
  - National Grid infrastructure; and
  - Locally, regional, and nationally.
- For the following vulnerable populations:
  - Children and young people;
  - Older people (over 65 years old);
  - People with existing poor health; and
  - People living in deprivation.

110. Firstly, the intra-project cumulative effects are considered. The aim of this step is to understand if different effects on health determinants from the proposed East Anglia ONE North project would cumulatively create a larger health effect, an additive effect. For example, at a particular location within the onshore development area it considers if changes to noise levels, traffic density, and air quality combine to provide a more significant effect than as individual impacts.

111. Secondly the inter-project cumulative effects are considered. As with other chapters, projects are screened for assessment based on a list agreed with relevant stakeholders. Then projects are considered for cumulative effect at different locations and for different vulnerable populations. This approach follows the method statement agreed with PHE.

27.4.5 Transboundary Impact Assessment

112. The proposed East Anglia ONE North project is required to consider the possibility of significant transboundary impacts on other European Economic Area (EEA) member states under the Espoo Convention (see ***Chapter 5 EIA Methodology***). However, the assessment is undertaken using the Rochdale Envelope approach that accepts certain details of the proposed East Anglia ONE North project will not be available at early stages of development. The Planning Inspectorate Advice Note 12 Transboundary Impacts and Process (Planning Inspectorate 2018), includes Annex 1, The Inspectorate's long form transboundary screening proforma. This indicates that Transboundary Screening focusses on the impact pathways relating to use of natural resources; production

of waste; pollution and nuisances; risk of accidents; and use of technologies. But primarily focusses on the impact on important environmental areas.

113. Some infrastructure and labour are likely to be procured from other EEA states, particularly with regards elements of the offshore supply chain. Until the procurement process is undertaken it is not possible to estimate what the specific non-UK input would be. Therefore, it is not possible to assess the characteristics outlined in Annex 1 of Advice Note 12 (Planning Inspectorate 2018).

114. It is unlikely that employment as a result of international procurement would lead to indirect adverse health transboundary effects. Furthermore, the offshore supply chain is likely to originate in EU countries such as Germany, the Netherlands, or Spain. As such, environmental impacts as a result of manufacturing and employment are unlikely to be significant because they would be subject by relevant national regulations derived from EU Directives.

115. The onshore construction elements of the proposed East Anglia ONE North project are entirely present within the UK so it is not anticipated that significant direct adverse health effects on neighbouring countries will arise.

116. This approach follows the method statement agreed with PHE. Given the above, transboundary impacts are therefore not considered further within this assessment.

27.5 Existing Environment

27.5.1 General

117. The areas within and in proximity to the onshore development area are predominantly rural in nature typified by small villages and hamlets and individual residential properties. The landfall and first, approximately, 3km of the onshore cable route fall within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB). The onshore cable route itself runs to the south of the villages of Aldringham and Knodishall Common, with the onshore substation and National Grid substation being located to the west of Knodishall Common, and to the east of the village of Friston, on agricultural land between them. The nature of the area is rural, with Knodishall Common and Thorpeness containing the largest concentration of residential properties. The onshore development area is shown on the figures associated with this chapter.

118. The population within these areas has moderate population growth, with the projected growth to 2026 similar to the average for England projected between mid-2016 and mid-2026; 5.9% and 4.5% respectively (ONS 2018).

119. All areas considered above have a higher proportion of retirement-aged people in relation to their working age populations when compared with the national UK averages.

120. Much of the onshore infrastructure is largely routed through agricultural land but will pass close to built-up areas at Knodishall Common, as well as some individual properties.

121. Individual receptors that are sensitive to potential health effects from the construction phase have been discussed in the other ES chapters (such as ***Chapter 19 Air Quality*** and ***Chapter 25 Noise and Vibration***). Sensitive receptors are typically associated with fixed infrastructure such as residential properties, schools, hospitals, footpaths, cycleways etc. This ES chapter considers population group effects, rather than individual receptors.

27.5.1.1 Suffolk County

122. Key findings from the Suffolk JSNA (2015) were that many people in Suffolk currently enjoy relatively good health and wellbeing, however the following trends were also noted:

- Suffolk's population is aging, and this is likely to increase local health and care need, particularly in relation to frailty;
- The number of years which people spend in good health in Suffolk is falling;
- Inequalities in life expectancy within Suffolk are increasing;
- Levels of relative deprivation in Suffolk have increased;
- One third of 11 year olds in Suffolk are overweight or obese, and fewer than one fifth of 5-16 year olds do the recommended amount of daily physical activity;
- Many children and young people in Suffolk will experience adverse events in their lives; while this does not predetermine their life chances, children experiencing four or more of these adverse events are likely to have increased risks of worse outcomes;
- Social mobility in Suffolk is very low;
- Mental health issues in Suffolk are increasing, reflected in rising rates of diagnosis and of self-harm;
- The number of people living with dementia in Suffolk is expected to double in the next 15 years;
- Many people with cancer in Suffolk are diagnosed very late in their disease, which often limits their chances of a good outcome from treatment; and

- In the future many more people will be living with multiple long term conditions, including cardiovascular disease, diabetes and dementia, some of which could be prevented if we make lifestyle changes in mid-life to lower our risks in later life.

123. The health of people in Suffolk County is varied compared to the England average (***Table 27.12***), but is only worse on two of the parameters listed in ***Table 27.12***[5]***,*** An increase in mental health issues is reflected in the increase in self harm hospital stays.

Table 27.12 Health of People in Suffolk County

Factor	Suffolk County	Comparison to England average
Health of Children		
Children live in low income families	13.6% (16,975)	Better than England at 16.8%
Child obesity in Year 6 of school	17.2% (1,226)	Better than England 20.0%
Alcohol specific hospital admissions among those under 18 (per 100,000 of the population)	33.4 (152)	No significant difference to England at 34.2
GCSE attainment: 5A*-C including English and Maths	53.8% (3,853)	Worse than England at 57.8%
Smokers as a proportion of the population	14.6%	Better than England at 15.6%
Levels of breastfeeding initiation	77.3% (5,772)	Better than England at 74.5%
Health of Adults		
Life expectancy for women (at birth)	84.2	Better than England at 83.1
Life expectancy for men (at birth)	80.8	Better than England at 79.5
Rate of alcohol-related harm hospital stays (per 100,000 of the population)	568	Better than England at 636
Rate of self-harm hospital stays (per 100,000 of the population)	200.6 (1,396)	Worse than England at 185.3
Rate of smoking related deaths (per 100,000 of the population, aged 35+)	229.0 (3,464)	Better than England at 272.0
Estimated levels of adult excess weight	61.5%	No significant difference to England at 61.3%
Estimated levels of adult smoking	13.9% (83,263)	No significant difference to England at 14.9%
The rate of people killed and seriously injured on roads (per 100,000 of the population)	34.0 (756)	Better than England at 39.7
Rate of statutory homelessness (rate per 1,000 households)	1.7 (545)	No statistical comparison possible. England at 3.3

[5] The colour coding is as follows: Blue = better than the average for England, Orange = there is no statistically significant difference between Suffolk and England, Red = worse than the average for England, White = no statistical comparison possible.

Factor	Suffolk County	Comparison to England average
Rate of violent crime (including sexual violence) – per 1,000 of the population	19.4 (14,388)	No statistical comparison possible. England at 20.0
Long term unemployment	0.23% (1,025)	No significant difference to England at 0.37%
Rate of early deaths (under 75) from cardiovascular diseases – per 100,000 of the population	61.2 (1,322)	Better than England at 73.5
Rate of early deaths from cancer (0-64)	40.2% (373)	No significant difference to England at 37.0%
The rate of complaints about noise per year 2015/16	4.1	Better than England at 6.3

124. The relative deprivation for Suffolk County is shown in ***Plate 27.2***[6] (Suffolk Observatory 2015). This shows that relative deprivation of LSOAs in Suffolk County varies across the county and thus inequality is high.

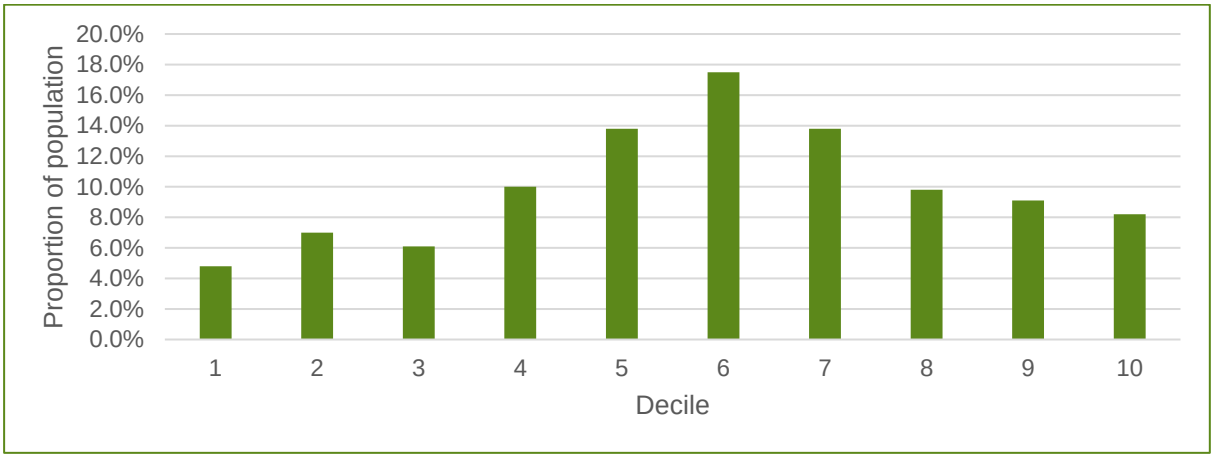

Plate 27.2 Proportion of LSOAs in Suffolk by IMD Decile (Suffolk Observatory 2015)

125. Health priorities for Suffolk County Council (Suffolk County Council 2019) are giving children the best start in life, increasing activity levels among all age groups, ensuring older people have a good quality of life, improving mental health and wellbeing and improving independent life for people with physical and learning disabilities.

27.5.1.2 Suffolk Coastal District

126. The health of people in the Suffolk Coastal District is varied compared with the England average, although is only worse for one parameter (***Table 27.13***).

[6] For larger areas, the ONS considers the proportion of LSOAs within the area that lie within each decile. Decile 1 represents the most deprived 10% of LSOAs in England while decile 10 shows the least deprived 10% of areas.

127. The relative deprivation for Suffolk Coastal District is shown in ***Plate 27.3*** (Suffolk Observatory 2015). For larger areas, the ONS considers the proportion of LSOAs within the area that lie within each decile. Decile 1 represents the most deprived 10% of LSOAs in England while decile 10 shows the least deprived 10% of areas. This shows that the majority of LSOAs in Suffolk Coastal are within the 50% least deprived LSOAs in England and that inequality across the district is relatively low.

128. The onshore development area is completely within the Aldeburgh ward where 66.7% of LSOAs are in decile 7 of 10 and 33.3% are in decile 8 of 10 (Suffolk Observatory 2015). This shows that the LSOAs within the vicinity are generally within the 40% least deprived in England.

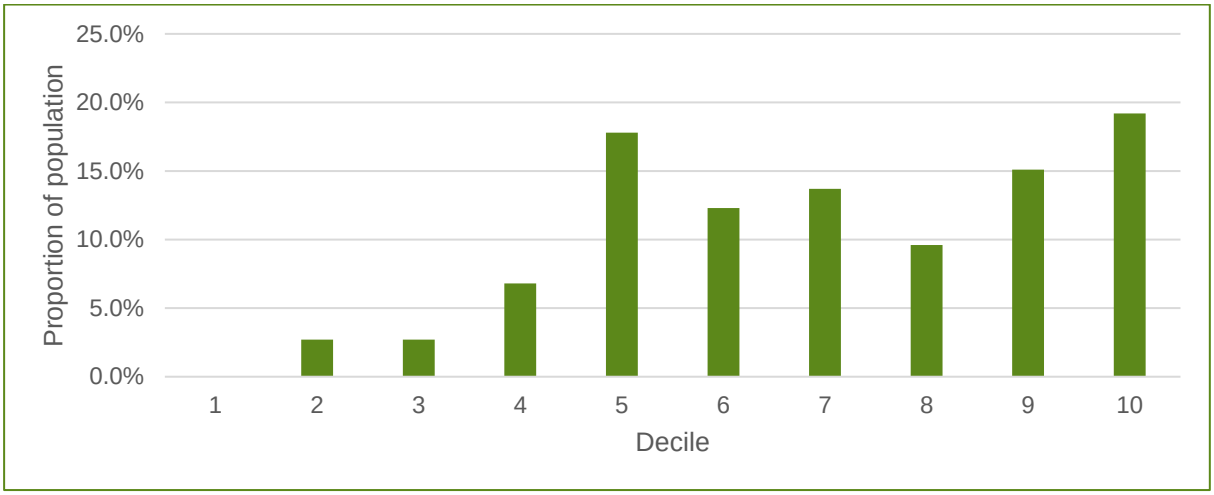

Plate 27.3 Proportion of LSOAs in Suffolk Coastal by IMD Decile (Suffolk Observatory 2015)

Table 27.13 Health of People in the Suffolk Coastal District

Factor	Suffolk Coastal District	Comparison to England average
Health of Children		
Children live in low income families	23.4% (4,090)	Worse than England at 16.8%
Child obesity in Year 6 of school	15.4% (181)	Better than England at 20.0%
Alcohol specific hospital admissions among those under 18 (per 100,000 of the population)	31.5 (23)	No significant difference to England at 34.2
GCSE attainment: 5 A*-C including maths and English	60.2% (738)	No significant difference to England at 57.8%
Smokers as a proportion of the population	12.3%	Better than England at 15.6%
Health of Adults		
Life expectancy for women (at birth)	84.7	Better than England at 83.1
Life expectancy for men (at birth)	81.8	Better than England at 79.5

Factor	Suffolk Coastal District	Comparison to England average
Rate of alcohol-related harm hospital stays (narrow) – per 100,000 of the population	575	Better than England at 636
Emergency Hospital Admissions for Intentional Self-Harm – per 100,000 of the population	182.7	No significant difference to England at 185.3
Rate of smoking related deaths	Not available	N/A
Estimated levels of adult excess weight	56.0%	No significant difference to England, at 61.3%
Estimated levels of adult smoking	9.3% (9,601)	Better than England 14.9%
The rate of people killed and seriously injured on roads (per 100,000 of the population)	32.0	Better than England at 39.7
Rates of sexually transmitted infections and TB	Not available	N/A
Rate of statutory homelessness (per 1,000 households)	0.1 (8)	Lower than England at 2.5
Rate of violent crime (including sexual violence) per 1,000 of the population	12.1 (1,516)	Better than England at 20.0
Rates of long term unemployment	Not available at district level	N/A
Rate of early deaths (under 75) from cardiovascular diseases – per 1,000 of the population	49.4 (201)	Better than England at 73.5
Rate of early deaths (under 75) from cancer – per 1,000 of the population	110.2 (461)	Better than England at 136.8
The rate of complaints about noise per year 2015/16	4.0	Better than England at 6.3

27.5.2 Noise

129. Noise effects are considered at the site-specific level (representative of landfall, onshore cable route, and onshore substation, see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

130. The environmental baseline for noise has been provided in ***Chapter 25 Noise and Vibration***. The baseline and assessment for noise takes account of the existing rural nature of much of the surrounding environment.

131. People who spend extended periods at home may experience greater noise exposure durations than those who are absent during normal working hours (***Table 27.14***).

Table 27.14 Summary of Baseline Relevant to Noise and Air Quality[7]

Project location	Landfall	Onshore development area		Suffolk Coastal	National
Representative LSOA (see ***Figure 27.1***)	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E	Suffolk Coastal average	England average
Households have no adults in employment	56.0%	37.8%	37.4%	10.3%	14.0%
Households include dependent children	10.5%	21.7%	20.5%	32.2%	38.4%
Percentage of population with a long-term health problem or disability (2011 census)	30.9%	29.3%	27.2%	18.5%	17.6%
People aged over 65 years old	50.8%	35.1%	32.5%	26%	17.6%
People report working mainly at or from home	12%	7.4%	7.4%	In 2011 census, 8,232 = 14%	5.4%
Deprivation can increase sensitivity to change					
For overall deprivation[8] where 1 is the most deprived LSOA[9]	23,277	21,985	16,821	240	32,844 LSOAs 326 Districts
Relative deprivation by LSOA or District in England[10]	Amongst the 30% least deprived LSOA	Amongst the 40% least deprived LSOA	Amongst the 50% least deprived LSOA	Amongst the 30% least deprived Districts	n/a

132. The measured indicators that are available for noise effects are not available for smaller areas such as LSOAs. Therefore, the baseline exposure to transport related noise at the regional (County) level, is considered representative of the smaller scale LSOA areas in this region. This indicates that 2.7% of people are exposed to road, rail and air transport noise of 65 A-weighted decibels (dB(A)) or

[7] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

[8] The index of multiple deprivation is comprised of domains for: income; employment; education, skills and training; health deprivation and disability; crime; barriers to housing and services; and living environment.

[9] Ministry of Housing, Communities & Local Government, 2015, English Indices of deprivation 2015. Available at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

[10] When compared against the other 32,844 LSOAs or 326 Districts respectively.

more, during the daytime, compared to an average of 5.2% in England (PHE 2018a and 2018b).

133. The indicator for night-time exposure to noise is also reported only on a regional (County) level and indicates that 3.9% of people in Suffolk are exposed to road, rail and air transport noise of 55dB(A) of more during the night-time, compared to an average of 8.0% for England. The most recent Census data available is from 2011 (PHE 2018a and 2018b).

134. Data from 2015/16 at the local level (***Table 27.13***) indicates a baseline of approximately 4.0 complaints about noise per year per thousand of the population in the Suffolk Coastal District (compared to an estimated value of 5.0 per thousand of the population in England).

27.5.3 Air Quality

135. Air quality effects are expected at the site specific level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

136. As with potential noise disturbance, people who spend extended periods at home (within range of potential effects) may experience greater periods of air pollutant exposure than those who are absent during normal working hours (as described in ***Table 27.14***).

137. The environmental baseline for air quality has been provided in ***Chapter 19 Air Quality***. The assessment concluded that the short term particulate matter (PM_{10}) objective was predicted to be met at all modelled locations.

138. Data from 2016 at the local level (Suffolk Coastal) indicates a baseline annual mean concentration of human-made fine particulate matter ($PM_{2.5}$), as shown in ***Table 27.15***. In comparison to target thresholds these baselines are well below the UK Air Quality Objectives (AQO) threshold but close to the WHO guide value (Public Health England 2018a and 2018b).

Table 27.15 Summary of Baseline for Air Quality[11]

	Suffolk Coastal	England
Annual mean concentration of human-made fine particulate matter ($PM_{2.5}$)	9.1 µg/m^3	9.3 µg/m^3
UK AQO target threshold	25 µg/m^3	
WHO guide value	10 µg/m^3	

27.5.4 Ground and / or Water Contamination

139. The environmental baseline for ground conditions and water resources has been provided in ***Chapter 18 Ground Conditions and Contamination*** and ***Chapter 20 Water Resources and Flood Risk*** respectively.

140. The potential for ground disturbance of historic contamination or new spills of pollutants (such as fuel or oil) to affect communities is dependent on proximity and behavioural exposure influences. This may include use of bathing waters or encountering *in situ* or mobilised contamination (dust or aerosols) whilst in the outdoor environment.

141. Children are more vulnerable to water contamination compared to adults as, in proportion to their body weight, they would ingest comparatively more contaminant than adults. Thus, the proportion of the population who are children and the overall population density is described in ***Table 27.16***.

Table 27.16 Summary of Population Baseline Relevant for Water Contamination

Project location	Landfall	Onshore development area		Suffolk Coastal	National
Representative LSOA	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E	Suffolk Coastal	England average
Resident population aged under 16 at the 2011 Census[12]	9.7%	12.5%	13.1%	17.6%	19%
	Lower than average for England	Lower than average for England	Lower than average for England	Lower than average for England	

[11] Public Health England, 2018. Wider Determinants of Health. Available at: https://fingertips.phe.org.uk/profile/wider-determinants/data#page/3/gid/1938133043/pat/6/par/E12000006/ati/101/are/E07000205/iid/92924/age/-1/sex/-1

[12] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

Project location	Landfall	Onshore development area		Suffolk Coastal	National
Resident population aged under 16 in 2017[13]	9.7%	12.5%	13.1%	16.7 %	19.1%
Population density (persons per km^2)[14]	15.05	7.83	38.71	139	401
	Much lower average for England	Much lower average for England	Much lower average for England	Much lower average for England	

27.5.5 Physical Activity

142. Physical activity effects are expected at the site-specific level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate.

143. On a district level (***Table 27.17***), the proportion of people reporting their health to be very good or good is equal to the average for England. The proportion reporting fair health is slightly above average compared to the average for England. The proportion of people reporting bad or very bad health is slightly lower than the average for England. This is consistent with a similar proportion of people reporting that their day-to-day activities are not limited compared to England. This is despite the slightly older age profile of the area compared to England, which may indicate that the health strategies have thus far been effective, however Suffolk does have an aging population, and this is likely to increase health and care need, particularly in relation to frailty, in the future.

[13] ONS, 2017, Lower Super Output Area Mid-Year Population Estimates (supporting information). Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates

[14] ONS, 2017, Lower Super Output Area Population Density (National Statistics). Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareapopulationdensity

Table 27.17 Summary of Baseline for Physical Activity at LSOA and District Level[15]

Project location	Landfall	Onshore development area		Suffolk Coastal	National
Representative LSOA	Suffolk Coastal 004A	Suffolk Coastal 003A	Suffolk Coastal 003E		England average
People reporting their health is very good or good	73.5%	77%	81.2%	81.2%	81%
Proportion reporting fair health	20.6%	17.3%	13.8%	13.8%	13%
Proportion of people reporting bad or very bad health	5.9%	5.6%	5%	4.5%	5.4%
People reporting that their day-to-day activities are not limited	71.4%	78.5%	80.2%	81.5%	82.4%
Population aged over 65	50.8%	35.1%	32.5%	26%	17.6%
Health deprivation can increase sensitivity to change					
For overall deprivation[6] where 1 is the most deprived LSOA	23,277	21,985	16,821	240	32,844 LSOAs 326 Districts
Relative deprivation by neighbourhoods in England	Amongst the 30% least deprived LSOA	Amongst the 40% least deprived LSOA	Amongst the 50% least deprived LSOA	Amongst the 30% least deprived Districts	n/a
Access to a vehicle is indicative of being able to access alternative physical activity opportunities					
Households have a vehicle (2011 census)	86.4%	90.1%	92.9%	86.0%	74%

144. On a regional level (Suffolk County) (***Table 27.18***), the baseline for physical activity shows a slightly higher percentage of people active in some way in Suffolk Coastal to the average for England. This correlates with the slightly higher percentage of adults using sports club or outdoor spaces for exercise (***Table 27.19***).

[15] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue

Table 27.18 Summary of Baseline for Physical Activity at District and County level[16]

Category	Suffolk Coastal	Suffolk	England
Physically active adults	67.0%	66.8%	66.0%
Physically inactive adults	22.5%	21.7%	22.2%
Adults who do any walking, at least five times per week	47.3%	49.1%	50.6%
Adults who do any walking, at least once per week	84.3%	80.2%	80.6%
Adults who do any cycling, at least three times per week.	4.8%	5.4%	4.4%
Adults who do any cycling, at least once per month	16.7%	16.9%	14.7%

Table 27.19 Summary of Baseline for Exercise Types at County level[17]

Category	Suffolk Average	England Average
Percentage of people aged 16+ with sports club membership	22.7%	22.0%
Percentage of the adult population that is active	67.2%	66.0%
Percentage of people using outdoor space for exercise or other health reasons	18.6%	17.9%

145. The representative populations considered in this assessment are just below the median of relative health deprivation (***Table 27.17*** – approximately 16,800-23,300 out of 34,844). A higher proportion of households in the Suffolk Coastal District have access to a vehicle which would allow them to access wider physical activity opportunities. But this may be representative of the low population density.

27.5.6 Reduced Access to Local Assets

146. There is a potential for access to health assets to be affected at the local level (see ***section 27.3.1***). Baseline data is discussed accordingly, including reference to local or regional indicators as appropriate. District level data is used because statistics are not available at LSOA level.

[16] Public Health England, 2018, Physical Activity. Available at: https://fingertips.phe.org.uk/profile/physical-activity/data#page/1/gid/1938132899/pat/6/par/E12000006/ati/101/are/E07000205
[17] Data from Sport England, 2017, Active People Survey. Available at: https://www.sportengland.org/research/about-our-research/active-people-survey/

147. The district of Suffolk Coastal has been chosen due to the fact that the proposed East Anglia ONE North project is completely located in this district[18]. The population tends to travel further to work than national average but have higher access to health assets. The local area has a lower rate of death of serious injury on the road, which can be correlated with the lower density of people in these regions.

148. The environmental baseline for traffic has been provided in ***Chapter 26 Traffic and Transport***.

149. The human health baseline relevant to this is shown in ***Table 27.20***.

Table 27.20 Summary of Baseline for Journey Times and Access to Services[19]

	Suffolk Coastal	England
Average distance travelled to work	17.2km	15km
Baseline rate of people killed or seriously injured on the roads (per 100,000)[20]	32.0	39.7
Access to Health Assets & Hazards[21]	28.6%	21.2%
Access deprivation can increase sensitivity to change		
For the barriers to housing and services domain of deprivation[22] (where 1 is the most deprived area)	193	326

27.5.7 Employment

150. Employment effects are expected at the regional level (see ***section 27.3.1***). Baseline data is discussed accordingly.

[18] SCDC merged with WDC in April 2019 to form ESC. To ensure a robust assessment, data from SCDC was used to inform this ES chapter, as this data will be representative of the relevant geographic region until such a time that it is superseded by data issued by ESC.
[19] ONS, 2011, 2011 Census Data. Available at: https://www.ons.gov.uk/census/2011census/2011censusdata/2011censusdatacatalogue
[20] Data from 2014 to 2016
[21] Access to Health Assets & Hazards (AHAH) index measures the percentage of the population who live in LSOAs which score in the poorest performing 20% of domains for access to retail services, access to health services, and physical environment.
[22] The barriers to housing and services domain of deprivation is comprised of indictors for: road distance to a post office; road distance to a primary school; road distance to general store or supermarket; road distance to a GP surgery; household overcrowding; homelessness; and housing affordability. Uses rank of average rank.

151. The environmental baseline has been provided in ***Chapter 30 Tourism, Recreation and Socio-Economics.***

152. The human health baseline relevant to this topic is shown in ***Table 27.21***. ***Chapter 30 Tourism, Recreation and Socio-Economics*** and indicates there would be an appropriate pool of construction workers who would benefit from employment opportunities associated with the onshore construction tasks of the proposed East Anglia ONE North project.

153. The percentage of people living in income deprived households in Suffolk County in 2015 was above average compared to England at 18.5%, compared to 14.6% (***Table 27.21***). The percentage of older people and children affected by income deprivation are both below the average for England. In terms of gender pay equality, the average in Suffolk is slightly below the average for England and therefore shows some scope for improvement.

Table 27.21 Summary of Employment Baseline[23]

	Suffolk County	England average
Working age (16-64) people in employment	80.0% (Jan-Dec 2017)	74.4%
People in skilled manual occupations	10.7% in East	10.1%
People affected by income deprivation	18.5%	14.7%
Older people affected by income deprivation	9.9%	16.2%
Children affected by income deprivation	10.4%	19.9%
Gender pay equality[24]	77.83%	80.29%

27.5.8 Electromagnetic Fields

154. Electric and magnetic fields and the electromagnetic forces they represent are an essential part of the physical world. Their sources are the charged fundamental particles of matter (principally electrons and protons). EMFs occur naturally within the body in association with nerve and muscle activity allowing these functions to happen. Humans also experience the natural static magnetic field of the Earth (to which a magnetic compass responds) and natural static electric fields in the atmosphere.

155. Electric and magnetic fields occur in the natural world, and people have been exposed to them for the whole of human evolution. The advent of modern

[23] Public Health England, 2018, Public Health Profiles. Available at: https://fingertips.phe.org.uk/search/income%20deprivatoin#page/1/gid/1/pat/6/par/E12000006/ati/102/are/E10000029

[24] Ratio between the gross median hourly earnings for women and the gross median hourly earnings for men

technology and the wider use of electricity and electrical devices have inevitably introduced changes to the naturally occurring EMF patterns. Energised high voltage power-transmission equipment, along with all other uses of electricity, is a source of EMFs, for example many households make use of large kitchen appliances and mobile technology. Both the Alternating Current (AC) and Direct Current (DC) fields exist in addition to the Earth's steady natural fields.

156. Electric fields are measured in volts per metre (V/m). The atmospheric static electric field at ground level is typically around 100 V/m in fine weather and may rise to many thousands of volts per metre during thunderstorms. Electricity in homes is at a voltage of 230 V (volts) but outside homes it is distributed at higher voltages - from 11,000 V (usually written 11 kV) up to 400,000 V (400 kV). Generally, the higher the voltage, the higher the electric field. Electric fields are readily screened by most building materials and by trees, hedges etc. (unlike magnetic fields). Therefore, the electric field produced by a power line is screened when inside a house and is much less than the field outside without the screening walls. Electric fields next to trees, fences etc. are usually less than when located away from such objects, though they can also be greater directly above a fence.

157. Magnetic fields are produced by current, which is the flow of electricity. Magnetic fields are usually measured in microteslas (µT). The earth's static magnetic field varies over the surface of the globe and is about 50 µT in the UK.

158. In AC the voltage, current and corresponding EMF switches direction. Most national electricity grid infrastructure in the UK uses AC. Within the UK, the frequency of AC mains electricity is 50 hertz (Hz, or 50 cycles per second). Any alternating magnetic field will induce an electric field, which in turn produces a current in a conducting medium. The human body is conducting and will therefore have a current induced in it – albeit, usually, a very small one.

159. Mains-powered AC appliances produce elevated magnetic fields whenever they draw current. Such fields generally fall as the inverse cube of distance, and thus are significant only within a metre or two of the appliance, as shown in ***Table 27.22***.

Table 27.22 Typical Magnetic Field Levels from some Common Mains Appliances in the home (Source emfs.info)

Appliance	Magnetic Field (microteslas, µT)	
	Close to Appliance	1 Metre Away
Electric razor	2000	0.3
Vacuum cleaner	800	2

Appliance	Magnetic Field (microteslas, μT)	
	Close to Appliance	1 Metre Away
TV	50	0.2
Washing machine	50	0.2
Bedside clock	50	0.02
Fridge	2	0.01

160. The Applicant has made the decision to use High Voltage Alternating Current (HVAC) technology. Within the UK, the frequency of AC mains electricity is 50 hertz (Hz). AC fields are described as Extremely Low Frequency (ELF). Electric and magnetic fields are produced by AC power systems operating at 50 Hz frequencies. Sources of static fields are from the earth's natural fields, and fields from lines and cables.

161. As discussed, electric fields are shielded by most common building materials, trees, and fences, and diminish rapidly with distance from the source. When high-voltage underground cables are buried underground, each cable is surrounded by a metal sheath/screen to provide mechanical protection. This also eliminates the electric field outside the cable, but it has no effect on the magnetic field.

162. Large National Grid substations do not produce significant electric fields outside their boundary because the perimeter fence screens the electric field from any sources within the substation. There is equipment inside substations which produces magnetic fields. As the field falls with distance quite rapidly, by the time a person is at the perimeter fence or a few metres outside it, the magnetic field from inside the substation is usually approaching background levels.

163. Overall, ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line but can actually be higher at small distances from the cable. To put this in context, in a buried AC system the typical magnetic field has a strength of 20-24 μT (EMFs.info 2018[25]) when standing directly over it which is, on average, half of that experienced from a TV or washing machine. This drops to 0.12-0.23 μT when 20m away (EMFs.info 2018).

[25] http://www.emfs.info/ This website is maintained by National Grid

27.5.9 Anticipated Trends in the Baseline Condition

164. Key findings of the JSNA are outlined in ***section 27.5.1.1***. The JSNA (Suffolk Health and Wellbeing Board and Suffolk County Council 2015) provides a good overview of future trends in health needs:

- **Population** – in 2017, approximately 757,000 people lived in Suffolk. Compared to England, Suffolk has a higher proportion of people aged 65 and over and a lower proportion of working age people. The total population of Suffolk is expected to grow, with the number of older people increasing rapidly. In 2019, about 1 in 5 people living in Suffolk are aged 65 and over. Over the next 20 years, this is forecast to change, with 1 in 3 Suffolk residents being aged 65 and over, compared to 1 in 4 for England. 4.7% of Suffolk residents were from an ethnic group other than white, with Ipswich being the most multicultural region with 11.1% of its residents from a non-white ethnic group. These trends are also observed in the site specific populations and as such are not expected to change;
- **Outside space** - Suffolk has 12,000 acres (4,800 hectares (ha)) of open access land and 5,500km of footpaths, bridleways and byways plus 800km of cycle lanes and waymarked leisure cycling routes. This means Suffolk has excellent access to outside space for its residents. Within the vicinity of the onshore development area there is a significant amount of outside space and this is not expected to reduce;
- **Work and economy** – the economy of Suffolk is characterised by stable employment and growth rate, but lower than average productivity and wages. 7.4% of Suffolk's population live in the 20% most deprived areas in England – equivalent to around 53,000 people. Based on findings in ***Chapter 30 Tourism, Recreation and Socio-Economics***, this trend is expected to continue;
- **Prenatal and early years** – in 2017, Suffolk saw 7,676 live births (the lowest number in more than a decade). However, there is a consistently large gap in life expectancy for males when compared to females. 12.5% of women smoked during pregnancy, meaning some children started life at a disadvantage. This disadvantage manifests also in children that are born in deprived areas. Reducing smoking and obesity in pregnant women is an opportunity highlighted for prevention. Obesity at school entry age is rising from 20.1% in 2013 to 22.1% in 2014, with this percentage higher in the most deprived areas. It is not expected that these trends would dramatically change however there is a comparatively smaller proportion of children in the site specific populations;
- **Education** – it's estimated that 1 in 7 children live in relative poverty in Suffolk (15%) with health measures for the county's Looked After Children are poorer

than the rest of the population. In 2014, 31.9% of children aged 10-11 in Suffolk were overweight or obese however this was slightly lower than the statistic for England. There is a focus on improving the health and education of early years and school age children due to the positive impact this can have later in life. This includes reducing exposure to tobacco smoke both through smoking themselves and second-hand smoke and increasing activity levels in children. Also targeted interventions for children from deprived communities. A significant change is not expected in this aspect;

- **Moving into adulthood (16-24)** – this focusses on education and inequalities in education and obesity and physical activity. 5.2% of 16-18 year olds in Suffolk were Not in Education, Employment or Training (NEET) in 2015, but the proportion of those NEET was five times higher in the more deprived areas. Males are more likely than females to be active at almost every age, but physical activity declines with age in both sexes, more rapidly in females. A significant change is not expected in this aspect;
- **Working age (25-64)** – 51% of the Suffolk population is aged 25-64 which is below the national average suggesting an ageing population. Health outcomes for the most deprived working age people are significantly worse than those in the least deprived. Early cancer deaths are up to 40% higher in the 20% most deprived parts of Suffolk. Projections in ***Chapter 30 Tourism, Recreation and Socio-Economics*** show that this trend is set to continue. However, none of the site specific populations are within the 20% most deprived in Suffolk; and
- **Retirement age from 65 upwards** – over 77,000 people provide unpaid care in Suffolk, 19,000 of these were over 65. The number of older carers is expected to increase across all age groups with a projected total of almost 31,300 unpaid carers over 65 in Suffolk by 2030. Survey evidence suggests approximately 70% of older carers experience high levels of physical and mental ill health highlighting a need for the health of carers to be protected.

27.6 Potential Impacts

27.6.1 Potential Impacts during Construction

165. This section considers the potential effects during construction as discussed in ***section 27.3.2.1***. First general effects and the potential causal pathway is discussed, then each impact is assessed.

27.6.1.1 Noise Effects

27.6.1.1.1 Health Outcomes

166. During construction, there is potential for noise to temporarily arise from construction works and movement of Heavy Goods Vehicles (HGVs) across the onshore development area.

167. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid infrastructure (site-specific).

168. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

169. The key health outcomes relevant to noise as a determinant of health are cardiovascular health (only as a result of chronic noise effects), mental health (including stress, anxiety or depression as a result of chronic noise effects) and cognitive performance in children, particularly at school (***Table 27.12*** states that currently the GCSE attainment:5A*-C including English and maths for Suffolk County is below the England average). This is particularly relevant to two of the health priorities (***section 27.4.1.4***) outlined by Suffolk County Council, quality of life for the elderly and support to young children.

27.6.1.1.2 Temporal Scope

170. The temporal scope for this effect (as described in ***section 27.3.1.4***) varies depending on the element of the onshore infrastructure and construction stage. The potential temporal scopes are discussed below.

171. At landfall, there is a potential for short term temporal scope due to HDD and the presence of landfall CCS.

172. Along the onshore cable route there is a potential for short term temporal scope because (as described in ***Chapter 6 Project Description***) the onshore cable route will be constructed in 4 sections concurrently, each with a length of 500m to 2km. Within these sections works will be sequential therefore any noise (or dust or emissions, see ***section 27.6.1.2.2***) will be generated within these sections at the locations of construction works or where construction vehicles pass receptors. The onshore cable route construction phase is expected to be no longer than 24 months in duration in total and works are proposed to be undertaken during the day time.

173. At the onshore substation, National Grid substation and connection infrastructure location, there is potential for medium term temporal scope because the works are planned across several years.

174. With regards traffic emissions, there is a potential for medium term temporal scope because this will be a requirement for the entirety of the proposed East Anglia ONE North project. However, locally, the impacts will be short term as the works progress along the onshore cable route.

27.6.1.1.3 Likelihood

175. Assessment in ***Chapter 25 Noise and Vibration*** shows that during construction of the proposed East Anglia ONE North project:

- Predicted noise impacts from construction works at the landfall location and along the onshore cable route receptor locations would be of negligible significance;
- Predicted vibration impact levels from onshore infrastructure construction works would be of minor adverse significance; and
- Predicted impacts from off-site construction traffic noise are at worst of a low magnitude at a medium sensitivity receptor resulting in a minor adverse significance.

176. Due to this the assessment in ***Chapter 25 Noise and Vibration*** states that no additional mitigation is required beyond the embedded mitigation included within the assessment presented in this chapter.

177. ***Figure 27.2*** shows six health and community assets (***Table 27.23***) within 1km of the onshore development area that are mainly care homes or schools. During the day, vulnerable groups (older people and children) would be present in these assets and may potentially be affected by the construction works.

Table 27.23 Health and Community Assets within 1km of the Onshore Development Area

Asset Type	Name	Distance from onshore development area
Care Home	Aldringham Court	0.05km
Care Home	Pear Tree Lodge Residential Home	0.58km
Care Home	Heritage Care at Home Ltd	0.55km
School	Coldfair Green Community Primary School	0.34km
School	Leiston Primary School	0.73km
School	Alde Valley School	0.55km

178. Potential health effects are considered likely because (based on the methods described in ***section 27.4.3.3***) there is a plausible source-pathway-receptor relationship where:

- The source is construction plant and operations;
- The pathway is through noise travelling through the air; and
- Receptors are communities of people.

179. Furthermore, the potential effect is probable as no unusual conditions are required for the source-pathway-receptor linkage.

27.6.1.1.4 Sensitivity

180. As described in ***Table 27.24***, the sensitivity of the general population and vulnerable groups (described in ***section 27.5.1***) can be characterised as medium (based on the methods described in ***section 27.4.3.4***). The sensitivity of the general population is low however there is a higher proportion of older people than national averages, older people (potentially with ongoing health conditions) in care homes and young people at schools near the onshore development area, as shown in ***Figure 27.2***.

Table 27.24 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly more (38 to 56% compared to 10.3%) households with no adults in employment and significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages (***Table 27.14***).
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	In Suffolk County and Suffolk Coastal District, the health of people is varied, but generally better than the average for England. Life expectancy is higher overall when compared against England averages.
Life stage	Households with no adult in employment and no dependent children correlates with the proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. Within the assets listed there are likely to be older people (probably with ongoing health issues) and children.
Outlook	Consultation (through stakeholder events described in ***section 27.2***) indicates that populations closer to the onshore substation have a more concerned outlook than other groups.

27.6.1.1.5 Magnitude

181. As described in ***Table 27.25*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, noise levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.25 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 25 Noise and Vibration*** concludes that residual noise impacts would have negligible to minor adverse significance. The levels of noise experienced would be within working noise limits for temporary disruption.
Extent	Noise effects would be localised to the associated construction activity or vehicle movements. Therefore, they would be felt by a small number of people in the local population.
Frequency	Construction related noise close to particular dwellings or other community receptors would be infrequent and of short duration over a short to medium time period.
Reversibility	Noise effects would end completely once the associated construction elements has been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.1.6 Significance

182. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.26***. Although the sensitivity is medium there is only expected to be a small change to noise levels that is short term, localised and fully reversible. Based on this, noise effects are assessed to be **not significant** for the general population and for vulnerable groups within the general population.

Table 27.26 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.2*****,** scientific literature does show a causal link between chronic noise above certain thresholds and health determinants. The evidence does not indicate a lower threshold at which health effects do not occur.
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There are a higher proportion of older people and people not in work (likely to be a similar group) than national averages therefore these people are likely to spend more time at home. Conversely there are a fewer households with dependent children than national average. Baseline conditions indicate an older, retired, and relatively affluent compared to national deprivation indicators. These characteristics are more prevalent

Evidence sources	Description
	amongst coastal communities than inland communities. Baseline conditions also show care homes and schools within the vicinity of the onshore development area.
Sensitivity	Sensitivity of the general population and vulnerable groups can be characterised as medium. The sensitivity of the general population is low however there is a higher proportion of older people than national averages.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small.
Health priorities	***Section 27.4.1.4*** indicates that quality of life for older people is a key outcome of the Joint Health and Wellbeing Strategy for Suffolk that includes the aim to provide a good environment in which to live for older people.
Consultation responses	Consultation responses raised concerns about construction and traffic related noise in rural areas of relatively low baseline levels of traffic and noise.
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 25 Noise and Vibration.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 25 Noise and Vibration***) the proposed East Anglia ONE North project has avoided significant impacts for noise and vibration, has proposed additional mitigation in place where significant impacts are predicted, and will put in place measures to effectively manage and control noise.

27.6.1.2 Air Quality Effects

27.6.1.2.1 Health Outcomes

183. During construction, there is potential for air quality to be temporarily affected by dust and fine particulate from construction, and emissions from construction vehicles.

184. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid substation (site-specific).

185. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

186. The key health outcomes relevant to this determinant of health are an increased risk of cardiovascular diseases (Meo and Suraya 2015) and asthma exacerbation (Orellano et al. 2017).

27.6.1.2.2 Temporal Scope

187. The temporal scope for this effect (as described in ***section 27.3.1.4***) varies depending on the area of the onshore development area:

- At landfall, there is a short term temporal scope due to HDD and the presence of the landfall CCS;
- Along the onshore cable route there is a short term temporal scope because (as described in ***Chapter 6 Project Description***) the onshore cable route will be constructed concurrently in 4 sections of 500m to 2km with sequential construction in these areas. Therefore, any dust or emissions will be generated along short work intervals or at locations where construction traffic pass receptors. Onshore cable route construction phase is expected to be no longer than 24 months in duration (in line with the assessment presented in ***Chapter 26 Traffic and Transport***) and proposed to be undertaken during the day time;
- At the onshore substation and National Grid substation, there is a medium term temporal scope because the works are planned across several years; and
- With regards traffic emissions, there is a medium term temporal scope because this will be a requirement for the entirety of the proposed East Anglia ONE North project. However, locally, the impacts will be short term as the works progress along the onshore cable route.

27.6.1.2.3 Likelihood

188. The conclusions of ***Chapter 19 Air Quality*** of this ES are as follows:

- Impacts due to construction dust and fine particulate are not significant with appropriate mitigation; and
- Development-generated traffic impacts upon local air quality are not significant.

189. The mitigation measures taken into consideration during the assessment are as described in ***section 19.6.1.1.5*** and ***section 19.6.1.2.1*** of ***Chapter 19 Air Quality***. They include following good construction practice, seeding topsoil stockpiles to reduce windblown particulate matter and committing to the use of Euro VI-standard vehicles during construction where possible to minimise increase of Nitrogen dioxide (NO_2) emissions.

190. The potential health effect is considered likely because (based on the methods described in ***section 27.4.3.3***) there is a plausible source-pathway-receptor relationship where:

- Sources of dust are excavated materials and sources of particulate or emissions are construction traffic;
- The pathway is dispersion through the air and inhalation; and
- Receptors are communities of people.

191. Furthermore, the potential effect is probable as no unusual conditions are required for the source-pathway-receptor linkage.

27.6.1.2.4 Sensitivity

192. As described in ***Table 27.27***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as medium (based on the methods described in ***section 27.4.3.4***). The sensitivity of the general population is low however there is a higher proportion of older people than national averages. It should be noted that the receptor population for noise and air quality is considered to be the same.

Table 27.27 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly more (38 to 56% compared to 10.3%) households with no adults in employment and significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages. (***Table 27.14***)
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	In Suffolk County and Suffolk Coastal District, the health of people is varied, but generally better than the average for England. Life expectancy is higher overall when compared against England averages.
Life stage	Households with no adult in employment and no dependent children correlates with the proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. As shown in ***Table 27.23*** there are also care homes and schools within the vicinity of the onshore development area where older people (probably with ongoing health conditions) and young people are likely to reside during the day.
Outlook	Consultation (through stakeholder events described in ***section 27.2***) indicates that populations closer to the onshore substations have a more concerned outlook than other groups.

27.6.1.2.5 Magnitude

193. As described in ***Table 27.28*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, air quality levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.28 Characterisation of Magnitude

Factor	Description
Severity	Annual mean concentration of human-made fine particulate matter ($PM_{2.5}$) is lower than the England average (***Table 27.15***). As such it is well below UK AQO target threshold and below WHO guide value. Therefore, the small change assessed in ***Chapter 19 Air Quality*** would not increase concentrations above target thresholds.
Extent	Air quality effects would be localised to the associated construction activity or vehicle movements. Therefore, they would be felt by a small number of people in the local population.
Frequency	Construction related dust or particulates close to particular dwellings or other community receptors would be infrequent and of short duration over a short to medium time period.
Reversibility	Air quality effects would end completely once the associated construction elements has been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.2.6 Significance

194. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.29***. Although the sensitivity of the receiving population is considered medium the level of change is expected to be short term, localised and fully reversible. Based on this, air quality effects are assessed to be **not significant** for the general population and for vulnerable groups within the general population.

Table 27.29 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.2***, scientific literature does indicate a causal link between air pollution due to dust, particulate, and various gases, including those associated with internal combustion engines with health impacts. Whilst the literature supports there being thresholds set for health protection purposes, it also acknowledges that for some air pollutants there are non-threshold health effects (i.e. when there is no known exposure threshold level below which adverse health effects may not occur). The assessment has identified population groups that may be particularly sensitive to air quality effects. The assessment in ***Chapter 19 Air Quality*** shows that the

Evidence sources	Description
	concentration of pollutants is not likely to exceeded thresholds set for health protection (i.e. UK AQOs).
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There are a higher proportion of older people and people not in work (likely to be a similar group) than national averages therefore these people are likely to spend more time at home. Conversely there are a fewer households with dependent children than national average. Baseline conditions indicate an older, retired, and relatively affluent compared to national deprivation indicators. These characteristics are more prevalent amongst coastal communities than inland communities. Baseline conditions also show care homes and schools within the vicinity of the onshore development area.
Sensitivity	Sensitivity of the general population and vulnerable groups can be characterised as medium. The sensitivity of the general population is low however there is a higher proportion of older people than national averages.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small.
Health priorities	***Section 27.4.1.4*** indicates that quality of life for older people is a key outcome of the Joint Health and Wellbeing Strategy for Suffolk that includes the aim to provide a good environment in which to live for older people.
Consultation responses	Consultation responses from PHE are relevant to the assessment undertaken in ***Chapter 19 Air Quality***.
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 19 Air Quality***.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 19 Air Quality***) the proposed East Anglia ONE North project has avoided significant impacts for dust and vehicle emissions, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control dust and vehicle emissions.

27.6.1.3 Ground or Water Contamination Effects

27.6.1.3.1 Health Outcomes

195. During construction, water quality has the potential to be temporarily affected by construction site run-off, or temporary impoundment of water courses. Drinking water is not likely to be affected because the population of Suffolk District is supplied by piped drinking water and is not abstracted directly from surface or ground water sources without treatment.

196. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and

- The population near the onshore substation and National Grid substation (site-specific).

197. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

198. The key health outcomes relevant to this determinant of health relate to potential toxicological exposure associated with contaminated bathing water. Effects may relate to either biological toxins (e.g. associated with eutrophication) or chemical toxins (e.g. associated with mobilisation of historic contamination).

27.6.1.3.2 Temporal Scope

199. The temporal scope for these effects is (as described in ***section 27.3.1.4***) very short term because the most likely pathways are at points where the offshore export cable makes landfall, or where the onshore cable route crosses small watercourses using temporary dam and diversion methods. As described in ***Chapter 6 Project Description***, at this point, water would be temporarily impounded upstream of the crossing and, therefore, has the potential to stagnate.

27.6.1.3.3 Likelihood

200. The conclusions of ***Chapter 18 Ground Conditions and Contamination*** and ***Chapter 20 Water Resources and Flood Risk*** of this ES can be summarised as follows.

201. Five water resources are considered in ***Chapter 20 Water Resources and Flood Risk*** with regards Impact 3: Accidental Release of Contaminants provides the following residual significance of impact following mitigation (see ***Figure 20.1 and Figure 20.3***):

- Coastal fringe – no impact;
- Hundred River – minor adverse impact;
- Leiston Beck – minor adverse impact;
- Friston Watercourse – minor adverse impact; and
- Groundwater – minor adverse impact.

202. ***Chapter 18 Ground Conditions and Contamination,*** Impact 4 - Impact on Surface Water Quality from Contamination of Groundwaters And Subsequent Discharge states that "*after adopting the outlined embedded mitigation measures, specifically the adherence to the Environment Agency Pollution Prevention Guidance (PPG)[26], the magnitude of effect will be reduced to negligible*".

203. ***Chapter 8 Marine Water and Sediment Quality*** states that designated Bathing Waters are not located within the 1km area identified as being the most at risk of experiencing elevated levels of suspended sediment concentrations (the nearest being over 7km away) and are therefore considered to be of low sensitivity. An overall minor adverse impact is predicted.

204. The mitigation measures taken into consideration during the assessment are as described in ***Chapter 18 Ground Conditions and Contamination and Chapter 20 Water Resources and Flood Risk and Chapter 8 Marine Water and Sediment Quality.***

205. Based on the methods described in ***section 27.4.3.3*** there is a plausible but unlikely source-pathway-receptor relationship:

- Sources include the potential for increased SSC from marine construction, increased water turbidity, accidental fuel spill, or mobilisation of historic contamination;
- The pathway would be lower water quality, contaminants in surface waters or ground waters discharge to surface water; and
- Receptors include users of watercourses.

206. The plausibility of the potential effect occurring largely depends on unusual conditions to make the source-pathway-receptor linkage. The sources relate to accidental releases of pollutants or the unexpected encountering of historic contamination in combination with a failure of the outlined mitigation measures.

27.6.1.3.4 Sensitivity

207. As described in ***Table 27.30***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4).*** Younger people are considered to be more vulnerable to ground or water contamination due to having a lower body mass and a higher likelihood of

[26] PPG guidance withdrawn in 2015 by the UK Government. Following which, Pollution Prevention for Businesses was published in 2016. The PPGs are revoked as regulatory guidance in England, but still provide a useful guide for best practice measures.

exposure to water bodies during recreational activities. There are fewer young people in the local population than national averages and statistics show that they are generally of better health than average. Therefore, the sensitivity of vulnerable populations is considered to be low.

Table 27.30 Characterisation of Sensitivity

Factor	Description
Inequalities	Across all LSOAs there are significantly fewer people under 16 (both in 2011 and 2017) compared to national averages (***Table 27.16***)
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed. However, there are more children living in low income families than the national average **(*Table 27.13***).
Health status	Young people's health in Suffolk Coastal (***Table 27.13***) is considered to be equal or better than national average.
Life stage	There are significantly fewer households with dependent children (21.7 to 10.5% compared to 38.4%) when compared to national or district averages. (***Table 27.14***), more (38 to 56% compared to 10.3%) households with no adults in employment and a great proportion of people over 65 years old. 32.5 to 50.8% across LSOAs compared to 17.6% and 26% averages at national and district level, respectively. This suggests that the average life stage in the local population is older than average.
Outlook	Consultation has not indicated particular concern about water contamination.

27.6.1.3.5 Magnitude

208. As described in ***Table 27.31*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, water quality levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.31 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination*** conclude negligible to no impact on surface water bodies or ground water discharging to surface water. ***Chapter 8 Marine Water and Sediment Quality*** concludes a minor adverse impact in deterioration in marine water quality from marine activities, although the risk to bathing waters is considered to be low due to the distance of the nearest designated Bathing Water site from the area of marine construction activity.
Extent	Any effects would be highly localised to the associated accidental spillage. Therefore, they would be felt by a very small number of people in the local population.
Frequency	Accidental spillage would be highly infrequent.

Factor	Description
Reversibility	In the event of a spillage any material would be removed and disposed of. Any residual material is likely to be small and diluted in the water body.
Exposure	The general exposure profile would be one of very low exposure by a very small population.

27.6.1.3.6 Significance

209. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.32***. The sensitivity of the receiving population is assessed to be low and the magnitude of change is small. Based on this, water contamination effects are assessed to be **not significant for the general population** and **for vulnerable groups** within the general population.

Table 27.32 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.2*****,** scientific literature indicates sufficient strength of evidence from sufficiently high-quality scientific studies to establish that clean and sufficient drinking water is required to remain healthy. Children may be particularly sensitive to toxicological effects due to developmental stage and more time spent outdoors, including use of bathing waters. The baseline indicates that the areas affected by the proposed East Anglia ONE North project typically have a lower than average percentage of young people (compared to national comparators) and lower population density (compared to national comparators).
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages but a higher level of children living in low income households. However, there is a generally lower level of children in the local population than national averages, children are comparatively healthy and there is a much lower population density.
Sensitivity	Considered to be low for both the general population and vulnerable groups.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small.
Health priorities	Review of regional public health needs assessments and strategies indicates that water quality, as a determinant of health, is not a key public health priority issue, health priorities for Norfolk County Council do focus on young people generally.
Consultation responses	Consultation responses from PHE stress that assessment of water impacts should include potential impacts to human health. This chapter draws on assessments undertaken in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination and Chapter 8 Marine Water and Sediment Quality.***
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination and Chapter 8 Marine Water and Sediment Quality.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 20 Water Resources and Flood Risk*** and ***Chapter 18 Ground Conditions and Contamination and Chapter 8 Marine Water and***

Evidence sources	Description
	Sediment Quality) the proposed East Anglia ONE North project has avoided significant impacts for contamination, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control contamination.

27.6.1.4 Physical Activity Effects

27.6.1.4.1 Health Outcomes

210. During construction, there is the potential for physical activity to be temporarily affected by the proposed East Anglia ONE North project temporarily diverting Public Rights of Way (PRoWs). All other interactions with public spaces such as playing fields and common land has been avoided through site selection as part of the embedded mitigation for the proposed East Anglia ONE North project and discussed in ***Chapter 4 Site Selection and Assessment of Alternatives***.

211. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near landfall (site-specific);
- The population along the onshore cable route (site-specific); and
- The population near the onshore substation and National Grid infrastructure (site-specific).

212. Within these populations the following groups are considered to be more vulnerable to impacts than the general population:

- Children and young people;
- Older people; and
- People with existing poor health (physical and mental health).

213. The key health outcomes relevant to this determinant of health are physical health conditions (e.g. cardiovascular health) and mental health conditions (e.g. stress, anxiety or depression) associated with levels of physical activity and obesity levels. For example, due to the level of active travel (such as road cycling), leisure activities (such as team sports on public facilities) or outdoor activities (such as hiking or mountain biking).

27.6.1.4.2 Temporal Scope

214. The temporal scope for these effects is (as described in ***section 27.3.1.4***) very short term. This is because the onshore cable route does not directly impact any

community infrastructure (such as sports facilities) as shown in ***Figure 30.2***. However, temporary and reversible impacts to PRoWs are discussed in ***Chapter 30 Tourism, Recreation, and Socio-economics*** and will be encompassed within the Outline PRoW Strategy (OPRoWS) which has been submitted as part of the DCO application and is secured under the requirements of the draft DCO. The final PRoW Strategy will be agreed with the Local Planning Authority prior to construction commencing and will detail the mitigation that will be applied to every PRoW which may be affected by the proposed East Anglia ONE North project. During these periods, there may be a change in the tranquillity and perceived quality of physical activity opportunities.

27.6.1.4.3 Likelihood

215. The conclusion of this ES chapter can be summarised as follows, assuming mitigation is implemented:

- There are no residual impacts on community infrastructure (such as sports facilities) as shown in ***Figure 27.2*** and ***Figure 30.2***, due to site selection avoiding interaction with these sites; and
- The onshore development area indicates that there is potential interaction with a number of PRoWs. Residual impact on the majority of PRoWs is negligible, as discussed in ***Chapter 30 Tourism, Recreation, and Socio-economics.***

216. The mitigation measures taken into consideration during the assessment are as described in ***Chapter 30 Tourism, Recreation and Socio-economics***. Any temporary or alternative routes or diversions of PRoWs would be agreed with the Local Planning Authority and will be encompassed in the final PRoW Strategy.

217. ***Chapter 19 Air Quality*** and ***Chapter 25 Noise and Vibration*** provide mitigation measures which will limit the disturbance experienced by users of public space through the onshore construction phase of the proposed East Anglia ONE North project.

218. Based on the methods described in ***section 27.4.3.3*** there is a plausible but unlikely source-pathway-receptor relationship:

- The source is construction activity and vehicles/plant operations increasing emissions and disturbance to users of PRoWs, and recreational areas;
- The pathway is noise, emissions and dust particulates travelling through the air reducing amenity; and
- Receptors are users of the recreational facilities resulting in a lower level of active travel or outdoor recreation.

219. The effects would be due to the sequential construction of the onshore cable route. During this time, temporary alternative routes may be put in place or, at worst, PRoWs would be temporarily closed as agreed with the Local Planning Authority for a short duration. After this, the site would be reinstated except for temporary access points. The area would then be reinstated but some time would be required before the same level of natural coverage (such as grass, shrubs, and hedgerows) returns. This will be detailed in the final PRoW Strategy which will be agreed with the Local Planning Authority post-consent.

27.6.1.4.4 Sensitivity

220. As described in ***Table 27.33***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4***).

221. There is a higher proportion of older people in the site-specific populations than district and national averages but they are also relatively less-deprived and have a high proportion of car ownerships (***Table 27.17***). Adult activity levels are reported at a similar level to national averages that indicates a larger proportion of older people are physically active than on average. This suggests that they would be resilient to potential changes in availability of recreational assets and would temporarily use another location, thus their health would not be affected. This correlates with the rural character of the area and availability of natural areas (such as PRoWs, open land, and woodland) as people would use these assets for physical activity. Therefore, sensitivity of vulnerable groups is also characterised as low.

Table 27.33 Characterisation of Sensitivity

Factor	Description
Inequalities	Although the area around the onshore development area does not have a significant number of sports facilities (***Figure 27.2***) as a rural area it benefits from ready access to open space. This includes PRoWs, open land, woodland, and beaches.
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England. Deprivation levels are lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Health status	Self-reported health levels and activity levels in the three LSOAs are generally consistent with national averages (***Table 27.17***). People in Suffolk Coastal District report marginally higher levels of physical activity than national average across the indicators in ***Table 27.18*** with the exceptions of “adults who walk at least five times a week”. However, this is countered by a higher level of adults who cycle three times a week or once a month. These are broadly similar across the three LSOAs with a slightly more people reporting lower levels of health amongst the landfall community than the inland communities (***Table 27.17***).

Factor	Description
Life stage	A higher proportion of the site specific population is over 65 years old when compared to average levels in Suffolk Coastal District and at a national level. Around half the population at landfall are of an older age and a third amongst in land populations.
Outlook	Consultation responses have not shown a strong concern about the proposed East Anglia ONE North project's impact on physical activity levels. However, consultation has raised the importance of the local PRoW network across on onshore development area.

27.6.1.4.5 Magnitude

222. As described in ***Table 27.34*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, physical activity levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.34 Characterisation of Magnitude

Factor	Description
Severity	As described in ***Chapter 30 Tourism, Recreation, and Socio-economics*** the proposed East Anglia ONE North project is unlikely to adversely impact on recreational assets.
Extent	As shown in ***Figure 27.2*** there are some areas of open or common land in the vicinity of the onshore development area, but it is unlikely that physical disturbances would negatively impact on these areas.
Frequency	Any potential impacts would be short term.
Reversibility	Any disturbance to recreational assets would be completely reversible once construction activities stop.
Exposure	Due to the sequential nature of the construction process there would be a small number of people potentially affected at any one time.

27.6.1.4.6 Significance

223. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.35***. Sensitivity of the receiving population is considered to be low and the magnitude of change is assessed as small. Based on this physical activity effects are assessed to be **not significant for the general population** and **for vulnerable groups** within the general population.

Table 27.35 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.2***, scientific literature does show a substantial health benefit from increased physical activity that includes improvements to mental health. However, there is no evidence to suggest that construction projects reduce the amount of physical activity in an area unless there is an obvious obstruction of recreational assets.
Baseline conditions	The existing environment shows a population with a comparatively high proportion of older people and fewer children. Levels of physical activity are broadly similar to national averages and there is good availability of natural assets that can be enjoyed for recreational physical activity – such as PRoWs and beaches.
Sensitivity	Considered to be low for both the general population and vulnerable groups.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small
Health priorities	Ensuring older people have a good quality of life and that people in general have the opportunity to improve their mental health are both priorities for Suffolk County Council. Access to recreational assets is an import aspect of this.
Consultation responses	Consultation responses do not show a strong concern about the proposed East Anglia ONE North project's impact on physical activity.
Regulatory standards (if appropriate)	There are no relevant regulatory standards.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that proposed East Anglia ONE North project has avoided significant impacts for obstruction to recreational activities, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control temporary obstruction.

27.6.1.5 Effect of Reduced Access to Health Services

27.6.1.5.1 Health Outcomes

224. During construction, there is the potential for journey times and access to be temporarily affected by an increase in the number of HGVs or employee vehicles on the road and temporary traffic management at certain locations. These have the potential to lead to temporary delays and temporarily reduce access to local health services.

225. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the population of Suffolk Coastal District (local).

226. Vulnerable groups are:

- People living in deprived areas; and
- Older people (aged of 65 years).

227. Travelling to, or accessing health care, underpins management of illness or injury. The key health outcomes relevant to this determinant of health are emergency response times or non-emergency treatment outcomes associated with delays or non-attendance caused by increased traffic and journey times arising from additional proposed East Anglia ONE North project traffic.

27.6.1.5.2 Temporal Scope

228. The temporal scope for these effects is (as described in ***section 27.4.3.3***) short term as any obstruction to access would be temporary due to the sequential nature of the construction works.

229. With regards traffic movement, the temporal scope would also be short term. Although the proposed East Anglia ONE North project as a whole has a medium term (measured in years) temporal scope, for areas where impacts are predicted in ***Chapter 26 Traffic and Transport***, the duration is measured in weeks.

27.6.1.5.3 Likelihood

230. ***Chapter 26 Traffic and Transport*** of this ES has assessed a total of 15 highway links, five collision cluster sites, 11 sensitive junctions and two sensitive links within the onshore highway study area for the effects on pedestrian amenity, severance, road safety and driver delay. With the application of additional mitigation measures (as appropriate) the residual impact for all highway links was assessed to be not significant. The detailed assessment in ***Chapter 26 Traffic and Transport*** concluded that no residual significant adverse impacts would arise, with all impacts being of minor adverse or negligible levels.

231. NPS EN-1 (DECC 2011c) requires projects to consider indirect health impacts due to an increase in the size of local population. As discussed in ***Chapter 30 Tourism, Recreation and Socio-economics***, the peak employment level of 249 staff in the third quarter of 2024 (assuming a start date mid 2023) would not increase the population of Suffolk Coastal district by a significant amount. Furthermore, non-residential workers would be distributed within a 45 minute driving cordon of the onshore development area and would be mobile enough to access health services at several locations around Suffolk Coastal, Waveney, Ipswich, and Great Yarmouth. Non-residential workers are also expected to return to their normal residence when not working on the proposed East Anglia ONE North project. It is anticipated that all non-residential workers will maintain being registered with their local GP at their permeant place of residence, and therefore use of any health services in the vicinity of the proposed East Anglia ONE North project by construction workers are likely to be under emergency circumstances only. The project will be undertaken following Construction Design Management (2015) regulations to ensure the protection of the health and safety

of the public. For these reasons, this potential for reduced access to health services will not be considered further.

232. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- Sources include the potential for increased temporary traffic disturbance locally;
- The pathway would be delays in accessing health care; and
- Receptors include people with ongoing health conditions, people living in deprivation and health services responding to emergency calls.

27.6.1.5.4 Sensitivity

233. As described in ***Table 27.36***, the sensitivity of the general population and particularly for vulnerable groups (collectively as a single group) can be characterised as low (based on the methods described in ***section 27.4.3.4***). Sensitivity of the vulnerable group with long-term health problems or disability is considered medium because of this makes up a larger proportion of the population than national averages.

Table 27.36 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality across Suffolk Coastal district and Aldeburgh ward is generally low (***Plate 27.3)***. Deprivation levels are marginally lower at the coast where landfall is proposed compared to inland where the substations are proposed.
Deprivation	The majority of LSOAs in Suffolk Coastal and Aldeburgh ward are within the 50% and 40% of least deprived neighbourhoods in England, respectively. Therefore, there is a lower likelihood of this effect affecting people living in relatively deprived areas.
Health status	Adult health status in Suffolk Coastal is relatively good and people self-report a similar level of health to national averages. However, a higher proportion of people have a long-term health conditions or problems when compared to national averages (***Table 27.14***).
Life stage	A higher proportion of people in Suffolk Coastal are over 65 years old and this proportion is seen to increase amongst coastal populations near landfall. This trend correlates with the higher proportion of people with long-term health problems or disabilities.
Outlook	Consultation responses show that, in general, people closer to the onshore substations hold stronger negative views to the proposed East Anglia ONE North project than other areas. Wider public concerns are mostly related to short term disturbance from construction activities.

27.6.1.5.5 Magnitude

234. As described in ***Table 27.37*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods

described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, reduced access levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.37 Characterisation of Magnitude

Factor	Description
Severity	Following mitigation, the residual impact would be minor adverse.
Extent	Effects would be localised and can be mitigated as identified in ***Chapter 26 Traffic and Transport***
Frequency	Construction and traffic related disturbance would infrequent and for short duration.
Reversibility	Effects would end completely once the associated elements have been completed.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.1.5.6 Significance

235. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.38***. Sensitivity of the receiving population is considered to be low and the magnitude of change is assessed as small. Based on this effect of reducing access to health services is assessed to be **not significant for the general population** and for **vulnerable groups** within the general population.

Table 27.38 Characterisation of Significance

Evidence sources	Description
Scientific literature	Scientific literature, as described in ***Appendix 27.2***, shows that barriers to transport can have significant health effects and community. Particularly for vulnerable groups and especially where there are shortages of health care available.
Baseline conditions	Baseline conditions show that inequality is relatively low across Suffolk Coastal District, the population has a relatively high number of older people and people living with long-term health problems or disabilities. ***Figure 27.2*** also shows that health assets are mainly located in Coldfair Green and Leiston whereas there is a higher proportion of older people in Thorpeness (***Table 27.14*****).** This indicates that they may need to travel further to access health services.
Sensitivity	Sensitivity is considered low for the general population due to low levels of comparative deprivation and health levels that are as good as or better than national averages. However, there is a higher proportion of people with long-term health problems or disabilities thus this vulnerable group is considered to have a medium sensitivity.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small

Evidence sources	Description
Health priorities	Maintaining quality of life of older people is a priority of Suffolk County Council and this would be a factor within that aim.
Consultation responses	Consultation responses have raised concerns about traffic delays for the local population as well as for emergency services
Regulatory standards (if appropriate)	There are no relevant regulatory standards with regards increased traffic delaying access to health services. Regulatory standards with regards traffic impacts in general are detailed in ***Chapter 26 Traffic and Transport.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that proposed East Anglia ONE North project has avoided significant impacts for obstruction to health services, ***Chapter 26 Traffic and Transport*** has proposed mitigation in place where impacts are predicted and will put in place measures to effectively manage and control temporary obstruction.

27.6.2 Potential Impacts during Construction and Operation

27.6.2.1 Employment

27.6.2.1.1 Health Outcomes

236. Employment has been considered across both construction and operation because, as discussed in ***Chapter 30 Tourism, Recreation and Socio-economics***, the development of the proposed East Anglia ONE North project is part of a wider process of developing an offshore wind supply chain in the New Anglia LEP region. Therefore, from a human health point of view, creating a demand for transferable skills (both between construction projects and on to operation of projects) has a multiplying effect on employment. Direct employment by the proposed East Anglia ONE North project also creates indirect employment in the supply chain and induced employment due to expenditure.

237. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the population of Suffolk County (regional).

27.6.2.1.2 Temporal Scope

238. The temporal scope for these effects (as described in ***section 27.3.1.4***) is variable:

- During construction, the temporal effect is measured in years, but individuals may only be directly employed for months at a time. However, the overall effect on direct and indirect employment would be considered across the duration of the construction phase and is therefore medium term; and
- During operation, it is expected that people would be permanently employed, and that this employment could last for decades. Therefore, the temporal scope is long term.

27.6.2.1.3 Likelihood

239. The conclusions of ***Chapter 30 Tourism, Recreation and Socio-economics*** of this ES found that employment has a moderate beneficial impact during construction, a potentially major beneficial impact for the tourism industry (due to increased demand in the off-peak season) and a major beneficial impact on long term employment during the operational phase. To counter this, it also found minor adverse impacts for visitors in both the short and long term which are unlikely to significantly reduce employment in the tourism industry.

240. Enhancement measures taken in to consideration during the assessment is the continuation of the Supply Chain Plan (ScottishPower Renewables 2014) from the East Anglia ONE project[27] that is currently under construction. The continuation of this strategy was agreed as part of East Anglia THREE which has received consent and builds on the process set out for the earlier project. The proposed East Anglia ONE North project would continue the same trend and continue from the position subsequently set. Therefore, a continuation of investment into local employment and supply chains would create long term benefit across many years.

241. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- The source is direct, indirect and induced job creation due to the development of the proposed East Anglia ONE North project;
- The pathway is through employment, with increased probability of effect due to supply chain and skills development being undertaken by ScottishPower Renewables; and
- The receptor is people of working age in the regional labour market (and their dependants).

27.6.2.1.4 Sensitivity

242. As described in ***Table 27.39***, the sensitivity of the general population can be characterised as medium (based on the methods described in ***section 27.4.3.4***).

243. As people cannot be vulnerable to an employment benefit, this population grouping has been omitted from this effect.

[27]Scottish Power Renewables has a majority share in East Anglia ONE and is responsible for the construction, operation and maintenance of the project, and is solely responsible for East Anglia THREE, the proposed East Anglia TWO and proposed East Anglia ONE North projects.

Table 27.39 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality across Suffolk County is generally high (***Plate 27.2***).
Deprivation	Almost as many LSOAs are in the 50% of most deprived neighbourhoods in England as are in the 50% least deprived. The proportion of people suffering income deprivation is higher in Suffolk than England but the proportion of children in households suffering from income deprivation is nearly half that of England (***Table 27.21***).
Health status	Adult health status in Suffolk County is variable but generally comparable or better than averages in England (***Table 27.12).*** People self-report a similar level of health to national averages (***Table 27.18***)
Life stage	Proportion of population that are of working age in Suffolk County is higher than the average for England.
Outlook	Consultation responses show that stakeholders are concerned about the potential for employment due to the proposed East Anglia ONE North project.

27.6.2.1.5 Magnitude

244. As described in ***Table 27.40*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as medium (based on the methods described in ***section 27.4.3.4.2***). Improvements in socio-economic status associated with long term employment are likely to lead to improvements in general wellbeing.

Table 27.40 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 30 Tourism, Recreation, and Socio-economics*** concludes that the proposed East Anglia ONE North project would produce major long term benefit for the region.
Extent	Direct effect would benefit several hundred people (both during construction and operation) and indirect effects due to the continuous supply chain would benefit several hundred more. This may lead to higher expenditure levels by those directly and indirectly employed by the proposed East Anglia ONE North project which could, in turn, benefit people at lower socio-economic levels through induced employment.
Frequency	Although construction employment is contract based over a medium term (years) the continuous demand during construction and operation would generate continuous long term opportunity.
Reversibility	The benefit would be maintained for at least 25 years following construction.
Exposure	The general exposure profile would be one of high exposure to a medium population due to direct or indirect employment and low exposure to a large population due to induced employment.

27.6.2.1.6 Significance

245. As a wider determinant of overall health this has the potential to lead to improvements in wellbeing.

246. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.41***. The receiving population is judged to have a medium sensitivity as deprivation is comparatively high, therefore employment opportunities would be welcomed. The magnitude of change is considered to be medium to large and potentially long term due to the operational lifetime of the proposed East Anglia ONE North project. The development of the offshore wind industry in Suffolk is assessed to be positive (see ***Chapter 30 Tourism, Recreation and Socio-Economics***). Increasing employment demand over a long period is assessed to have a beneficial impact for the general population but the health effect due to the proposed East Anglia ONE North project is considered to be **not significant**.

Table 27.41 Characterisation of Significance

Evidence sources	Description
Scientific literature	Scientific literature, as described in ***Appendix 27.2***, shows that as wider determinant of health, employment has a beneficial impact on general health and wellbeing.
Baseline conditions	Baseline conditions in ***Chapter 30 Tourism, Recreation and Socio-economics*** show that there is a labour market that would benefit from increased demand for employment but also that there is a higher proportion of adults living in income deprivation. This inequality is mirrored in the IMD decile spread in Suffolk County (***Plate 27.2***) where it can be seen that as many people live in relatively deprived areas as relatively affluent areas.
Sensitivity	As such the sensitivity of the general population is considered to be medium.
Magnitude	Magnitude of the long term employment is considered to be medium to large. A medium number of people would receive a moderate to major benefit whereas a large number of people would receive a moderate to minor benefit.
Health priorities	Providing the opportunity for people to improve their wellbeing is a priority for Suffolk County Council. However, it should be noted that long term employment is only one of several wider determinants to lead to this.
Consultation responses	Consultation responses do indicate specific concern about employment opportunities and opportunities for people from lower socio-economic backgrounds.
Regulatory standards (if appropriate)	There are no relevant regulatory standards with regards increased employment opportunities.
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that the proposed East Anglia ONE North project has identified significant benefit from potential employment and proposes enhancement measures with the aim of retaining benefit in the regional economy.

27.6.2.2 Perception of Risk

27.6.2.2.1 Health Outcomes

247. Perception of risk is considered across both construction and operation phases because the concern highlighted by site specific populations at the onshore substation relate to the visual impact of the presence of industrial infrastructure in a rural environment. Although ***Chapter 30 Tourism, Recreation and Socio-economics*** concludes that there is likely to be limited economic change due to the presence of the industrial infrastructure associated with the onshore substation and National Grid infrastructure, PHE have highlighted that the perception of risk has been observed to lead to health outcomes.

248. The population group relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***) the site specific population near to the onshore substation location.

27.6.2.2.2 Temporal Scope

249. The temporal scope for these effects is (as described in ***section 27.3.1.4***) considered to potentially be long term due to the presence of industrial infrastructure in a predominantly rural area.

27.6.2.2.3 Likelihood

250. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship:

- Source: opinions raised at PIDs and the development of local action groups show that there is a clear source of anxiety, predominantly due to potential visual impacts; and
- There is a potential pathway because uncertainty and ambivalence are associated with reduced mental wellbeing, as highlighted by PHE in their scoping response (detailed within ***Appendix 27.1***).

251. The only way to mitigate against uncertainty is through strong communication and provision of information by the Applicant. This has been affected through a series of PIDs (***section 27.2***) as well as targeted briefings and public meetings. Full details of the proposed East Anglia ONE North project consultation process are presented in the Consultation Report (document reference 5.1), which is provided as part of the DCO application. This will be on-going throughout the development process through the production of a Stakeholder Communications Plan, as secured under the requirements of the draft DCO.

252. As described in ***Table 27.42***, the sensitivity of the general population can be characterised as low (based on the methods described in ***section 27.4.3.4***).

Sensitivity of vulnerable groups (e.g. those potentially directly affected by works or with existing strong opinions) is considered to be high.

Table 27.42 Characterisation of Sensitivity

Factor	Description
Inequalities	Inequality in site specific populations are generally low.
Deprivation	All LSOAs are within the 50% of least deprived neighbourhoods in England
Health status	Populations in LSOA 003A (Coldfair Green side) and 003E (Friston side) report a similar level of health as national averages. 003E reports a slightly higher level of people with good to very good health. (***Table 27.17***)
Life stage	Proportion of population that are of older age in LSOA 003A and 003E is 35.1% and 32.5% respectively. This is higher than Suffolk Coastal District (26%) and national averages (17%).
Outlook	Consultation responses show that some people in these site specific populations have strong concerns about the development of industrial infrastructure in a rural area, as well as other concerns around construction activities.

27.6.2.2.4 Magnitude

253. As described in ***Table 27.43***, the magnitude of the change due to the proposed East Anglia ONE North project is characterised as medium (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new physical or mental health condition. However, if people have existing conditions the increase in uncertainty may increase anxiety and exacerbate their condition.

Table 27.43 Characterisation of Magnitude

Factor	Description
Severity	Anxiety is observed amongst site specific populations. This may be affecting general wellbeing amongst some people. However, this is unlikely to lead to a significant change in health outcomes for the general population. ***Chapter 29 Landscape and Visual Impact Assessment*** notes that *"significant effects on the character of the landscape are assessed as occurring within a localised area."*
Extent	People within the onshore study area are demonstrating anxiety about the proposed East Anglia ONE North project. This is mitigated by significant public engagement being undertaken by the proposed East Anglia ONE North project. ***Chapter 29 Landscape and Visual Impact*** notes that the localised areas is "*approximately 1km around the onshore substation and National Grid substation"* and experienced to the north of Friston or whilst using PRoWs.
Frequency	Anxiety is a continuous problem but the perception of risk due to the presence of substations may dissipate over time as people adjust to the change in the landscape.
Reversibility	All construction impacts discussed above will cease at the completion of the construction proposed East Anglia ONE North project. However, the assessed visual impacts will persist throughout operation. The appearance of the onshore substation

Factor	Description
	and National Grid infrastructure will be influenced by the establishment and growth of areas of woodland planting over time providing progressive screening, from an initially limited level of screening when first planted, through partial screening during establishment to full and effective screening at approximately 15 years post planting.
Exposure	The general exposure profile would be one of low exposure to a small population.

27.6.2.2.5 Significance

254. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.44***. The general population is not considered to be sensitive, so even though the magnitude of change is high it is expected that the health impact would be **not significant for the general population**. However, within the general population there are evidently some people who are particularly sensitive to the proposed changes. It would be disproportionate to the overall effect to assess their individual health levels but there is little evidence to connect landscape change of this nature to significant health changes. Some people may still be anxious about the change and the best way to mitigate against this uncertainty is by providing information and engaging them in dialogue. This is being achieved through several public engagement channels as described in ***section 27.6.1.5.3*** and appropriate community consultation will be maintained throughout development. Due to the continuation of this mitigation, the health effect for **vulnerable groups within the general population would be not significant**.

Table 27.44 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarised in ***Appendix 27.2*****.**
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There is a higher proportion of older people than national averages who have a higher probability of living with an existing health condition.
Sensitivity	The general population are considered to have low sensitivity, but vulnerable groups are considered to have high sensitivity.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as medium and is mitigated through a strong public engagement process.
Health priorities	***Section 27.4.1.4*** indicates that people in Suffolk should have the opportunity to improve their mental health and wellbeing.
Consultation responses	PHE specifically states that *"in some cases, perception of risk may have a greater impact on health than the hazard itself."*

Evidence sources	Description
Regulatory standards (if appropriate)	There are no regulatory standards with regards the management of the perception of risk.
Policy context	The perception of risk in not considered under relevant policy.

27.6.3 Potential Impacts during Operation

27.6.3.1 Noise Effects

27.6.3.1.1 Health Outcomes

255. The potential for noise impacts during operation of the onshore substation and National Grid substation has been considered in ***Chapter 25 Noise and Vibration***.

256. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near the onshore substation (site-specific) including the following vulnerable groups:
  - Children and young people;
  - Older people;
  - People with existing poor health (physical and mental health); and
  - People living in deprivation, including those on low incomes.

257. The key health outcomes are the same as those discussed in ***section 27.6.1.1*** in relation to construction noise effects.

27.6.3.1.2 Temporal Scope

258. The temporal scope for this effect (as described in ***section 27.3.1.4***) is long term due to the operation of the infrastructure being at least 25 years.

27.6.3.1.3 Likelihood

259. ***Chapter 25 Noise and Vibration*** concludes that all noise sensitive receptors are assessed to have negligible residual impacts following compliance with the operational noise limit requirement in the draft DCO.

260. The proposed East Anglia ONE North project will limit operational noise from the onshore substation through a requirement of the draft DCO. The requirement of the draft DCO stipulates an operational rating noise limit (in accordance with BS4142:2014+A1:2019) of 34dBA at the nearest sensitive receptors during the day time and night time.

261. Detailed design will be set out in an Operational Noise and Vibration Management Plan to be agreed with the Local Authority to discharge a requirement of the draft DCO. Additional measures likely to be considered as part of these schemes involve:

- Selection of quieter equipment;
- Installation of acoustic enclosures;
- Installation of acoustic barriers;
- Silencing of exhausts/outlets for air handling/cooling units; and
- Locating equipment to take advantage of screening inherent in the design.

262. The 2018 World Health Organization guidance establishes a 45dB L_{Aeq} external noise level as desirable. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise. Windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that *"If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB".*

263. In terms of National Planning Practice Guidance and NPS guidance an outside night time noise level of 45dB L_{Aeq}, is defined as the lowest observed effect level. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.

264. The draft DCO requirement proposes the use of an external rating level (accordance with BS4142:2014+A1:2019) of 34dB $L_{Aeq,5mins}$. The proposed draft DCO requirement is considered appropriate as it is considerably below the external recommendation of 45dBA L_{Aeq} detailed in BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.

265. Based on the methods described in ***section 27.4.3.3*** there is a plausible source-pathway-receptor relationship, where:

- The source is the operation of the onshore substation;
- The pathway is through noise travelling through the air; and
- Receptors are communities of people.

266. Furthermore, the potential effect is probable as no unusual conditions are required for the source-pathway-receptor linkage.

27.6.3.1.4 Sensitivity

267. As described in ***Table 27.24***, the sensitivity of the general population and vulnerable groups in the vicinity of the onshore substation (described in ***section 27.5.1***) can be characterised as medium (based on the methods described in ***section 27.4.3.4***). The sensitivity of the general population is low however there is a higher proportion of older people than national averages, older people (potentially with ongoing health conditions) in care homes and young people at schools near the onshore development area, as shown in ***Figure 27.2***.

27.6.3.1.5 Magnitude

268. As described in ***Table 27.45*** the magnitude of the change due to the proposed East Anglia ONE North project is characterised as small (based on the methods described in ***section 27.4.3.4.2***). At these levels, it is unlikely that there would be changes in the risk of developing a new health condition or of exacerbating an existing condition. Reductions in wellbeing associated with short-term, or very short-term, noise levels would be unlikely to persist beyond the period of elevated exposure.

Table 27.45 Characterisation of Magnitude

Factor	Description
Severity	***Chapter 25 Noise and Vibration*** concludes that residual noise impacts at the onshore substation would have minor adverse significance during the night time.
Extent	Noise effects would be very localised to the onshore substation. Therefore, they would be felt by a small number of people in the local population.
Frequency	Operation related noise close to particular dwellings or other community receptors would be over a long time period.
Reversibility	Noise effects would persist for the duration of the project.
Exposure	The general exposure profile would be one of low exposure by a small population.

27.6.3.1.6 Significance

269. The significance of the potential effects has been informed by the guide questions in ***Table 27.11*** as described in ***Table 27.46***. Although the sensitivity is medium there is only expected to be a small change to noise levels that is localised. Based on this, noise effects are assessed to be **not significant** for the general population and for vulnerable groups within the general population.

Table 27.46 Characterisation of Significance

Evidence sources	Description
Scientific literature	Summarising ***Appendix 27.2*****,** scientific literature does show a causal link between chronic noise above certain thresholds and health determinants. The evidence does not indicate a lower threshold at which health effects do not occur.

Evidence sources	Description
Baseline conditions	Baseline conditions shows lower levels of deprivation compared to national averages. There are a higher proportion of older people and people not in work (likely to be a similar group) than national averages therefore these people are likely to spend more time at home. Conversely there are a fewer households with dependent children than national average. Baseline conditions indicate an older, retired, and relatively affluent compared to national deprivation indicators. These characteristics are more prevalent amongst coastal communities than inland communities. Baseline conditions also show care homes and schools within the vicinity of the onshore development area.
Sensitivity	Sensitivity of the general population and vulnerable groups can be characterised as medium. The sensitivity of the general population is low however there is a higher proportion of older people than national averages.
Magnitude	Change due to the proposed East Anglia ONE North project is characterised as small.
Health priorities	***Section 27.4.1.4*** indicates that quality of life for older people is a key outcome of the Joint Health and Wellbeing Strategy for Suffolk that includes the aim to provide a good environment in which to live for older people.
Consultation responses	Consultation responses raised concerns about operational impacts at the substation.
Regulatory standards (if appropriate)	Compliance with regulatory standards is detailed in ***Chapter 25 Noise and Vibration.***
Policy context	In line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 25 Noise and Vibration***) the proposed East Anglia ONE North project has avoided significant impacts for noise and vibration, has proposed additional mitigation in place where significant impacts are predicted, and will put in place measures to effectively manage and control noise.

27.6.3.2 EMF Effects

27.6.3.2.1 Health Outcomes

270. During operation, EMF effects may arise from the operation of the onshore substation and National Grid substation and along the onshore cable route.

271. The population groups relevant to this assessment, due to either proximity or other sensitivity are (as defined in ***section 27.3.1.2***):

- The population near the onshore substation (site-specific); and
- The population along the cable route including the following vulnerable groups:
  - Children and young people;
  - Older people;
  - People with existing poor health (physical and mental health); and
  - People living in deprivation, including those on low incomes.

27.6.3.2.2 Temporal Scope

272. The temporal scope for potential effects would be likely to be long term due to the operation of the infrastructure being at least 25 years.

27.6.3.2.3 Likelihood

273. The Applicant's policy is only to design and install equipment that is compliant with the relevant exposure limits. To ensure this, all of the equipment for the proposed East Anglia ONE North project capable of producing EMFs will be assessed in accordance with the provisions of the UK Government's Code of Practice on Compliance, which is compliant with ICNIRP guidance (ICNIRP 1998).

274. There are two main sources of EMF within the onshore development area: the HVAC underground cable and the substation site (including the onshore substation and National Grid infrastructure). AC produces a magnetic field that switches direction and induces a current in a conducting material.

275. As described in ***section 27.4.1.3.1***, if the EMFs produced by an item of equipment are lower than 9kV/m and 360µT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with PHE recommendations and UK Government policy.

276. National Grid (EMFs.info 2018) provides the following information with regards the magnetic fields for buried underground cables and substation.

277. The maximum magnetic field typically produced by an underground 400kV HVAC cable is[28] between 80µT and 95µT depending on type of installation (as shown in ***Table 27.22*** this is significantly lower than the field created by a vacuum cleaner). The typical fields are much lower between 21µT and 24µT. The magnetic field strength drops rapidly with distance and by 5m a buried 400kV cable would typically have a maximum field strength of between 7µT and 13µT.

278. Fields from substations are usually measured rather than calculated. Calculations are not usually feasible because of the complex geometry of the current paths within a substation. At the perimeter fence of a large, high-voltage substation, the highest fields are invariably produced by overhead lines or underground cables entering the substation. Away from these lines and cables, the field would normally be below 1µT[29].

279. Magnetic fields will be calculated and measured where appropriate but are expected to be well below the limit of 360µT, including directly beneath the

[28] Information available online at: http://www.emfs.info/sources/overhead/specific/400-kv/
[29]Information available from: http://www.emfs.info/compliance/public/

overhead lines where fields are highest. When compared to ***Table 27.22*** it can be seen that the expected level of a typical magnetic fields is below that of a domestic appliance.

280. Based on the methods described in ***section 27.4.3.3*** there is no a plausible source-pathway-receptor relationship:

- The source of EMF arising from the onshore cable route, and onshore substations are all below regulatory exposure limits;
- There is limited demonstrable health effect due to static EMF from HVAC infrastructure and all elements of the onshore substation are designed within regulatory standards; and
- Receptors would be people living close to the onshore substation. But typical level of magnetic fields generated by infrastructure is expected to be below typical levels of household appliances.

27.6.4 Potential Impacts during Decommissioning

281. No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that the industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.

27.7 Cumulative Impacts

282. As discussed in ***section 27.4.4***, this ES chapter takes a different approach to the methodology used for the CIA described in ***Chapter 5 EIA Methodology***. This starts from the consideration of the many inter-relationships between determinants of health and health outcomes. Therefore, the sections considering interactions and inter-relationships discussed in other technical ES chapters, are included in the overall approach of cumulative effect.

283. This section on inter-relationships considers both cumulative intra-project effects and cumulative inter-project effects:

- **Intra-project** effects relate to the combined influence from different aspects of the proposed East Anglia ONE North project on the same population groups; and
- **Inter-project** effects consider the effect of the proposed East Anglia ONE North project together with the expected effects of other projects that may be occurring at a similar time with effects to the same populations.

27.7.1 Cumulative Impact with the proposed East Anglia TWO Project

284. The East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application phase. The proposed East Anglia TWO project has a separate DCO application which has been submitted at the same time as the proposed East Anglia ONE North project. The two projects share the same landfall location and onshore cable corridor and the two onshore substations are co-located, and connect into the same National Grid substation. This co-location strategy has been designed to minimise cumulative impacts that might arise from the construction of the two offshore windfarms, including impacts associated with traffic, noise, air quality and number of PRoWs affected, which may impact on the health of the local community.

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

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

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

287. More detailed information regarding these scenarios is given in ***Chapter 5 EIA Methodology***.

288. As discussed in ***section 27.4.3***, change in health determinants are reliant upon the size of the factor influencing it. Under scenario 2, the proposed East Anglia ONE North and the proposed East Anglia TWO projects will be constructed sequentially. Under scenario 2, whilst acknowledging the repeated 3-year construction period and thereby the duration of impact is extended, the construction phase of the two projects would not overlap and therefore none of the potential effects discussed in ***section 27.6.1*** would combine temporally to create a greater influence.

289. Therefore, both intra-project and inter-project cumulative effects will be considered under scenario 1 where both the proposed East Anglia ONE North and proposed East Anglia TWO projects are built simultaneously. Under this scenario it is likely for effects to be increased. As such this would be the worst case scenario with regards change to human health determinants, as described in ***Table 27.47***.

Table 27.47 Realistic Worst Case Scenarios

Impact	Parameter	Notes
Construction		
Noise Effects	Intensity and duration of noise	Under scenario 1 overall noise effects would not increase in residual significance compared to building one project in isolation.
Air Quality Effects	Intensity and duration of dust or emissions	Under scenario 1 overall air quality effects would not increase in residual significance compared to building one project in isolation.
Ground or Water Contamination Effects	Simultaneous construction would not increase the likelihood of spillage or exposure to contaminated land	This will not be considered as a cumulative intra-project effect. But will be considered as an inter-project effect discussed in ***section 27.7.3.***
Physical Activity Effects	Reliant upon on location of multiple effects.	Intra-project effects discussed in ***section 27.7.2*** and Inter-project effects discussed in ***section 27.7.3***
Effect of Reduced Access to Health Services	Reliant upon on location of multiple effects.	Intra-project effects discussed in ***section 27.7.2*** and Inter-project effects discussed in ***section 27.7.3.***
Construction and operation		
Employment	Reliant upon the number of people employed.	Only considered as an Inter-project effect discussed in ***section 27.7.3.***
Perception of Risk	It is possible that multiple projects being constructed will increase anxiety.	Only considered as an Inter-project effect discussed in ***section 27.7.3***.
Operation		
Noise Effects	Both the proposed East Anglia ONE North and proposed East Anglia TWO projects operational infrastructure will not exceed the operational	Intra-project effects discussed in ***section 27.7.2***

Impact	Parameter	Notes
	noise rating level (in accordance with BS4142:2014+A1:2019) of 34dBA secured through a requirement of the draft DCOs.	
EMF Effects	All of the equipment for the proposed East Anglia ONE North and proposed East Anglia TWO projects capable of producing EMFs will be in accordance with the provisions of the UK Government's Code of Practice on Compliance, which is compliant with ICNIRP guidance (ICNIRP 1998).	Not scoped in to the cumulative assessment
Decommissioning		
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.		

27.7.2 Intra-project Cumulative Effects

290. Intra-project cumulative effects consider whether there are areas where effects to more than one health determinant by the proposed East Anglia ONE North project and East Anglia TWO project may lead to a health outcome.

291. The following section considers the overall effect of different elements of the proposed East Anglia ONE North project and East Anglia TWO project on the same population groups. This includes populations geographically defined within the onshore development area, as well as those defined for other sensitivities.

292. Due to their increased likelihood to spend more time at home and their vulnerability to environmental changes it is assessed that there is an increased likelihood of effects on older people, those with existing health conditions and those living in deprived areas. Intra-project cumulative effects for site specific population groups are discussed in ***Table 27.48***. Potential vulnerable groups are discussed in ***Table 27.49.***

Table 27.48 Intra-project Cumulative Effects for Site Specific Population Groups

	Population near landfall	Population along the onshore cable route	Population near the onshore substation and National Grid substation
Effects related to location	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.
Outcome for general population at location	Upon following the mitigation stated in the EIA, the general population intra-project cumulative effect is considered to be **not significant** due to the very short temporal scope of negligible effects and the avoidance of significant impacts through design decisions taken during the site selection process.	Upon following the mitigation stated in the EIA, the general population intra-project cumulative effect is considered to be **not significant**. This is due to the sequential construction process which results in negligible effects of very short temporal scope at individual locations.	Upon following the mitigation stated in the EIA, the general population intra-project cumulative effect is considered to be **not significant**. Consultation and site selection has led to design decisions that reduce the likelihood of health outcomes due to accumulated effects.
Outcome for vulnerable population at location	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. This is because of the likelihood that vulnerable groups will be at home during the day and may feel the effects accumulate more rapidly. However, the effects would be **not significant** because magnitude is low, the effects are localised, short term and reversible and transient.	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. This is because of the likelihood that vulnerable groups will be at home during the day, and may feel the effects accumulate more rapidly However, the effects would be **not significant** because magnitude is low, the effects are localised, short term and reversible and transient.	For relevant vulnerable groups, combined proximity and increased sensitivity may result in a cumulative effect. The cumulative effect on physical health is **not significant.** Some people may feel more anxious due to perceived risk however the cumulative health effect would be **not significant**.

Table 27.49 Intra-project Cumulative Effect for Potentially Vulnerable Groups within site Specific Populations

	Children and young people	Older people	People with existing poor health (physical and mental health)	People living in deprivation, including those on low incomes
Effects related to vulnerable group	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; and • Journey times or reduced access.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; and • Journey times or reduced access.
Outcome for vulnerable population at location	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered to be **not significant**. This is because the main effect on children would be a change in conditions that reduce their ability to concentrate while at school but design decisions (for example onshore cable route refinement) have avoided these effects where possible.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered possible due to the increased percentage of older people in the community and the likelihood that they would spend more time at home where they may feel the effects accumulate more rapidly. However, the health effect would be **not significant** due to low level of change.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered possible because they are more likely to be at home where they may feel the effects accumulate more rapidly and may feel anxiety more acutely due to their existing conditions. However, the health effect would be **not significant** due to low level of change.	The intra-project cumulative effect for this group, taking account of differing effects across geographic levels, is considered to be **not significant**. On the one hand deprivation may increase their vulnerability of effects but on the other hand the increased opportunity for training and employment may have a beneficial effect.

27.7.3 Inter-project Cumulative Effects

293. Inter-project cumulative effects are those effects that would increase due to the presence of more than one project in an area. Following a review of projects which have the potential to overlap temporally or spatially with the proposed East Anglia ONE North project, two developments have been scoped into the CIA. The full list of projects for consideration has been developed in consultation with the Local Planning Authority. The two developments are the Sizewell C New Nuclear Power Station and the Sizewell B Power Station Complex, which includes construction and decommissioning / demolition works, see ***Table 27.50***. The developments are considered along with the proposed East Anglia TWO project.

Table 27.50 Summary of Projects Considered for the CIA in Relation to Human Health

Project Name	Status	Development Period	[30]Distance from East Anglia ONE North Onshore Development Area	Project Definition	Level of Information Available	Included in CIA	Rationale
Sizewell C New Nuclear Power Station	PEIR formally submitted 04.01.19.	Application expected in 2020. Construction expected to commence in 2021.	1.4km	A new nuclear power station at Sizewell in Suffolk. Located to the north of the existing Sizewell B Power Station Complex, Sizewell C New Nuclear Power Station would have an expected electrical capacity of approximately 3,260 megawatts (MW). Full PEIR available: https://www.edfenergy.com/download-centre?keys=&tid=1380&year%5Bvalue%5D%5Byear%5D=	Tier 5[31]	Yes	Potential for Cumulative effects on noise, air quality, physical activities, employment and journey times or reduced access to healthcare and perception of risk.
Sizewell B Power Station Complex	Planning application formally submitted 18.04.19. Awaiting Decision.	Construction expected to commence in 2022. Expected construction timetable of 53 months.	1.4km	The demolition and relocation of facilities at the Sizewell B Power Station Complex. In outline, demolition of various existing buildings (including the outage store, laydown area, operations training centre and technical training facility), and erection of new buildings, including a visitor centre, and the	Tier 4[32]	Yes	Potential for cumulative effects on noise, air quality, physical activities, employment

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

Project Name	Status	Development Period	[30]Distance from East Anglia ONE North Onshore Development Area	Project Definition	Level of Information Available	Included in CIA	Rationale
		Peak construction is expected in 2022, completion of construction expected in 2027.		construction of new access road, footpath and amended junction at Sizewell Gap; and associated landscaping and earthworks/recontouring. Full planning application available: https://publicaccess.eastsuffolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=PQ5NVGQXJJ100			and journey times, reduced access to healthcare and perception of risk.

294. Therefore, the following section considers the overall effect on health of the proposed East Anglia ONE North project being constructed simultaneously with:

- The proposed East Anglia TWO project;
- The Sizewell C New Nuclear Power Station; and
- The Sizewell B Power Station Complex.

295. This includes consideration of geographically defined populations, as well as those defined for other sensitivities. Cumulative impacts are not anticipated to occur during operation of the proposed East Anglia ONE North project. The Applicant is in ongoing consultation with EDF Energy to coordinate projects and understand cumulative effects between the two nuclear power stations and two proposed offshore windfarms.

296. Cumulative impacts with Sizewell C New Nuclear Power Station have been assessed using publicly available information:

- Sizewell C New Nuclear Power Station Scoping Report (EDF Energy 2014);
- Sizewell C New Nuclear Power Station Stage 2 Pre-Application Consultation (EDF Energy 2016);
- Sizewell C Proposed Nuclear Development Stage 3 Pre-Application; and
- Consultation available from the EDF Energy website (EDF Energy 2019a).

297. Cumulative impacts with Sizewell B Power Station Complex have been assessed using publicly available information:

- Sizewell B Relocated Facilities Planning Application, including Environmental Statement and associated documents (EDF Energy 2019b).

298. The construction activities required for Sizewell C New Nuclear Power Station are considerably greater than those required for the proposed East Anglia ONE North project, the proposed East Anglia TWO Project or works associated with Sizewell B Power Station Complex.

299. The construction and demolition works for the proposed Sizewell B Power Station Complex are anticipated to be undertaken in two phases over a 53 month period. At peak, the construction would require a workforce of 78 workers in Phase One and 70 workers in Phase Two. The peak year of construction is proposed to be 2022. The earliest start of construction for the proposed East Anglia ONE North project is mid 2023, with peak employment of 307 staff in

2024, and therefore as a worst case there may be overlap during Phase Two of Sizewell B Power Station Complex construction works.

300. Construction of the proposed Sizewell C New Nuclear Power Station is anticipated to be 10 years and as a worst case is assessed as overlapping with construction of the proposed East Anglia ONE North project. The proposed Sizewell C New Nuclear Power Station is anticipated to involve 5600 personnel on the main site plus 500 workers at associated development sites during the peak of the construction phase, although a higher number of construction staff are being considered in EDF Energy's assessments as a worst case. As such, EDF Energy are considering a series of mitigation measures to minimise impacts on the local population, all of which will be agreed with stakeholders before construction for the power station can commence, to reduce any impacts to an acceptable level. These include the following measures relevant to human health:

- Use of a rail led strategy or road strategy for freight management to reduce pressure on local road networks and move construction related traffic from populated areas (either of which would require a series of updates to both local rail and road networks);
- Commitment to the construction of a dedicated accommodation campus to house construction workers to minimise pressure on existing accommodation options;
- Development of a Construction Workforce Accommodation Strategy for those not housed within the dedicated campus;
- Undertaking of a Health Impact Assessment and creation of a Health Action Plan;
- Provision of an occupational healthcare package for workers that will avoid adding pressure on services currently provided by public bodies, including health risk prevention, health promotion, the provision of an onsite GP surgery for workers, management of referrals, provision of first aiders;
- Creation of an emergency services working group in order to work with fire and rescue, police and ambulance services and coastguard to ensure mitigation is in place for potential safety incidents on site, meeting project demand for the number and type of incidents which might occur on site and ensuring emergency response vehicles are not delayed in the local communities;

- Development of a strategy for PRoW diversions, including options for stakeholder consultation;
- Provision of Construction Worker Travel Plan, and consideration of park and rides, car sharing initiatives, walking and cycling to work; and
- Further strategies to mitigate negative effects and maximise benefits will be consulted on throughout the planning process (EDF Energy 2016).

27.7.3.1.1 Potential Cumulative Impacts during Construction

301. It should be noted that It has not been possible to undertake a quantitative assessment of the cumulative construction phase road traffic noise emissions with Sizewell C New Nuclear Power Station. EDF Energy have embarked upon a Stage 4 consultation exercise scheduled to run from 18 July to 27 September 2019. This Stage 4 consultation document does not contain sufficient information in terms of a freight management strategy to facilitate a quantitative assessment, therefore it is unable to be incorporated into the proposed East Anglia ONE North project cumulative assessment.

302. Therefore, a qualitative assessment has informed ***section 27.7.3.1.1.1***, ***section 27.7.3.1.1.2*** and ***section 27.7.3.1.1.5***, all of which require a detail freight management strategy to undertake a quantitative construction cumulative impact assessment.

27.7.3.1.1.1 Noise Effects

303. Cumulative noise impacts are considered in ***Chapter 25 Noise and Vibration,*** where Sizewell C New Nuclear Power Station is the only project taken forward into the CIA with the proposed East Anglia TWO project (Sizewell B Power Station Complex is scoped out of the CIA, for further details refer to ***Chapter 25 Noise and Vibration***). The magnitude of effect of any cumulative effects is dependent on the construction phasing of the Sizewell C New Nuclear Power Station project relative to the proposed East Anglia ONE North project. The Sizewell C New Nuclear Power Station is subject to an EIA, and therefore it is likely that the Sizewell C New Nuclear Power Station will implement site-specific measures to mitigate noise associated with construction works which would be implemented as part of a CoCP specific for the Sizewell C New Nuclear Power station. It is therefore not anticipated that any cumulative effects associated with the construction phase will be significant in EIA terms.

304. It has not been possible to undertake a quantitative assessment of the cumulative construction phase road traffic noise emissions with Sizewell C New Nuclear Power Station. EDF Energy have embarked upon a Stage 4 consultation exercise scheduled to run from 18 July to 27 September 2019. This

Stage 4 consultation document does not contain sufficient information in terms of a freight management strategy to facilitate a quantitative assessment, therefore it is unable to be incorporated into the proposed East Anglia ONE North project cumulative assessment.

305. Recognising that Stage 3 information released by EDF Energy is out of date, a detailed quantitative CIA cannot be provided at this stage because a detailed CIA alone would potentially be based upon out of date and incorrect information.

306. Therefore, it has not been possible to undertake a quantitative assessment of the cumulative construction phase road traffic emissions with Sizewell C New Nuclear Power Station. This CIA presented recognises the potential for cumulative impacts but recognising the low magnitude of effects from the proposed East Anglia TWO and East Anglia ONE North projects relative to the Sizewell C New Nuclear Power Station. Further detail is provided in ***Chapter 26 Traffic and Transport***. Cumulative road traffic noise emission impacts were not predicted to be significant for human receptors when considered qualitatively alongside Sizewell C New Nuclear Power Station.

307. Prior to construction, the proposed East Anglia ONE North project will produce a CoCP and Construction Traffic Management Plan (CTMP) that will be submitted to the Local Planning Authority for approval to discharge requirements of the draft DCO. It is anticipated the Sizewell C New Nuclear Power Station will also produce a CTMP prior to construction. It is therefore considered that any cumulative effects will be mitigated through compliance with these approved documents during construction.

27.7.3.1.1.2 Air Quality Effects

308. Cumulative air quality impacts are considered in ***Chapter 19 Air Quality***, where Sizewell C New Nuclear Power Station is the only project taken forward in the CIA with the proposed East Anglia TWO project (Sizewell B Power Station Complex is scoped out of the CIA, for further details refer to ***Chapter 18 Air Quality***).

309. The Sizewell C New Nuclear Power Station DCO application will include a construction dust impact assessment in accordance with Institute of Air Quality Management (IAQM 2017) guidance. The proposed East Anglia ONE North project will incorporate embedded and additional mitigation measures as recommended by the IAQM (as detailed in ***Chapter 19 Air Quality***) as well as soil stockpile management measures to control windblown particulates and a commitment to use of Euro VI HGVs during construction to minimise increases of NO_2.

310. It was concluded that cumulative impacts on air quality associated with construction phase dust were not significant in EIA terms at human receptors.

311. It has not been possible to undertake a quantitative assessment of the cumulative construction phase road traffic emissions with Sizewell C New Nuclear Power Station for the reasons discussed above. This CIA presented recognises the potential for cumulative impacts but recognising the low magnitude of effects from the proposed East Anglia TWO and East Anglia ONE North projects relative to the Sizewell C New Nuclear Power Station. Cumulative road traffic emission impacts were not predicted to be significant for human receptors when considered qualitatively alongside Sizewell C New Nuclear Power Station.

27.7.3.1.1.3 Ground or Water Contamination Effects

312. Ground or water contamination effects are considered in ***Chapter 18 Ground Conditions and Contamination*** and ***Chapter 20 Water Resources and Flood Risk.*** Impacts to designated Bathing Waters are discussed in ***Chapter 8 Marine Water and sediment Quality,*** where no cumulative impact is anticipated in the marine environment.

313. As detailed in ***section 27.6.1.3*** above, in line with the NPS EN-1 (DECC 2011c) it is considered that (based on the assessment in ***Chapter 18 Ground Conditions and Contamination*** and ***Chapter 20 Water Resources and Flood Risk***) the proposed East Anglia ONE North project has avoided significant impacts for contamination, has proposed mitigation in place where impacts are predicted, and will put in place measures to effectively manage and control contamination. This mitigation will also be in place for construction of East Anglia TWO.

314. EDF Energy state that in order to prevent pollution within the construction areas, features such as oil separators and filters would be used to remove hydrocarbons. For sustainability, water or dewatered groundwater, instead of potable water, may be reused for construction activities (e.g. dust suppression). Sustainable Urban Drainage Systems (SuDS) would be used, where possible, to manage surface water. Water management zones are commonly used as part of SuDS. A number of water management zones would be created within the main development site, in which surface water run-off would be attenuated, treated (if required) and monitored before being infiltrated back into the groundwater system or discharged to local watercourses under the relevant environmental permit.

315. All four projects are located (or partly located) within the Leiston Beck catchment area, and, to a lesser extent, the Hundred River catchment. Although

cumulative impacts have potential to occur though alteration of surface water flows, surface run off or accidental leaks and spillages, these will be mitigated through the construction environmental managed measures outlined for each project.

316. Given that all four projects will follow industry best practice guidance and have outlined a suite of mitigation to manage any risk to ground or water contamination, any associated impacts to health are assessed to be medium term, plausible but unlikely and of low magnitude on a population of medium sensitivity. Overall this is considered to be **not significant** when considered cumulatively.

27.7.3.1.1.4 Physical Activity Effects

317. The Applicant will agree a PRoW strategy with the Local Planning Authority prior to construction. An OPRoWS has been submitted as part of the DCO application and is secured under the requirements of the draft DCO. This will detail all agreed mitigation for any PRoW which may be affected by the construction activities of the proposed East Anglia ONE North project, which will also be relevant for the proposed East Anglia TWO project due to the shared route. Works associated with the proposed East Anglia ONE North project and proposed East Anglia TWO project will be limited and short term in nature. As discussed in ***section 27.6.1.4*** above, residual impact on the majority of PRoWs is negligible, as discussed in ***Chapter 30 Tourism, Recreation, and Socio-economics***. Physical activity effects are assessed to be not significant for the general population and for vulnerable groups within the general population.

318. A PRoW Strategy has been developed for the proposed Sizewell B Power Station Complex works, and one will also be developed for the proposed Sizewell C New Nuclear Power Station in consultation with local stakeholders to ensure local PRoW networks are diverted or mitigated appropriately to allow appropriate access to NMU.

319. Although the construction of the four projects will lead to disruptions to a number of PRoWs, the co-ordination with local stakeholders will ensure a suitably and agreed strategy is in place for all PRoWs which might be affected. As such the cumulative impact is assessed to be medium term and of low magnitude on a population of medium sensitivity, equating impacts of negligible to minor adverse. This is assessed to be **not significant**.

27.7.3.1.1.5 Effects of Journey Times and Reduced Access to Health Services

320. As described in ***section 27.6.1.5***, the effect of reducing access to health services is assessed to be not significant for the general population or for vulnerable groups within the general population. The increase in population due

to migrant workers is not anticipated to add significant pressure on existing health care facilities as workers would continue to be registered with a GP at their permanent place of residence.

321. Sizewell C New Nuclear Power Station will potentially create considerably higher pressure on local facilities than those anticipated for the other three projects due to the greater workforce and duration of works required for construction, and as such EDF Energy plan to mitigate these through a series of strategies (as detailed in the consultation material produced by EDF Energy listed in ***section 27.7.3***), including provision of healthcare facilities for its construction workforce and liaison with emergency services. The mitigation proposed for Sizewell C New Nuclear Power Station will be as such that all potential impacts will be reduced to an acceptable level and agreed to by stakeholders prior to construction activities commencing.

322. ***Chapter 26 Traffic and Transport*** has proposed mitigation in place where impacts are predicted, and will put in place measures, including ensuring all vehicles travel to a CCS at Link 9 where loads can be broken down and placed on smaller vehicles to minimise driver delay, to effectively manage and control temporary obstruction generated by the construction of the proposed East Anglia ONE North project and proposed East Anglia TWO project. EDF Energy are currently consulting on the use of a road led or rail led strategy to transport construction materials to site, either of which option will still require upgrades to both existing road and rail networks to allow for the capacity of vehicles required for construction of the Sizewell C New Nuclear Power Station. Should all four projects be constructed simultaneously, there is anticipated to be greatest cumulative impacts on traffic north of landfall between Thorpeness and Sizewell, and around the town of Leiston (see ***Chapter 26 Traffic and Transport***) particularly effects on motorised users and NMU travelling along the A12, B1122, Lovers Lane and Sizewell Gap.

323. The increase of construction workers in the area and disruption to traffic and transport from the proposed East Anglia ONE North project and proposed East Anglia TWO project should the projects all occur at the same time are anticipated to be medium to long term. The general population is considered to be of low sensitivity to these impacts, with the vulnerable population is considered to be of medium sensitivity. Overall, any effects are considered to be low in magnitude and **not significant**, when considered cumulatively with the mitigation undertaken for New Nuclear Power Station.

27.7.3.1.2 Potential Cumulative Impacts During Construction and Operation

27.7.3.1.2.1 Employment

324. As detailed in ***section 27.6.2.1*** above, increasing employment demand for the proposed East Anglia ONE North project over a long period is assessed to have a beneficial impact for the general population. When looking at the three smaller projects cumulatively, the health effect due to the proposed East Anglia ONE North project, the proposed East Anglia TWO project and the proposed works associated with Sizewell B Power Station Complex is considered to be **not significant**.

325. For the Sizewell C New Nuclear Power Station, EDF Energy anticipate around 2000 jobs will be undertaken by local workers commuting from home (defined as within an assumed 90 minute commute radius) on the main site at peak time, with up to 500 jobs at peak time servicing associated development such as the accommodation campus and park and ride sites, providing a range of long term employment opportunities for the area.

326. The health effects of all three projects acting cumulatively are anticipated to be medium to long term, over years and decades, but of low magnitude. The general population is considered to be of medium sensitivity, with the vulnerable population (in this case those in deprived areas or on low incomes who would benefit from a new source of employment locally) considered to be of high sensitivity. Improvements in socio-economic status associated with long term employment are likely to lead to improvements in general wellbeing. Increasing employment demand over a long period is assessed to have a minor beneficial impact for the general population but the health effect due to all four projects is considered to be **not significant**.

27.7.3.1.2.2 Perception of Risk

327. As detailed in ***section 27.6.2.2*** above, perception of risk is considered across both construction and operation phases because the concern highlighted by site specific populations at the onshore substation relate to the visual impact of presence of industrial infrastructure in a rural environment.

328. The only way to mitigate against uncertainty is through strong communication and provision of information by the Applicant. This is being achieved through several public engagement channels as described in ***section 27.6.1.5.3*** and appropriate community consultation will be maintained throughout development.

329. The presence of multiple windfarm substation and associated construction works has the potential to act cumulatively with the construction and operation of Sizewell C New Nuclear Power Station.

330. EDF Energy is also committed to extensive consultation with the local community to understand local concerns and alleviate them through mitigation agreed with the Local Planning Authority and other stakeholders. EDF Energy propose a Community Safety Management Plan and Worker Code of Conduct and will undertake a Community Impact Report to include but not be limited to Leiston, Theberton and Eastbridge.

331. Impacts are anticipated to be felt long term in the local communities, particularly around landfall and Leiston where cumulative impacts are more likely between the four projects due to the long term nature of the construction period of the proposed Sizewell C New Nuclear Power Station, and also in the vicinity of the onshore substation and grid connection for the proposed East Anglia ONE North and proposed East Anglia TWO project.

27.7.3.1.3 Summary of Cumulative Impacts

332. Inter project site specific cumulative impacts are summarised for population groups in ***Table 27.51*** and for potentially vulnerable groups ***Table 27.52***.

Table 27.51 Inter-project Cumulative Effects for Site Specific Population Groups

	Population near landfall	Population along the onshore cable route	Population near the onshore substation and National Grid infrastructure
Effects related to location	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; • Journey times or reduced access to healthcare; and • Perception of risk.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; • Journey times or reduced access to healthcare; and • Perception of risk.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; • Journey times or reduced access to healthcare; and • Perception of risk.
Outcome for general population at location	It is plausible that construction of the proposed East Anglia ONE North project and proposed East Anglia TWO project will overlap with construction of proposed Sizewell C New Nuclear Power Station and Phase 2 of proposed Sizewell B Power Station Complex works in the landfall area. Sizewell C New Nuclear Power Station has a build programme of 10 years. It is possible that noise, air quality and traffic impacts would cumulatively increase the impact to the north of landfall between Thorpeness and Sizewell, however due to the best practice and mitigation measures proposed by the Applicant construction of the proposed offshore windfarm projects is unlikely to result in cumulative effects greater than those	It is plausible that construction of the proposed East Anglia ONE North project and proposed East Anglia TWO project will overlap with construction of proposed Sizewell C New Nuclear Power Station and Phase 2 of proposed Sizewell B Power Station Complex works along the onshore cable route. Due to proximity, there is potential for cumulative health effects around Leiston. Negative effects are plausible due to increased traffic density and positive effects are due to increased employment however due to the best practice and mitigation measures proposed by the Applicant, construction of the proposed offshore windfarm projects is unlikely to result in cumulative negative effects greater than those caused by one project in isolation, and therefore unlikely to result in further significant effects when	It is plausible that construction periods will overlap between the proposed East Anglia ONE North project and proposed East Anglia TWO project and proposed Sizewell C New Nuclear Power Station and Sizewell B Power Station Complex. The onshore substation and National Grid substation are far enough from both nuclear power stations for direct cumulative effects to be unlikely. It is possible for increased traffic density to have an effect. Sizewell C New Nuclear Power Station is considering a Rail Led and Road Led strategy for the delivery of construction materials, in consultation with local and statutory stakeholders and the details of the final strategy are yet to be confirmed, however due to the best practice and mitigation measures proposed by the Applicant, construction of the proposed offshore windfarm projects is

	Population near landfall	Population along the onshore cable route	Population near the onshore substation and National Grid infrastructure
	caused by one project in isolation, and therefore unlikely to result in further significant effects when assessed cumulatively with the other proposed schemes.	assessed cumulatively with the other proposed schemes.	unlikely to result in cumulative effects greater than one project in isolation, and therefore unlikely to result in further significant effects when assessed cumulatively with the other proposed schemes.
Outcome for vulnerable population at location	The Applicant is in consultation with EDF Energy to coordinate projects and understand cumulative effects. Generally, vulnerable groups at each location are likely to be more sensitive to change than the general population. The existing environment shows that there is a higher proportion of older people and people living with ongoing health conditions. Therefore, these groups are likely to be more affected to any cumulative effects.		

Table 27.52 Inter-project Cumulative Effect for Potentially Vulnerable Groups within site Specific Populations

	Children and young people	Older people	People with existing poor health (physical and mental health)	People living in deprivation, including those on low incomes
Effects related to vulnerable group	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Journey times or reduced access to healthcare; and • Perception of risk.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Journey times or reduced access to healthcare; and • Perception of risk.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Journey times or reduced access to healthcare; and • Perception of risk.	Cumulative effects relate to the combined population health influences from: • Noise; • Air quality; • Physical activities; • Employment; an • Journey times or reduced access to healthcare; and • Perception of risk.
Outcome for vulnerable population at location	The main effect on children would be a change in conditions that reduce their ability to concentrate while at school, but	Due to the increased percentage of older people in the community and the likelihood that they would spend more time at home where	The inter-project cumulative effect is considered to be **minor adverse (not significant)** because people with existing	The inter-project cumulative is considered to be at worst **minor adverse (not significant),** as deprivation

	Children and young people	Older people	People with existing poor health (physical and mental health)	People living in deprivation, including those on low incomes
	design decisions have avoided these effects. Therefore, the cumulative effect is considered **negligible (not significant)**.	they may feel the effects accumulate more rapidly. The inter-project cumulative effect, is considered to be **minor adverse (not significant)**	poor health are more likely to be at home where they may feel the effects accumulate more rapidly and may feel anxiety more acutely due to their existing conditions.	may increase their vulnerability of effects. There will be increased opportunity for training and employment which may also have a **minor beneficial** effect.

27.8 Summary

333. A summary of the findings of this ES chapter is presented in ***Table 27.53.***

334. The main drivers of potential human health effect are the construction process and the associated construction traffic. These activities may lead to increased noise levels, dust and emissions. However, a combination of embedded mitigation (described in this chapter) and additional mitigation (detailed in the relevant technical chapters) can be used to control these impacts to an acceptable level (not significant in EIA terms).

335. Using the methodology agreed with PHE, human health effects due to changes in noise, air quality, ground or water contamination, physical activity, reduced access to health services, employment and the perception of risk have been assessed. This assessment finds that for the general population there would be no significant (in EIA terms) effect on human health as a result of the proposed East Anglia ONE North project.

336. There is the potential for increased effects on vulnerable groups due to their increased sensitivity to change. Due to the demography of the local environment, vulnerable groups are likely to be people over 65 years old and people with ongoing health conditions. However, it is unlikely that any particular health determinant will have a significant effect on these groups due to the extensive mitigation proposed as part of the proposed East Anglia ONE North project.

337. On the basis that all mitigation in place for the proposed East Anglia ONE North project (and consequently the proposed East Anglia TWO project) will be agreed with stakeholders and potential impacts reduced to acceptable levels, there is not anticipated to be a cumulative effect on any particular health determinant when the proposed East Anglia ONE North project is considered alongside the proposed East Anglia TWO project, the proposed Sizewell C New Nuclear Power Station project and the proposed Sizewell B Power Station Complex project.

338. In conclusion, the proposed East Anglia ONE North project is unlikely to have a significant effect on human health of either the general population or vulnerable groups within the population.

Table 27.53 Potential Impacts Identified for Human Health

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
Construction							
Noise	Short/Medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Air quality	Short/Medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Ground/water contamination	Very short term	Plausible but improbable	Low	Low	Small	Not significant	**Not significant**
Physical activity	Very short term	Likely	Low	Low	Small	Not significant	**Not significant**
Journey times or reduced access to healthcare	Short/medium term	Likely	Low	Medium	Small	Not significant	**Not significant**
Construction and Operation							
Employment	Medium to long term	Likely	Medium	N/A	Medium	Not significant	**Not significant**
Perception of risk	Long term	Plausible	Low	High	Medium	Not significant	**Not significant due to community engagement**
Operation							

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
Noise	Long term	Low probability	Low	Medium	Small	Not significant	**Not significant**
EMF	Long term	Not plausible	Medium	High	None	No effect	**No effect**
Intra-project Construction Cumulative Impacts with Other Developments							
Noise	Short/Medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Air quality	Short/Medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Ground/water contamination	Very short term	Plausible but improbable	Low	Low	Small	Not significant	**Not significant**
Physical activity	Very short term	Likely	Low	Low	Small	Not significant	**Not significant**
Journey times or reduced access to healthcare	Short/medium term	Likely	Low	Medium	Small	Not significant	**Not significant**
Intra-project Construction and Operation Cumulative Impacts with Other Developments							
Employment	Medium to long term	Likely	Medium	N/A	Medium	Not significant	**Not significant**
Perception of risk	Long term	Plausible	Low	High	Medium	Not significant	**Not significant due to**

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
							community engagement
Inter-Project Construction Cumulative Impacts with Other Developments							
Noise	short/ medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Air quality	short/medium term	Plausible	Low	Medium	Small	Not significant	**Not significant**
Ground/water contamination	Short term from proposed East Anglia ONE North project, Medium term cumulatively	Plausible but improbable	Medium	Medium	Small	Not significant	**Not significant**
Physical activity	Short term from proposed East Anglia ONE North project, Medium term cumulatively	Likely	Medium	Medium	Small	Not significant	**Not significant**
Journey times or reduced access to healthcare	Short term from proposed East Anglia ONE North project, Medium to long term cumulatively	Likely	Low	Medium	Small	Not significant	**Not significant**
Inter-Project Construction and Operation Cumulative Impacts with Other Developments							
Employment	Medium to long term cumulatively	Likely	Medium	High	Small	Not significant	**Not significant**

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of change	Significance of health effect on	
			General population	Vulnerable population		General population	Vulnerable population
Perception of risk	Long term cumulatively	Plausible	Low	High	Medium	Not significant	**Not significant due to community engagement**
Decommissioning Cumulative Impacts with Other Developments							
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. An Onshore Decommissioning Plan will be provided, as secured under the requirements of the draft DCO. The onshore substation will likely be removed and be reused or recycled. It is anticipated that the onshore cable would be decommissioned (de-energised) and either the cables and jointing bays left *in situ* or removed depending on the requirements of the Onshore Decommissioning Plan approved by the Local Planning Authority. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.							

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