# DOGGER BANK D WIND FARM

# Preliminary Environmental Information Report

## Volume 1
## Chapter 29 Human Health

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## Glossary

| Term | Definition |
|---|---|
| Additional Mitigation | Measures identified through the EIA process that are required as further action to avoid, prevent, reduce or, if possible, offset likely significant adverse effects to acceptable levels (also known as secondary (foreseeable) mitigation).<br>All additional mitigation measures adopted by the Project are provided in the Commitments Register. |
| Array Area | The area within which the wind turbines, inter-array cables and offshore platform(s) will be located. |
| Birkhill Wood Substation | The onshore grid connection point for DBD identified through the Holistic Network Design process. Birkhill Wood Substation which is being developed by National Grid Electricity Transmission and does not form part of the Project. |
| Commitment | Refers to any embedded mitigation and additional mitigation, enhancement or monitoring measures identified through the EIA process and those identified outside the EIA process such as through stakeholder engagement and design evolution.<br>All commitments adopted by the Project are provided in the Commitments Register. |
| Deemed Marine Licence (dML) | A consent required under the Marine and Coastal Access Act 2009 for certain activities undertaken within the UK marine area, which may be granted as part of the Development Consent Order. |
| Design | All of the decisions that shape a development throughout its design and pre-construction, construction / commissioning, operation and, where relevant, decommissioning phases. |
| Development Consent Order (DCO) | A consent required under Section 37 of the Planning Act 2008 to authorise the development of a Nationally Significant Infrastructure Project, which is granted by the relevant Secretary of State following an application to the Planning Inspectorate. |
| Effect | An effect is the consequence of an impact when considered in combination with the receptor's sensitivity / value / importance, defined in terms of significance. |
| Embedded Mitigation | Embedded mitigation includes:<br>• Measures that form an inherent part of the project design evolution such as modifications to the location or design of the development made during the pre-application phase (also known as primary (inherent) mitigation); and<br>• Measures that will occur regardless of the EIA process as they are imposed by other existing legislative requirements or are considered as standard or best practice to manage commonly occurring environmental impacts (also known as tertiary (inexorable) mitigation).<br>All embedded mitigation measures adopted by the Project are provided in the Commitments Register. |

| Term | Definition |
|---|---|
| Energy Storage and Balancing Infrastructure (ESBI) | A range of technologies such as battery banks to be co-located with the Onshore Converter Station, which provide valuable services to the electrical grid such as storing energy to meet periods of peak demand and improving overall reliability. |
| Enhancement | Measures committed to by the Project to create or enhance positive benefits to the environment or communities, as a result of the Project.<br>All enhancement measures adopted by the Project are provided in the Commitments Register. |
| Environmental Impact Assessment (EIA) | A process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information and includes the publication of an Environmental Statement. |
| Environmental Statement (ES) | A document reporting the findings of the EIA which describes the measures proposed to mitigate any likely significant effects. |
| Evidence Plan Process (EPP) | A voluntary consultation process with technical stakeholders which includes a Steering Group and Expert Topic Group (ETG) meetings to encourage upfront agreement on the nature, volume and range of supporting evidence required to inform the EIA and HRA process. |
| Expert Topic Group (ETG) | A forum for targeted technical engagement with relevant stakeholders through the EPP. |
| Grid Connection | The offshore and onshore electricity transmission network connection to Birkhill Wood Substation. |
| Haul Roads | The offshore and onshore electricity transmission network connection to Birkhill Wood Substation. |
| Health | State of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity. |
| Health Outcome | Change in health status of an individual, group, or population attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status. |
| Health Risk Factor | A social, economic, or biological status, or behaviours or environments which are associated with or that cause increased susceptibility to a specific disease, ill health or injury. |
| Impact | A change resulting from an activity associated with the Project, defined in terms of magnitude. |

| Term | Definition |
|---|---|
| Inter-Array Cables | Cables which link the wind turbines to the offshore platform(s). |
| Jointing Bays | Underground structures constructed at regular intervals along the onshore export cable corridor to facilitate the joining of discrete lengths of the installation of cables. |
| Landfall | The area on the coastline, south-east of Skipsea, at which the offshore export cables are brought ashore, connecting to the onshore export cables at the transition joint bay above Mean High Water Springs. |
| Likely Health Effect | This effect is one that, with reference to the scientific literature, shows a plausible theoretical link between source-pathway-receptor; and the occurrence of which is judged as probable, in a specific context. |
| Link Boxes | Structures housing electrical equipment located alongside the jointing bays in the onshore export cable corridor and the transition joint bay at the landfall, which could be located above or below ground. |
| Mental Health | 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 her or his community. |
| Mitigation | Any action or process designed to avoid, prevent, reduce or, if possible, offset potentially significant adverse effects of a development.<br>All mitigation measures adopted by the Project are provided in the Commitments Register. |
| Mitigation Hierarchy | A systematic approach to guide decision-making and prioritise mitigation design. The hierarchy comprises four stages in order of preference and effectiveness: avoid, prevent, reduce and offset. |
| Monitoring | Measures to ensure the systematic and ongoing collection, analysis and evaluation of data related to the implementation and performance of a development. Monitoring can be undertaken to monitor conditions in the future to verify any environmental effects identified by the EIA, the effectiveness of mitigation or enhancement measures or ensure remedial action are taken should adverse effects above a set threshold occur.<br>All monitoring measures adopted by the Project are provided in the Commitments Register. |
| Offshore Development Area | The area in which all offshore infrastructure associated with the Project will be located, including any temporary works area during construction, which extends seaward of Mean High Water Springs. There is an overlap with the Onshore Development Area in the intertidal zone. |
| Offshore Export Cable Corridor (ECC) | The area within which the offshore export cables will be located, extending from the DBD Array Area to Mean High Water Springs at the landfall. |

| Term | Definition |
|---|---|
| Offshore Export Cables | Cables which bring electricity from the offshore platform(s) to the transition joint bay at landfall. |
| Offshore Platform(s) | Fixed structures located within the DBD Array Area that contain electrical equipment to aggregate and, where required, convert the power from the wind turbines, into a more suitable voltage for transmission through the export cables to the Onshore Converter Station. Such structures could include (but are not limited to): Offshore Converter Station(s) and an Offshore Switching Station. |
| Onshore Converter Station (OCS) Zone | The area within which the Onshore Converter Station and Energy Storage and Balancing Infrastructure will be located in vicinity of Birkhill Wood Substation. |
| Onshore Converter Station (OCS) | A compound containing electrical equipment required to stabilise and convert electricity generated by the wind turbines and transmitted by the export cables into a more suitable voltage for grid connection into Birkhill Wood Substation. |
| Onshore Development Area | The area in which all onshore infrastructure associated with the Project will be located, including any temporary works area required during construction and permanent land required for mitigation and enhancement areas, which extends landward of Mean Low Water Springs. There is an overlap with the Offshore Development Area in the intertidal zone. |
| Onshore Export Cables | Cables which bring electricity from the transition joint bay at landfall to the Onshore Converter Station zone (HVDC cables) and from the Onshore Converter Station zone onwards to Birkhill Wood Substation (HVAC cables). |
| Onshore Export Cable Corridor (ECC) | The area within which the onshore export cables will be located, extending from the landfall to the Onshore Converter Station zone and onwards to Birkhill Wood Substation. |
| Population Health | The health outcomes of a group of individuals, including the distribution of such outcomes within the group. |
| Project Design Envelope | A range of design parameters defined where appropriate to enable the identification and assessment of likely significant effects arising from a project's worst-case scenario.<br>The Project Design Envelope incorporates flexibility and addresses uncertainty in the DCO application and will be further refined during the EIA process. |
| Safety Zones | A statutory, temporary marine zone demarcated for safety purposes around a possibly hazardous offshore installation or works / construction area. |
| Scoping Opinion | A written opinion issued by the Planning Inspectorate on behalf of the Secretary of State regarding the scope and level of detail of the information to be provided in the Applicant's Environmental Statement.<br>The Scoping Opinion for the Project was adopted by the Secretary of State on 02 August 2024. |

| Term | Definition |
|---|---|
| Scoping Report | A request by the Applicant made to the Planning Inspectorate for a Scoping Opinion on behalf of the Secretary of State.<br>The Scoping Report for the Project was submitted to the Secretary of State on 24 June 2024. |
| Scour Protection | Protective materials used to avoid sediment erosion from the base of the wind turbine foundations and offshore platform foundations due to water flow. |
| Significant Health Effect | An effect triggered by the Project that is judged to be important for public health (a positive or negative effect), highly desirable for public health (a positive effect) or unacceptable for public health (a negative effect). |
| Study Areas | A geographical area and / or temporal limit defined for each EIA topic to identify sensitive receptors and assess the relevant likely significant effects. |
| Temporary Construction Compounds | Areas set aside to facilitate the construction works for the onshore infrastructure, which include the landfall construction compound, main and intermediate construction compounds for onshore export cable works and OCS and ESBI construction compounds. |
| The Applicant | SSE Renewables and Equinor acting through 'Doggerbank Offshore Wind Farm Project 4 Projco Limited'. |
| The Project | Dogger Bank D (DBD) Offshore Wind Farm Project, also referred to as DBD in this PEIR. |
| Transition Joint Bay (TJB) | An underground structure at the landfall that houses the joints between the offshore and onshore export cables. |
| Trenching | Open cut method for cable or duct installation. |
| Trenchless Techniques | Trenchless cable or duct installation methods used to bring offshore export cables ashore at landfall, facilitate crossing major onshore obstacles such as roads, railways and watercourses and where trenching may not be suitable.<br>Trenchless techniques included in the Project Design Envelope include Horizontal Directional Drilling (HDD), auger boring, micro-tunnelling, pipe jacking / ramming and Direct Pipe. |
| Vulnerable Groups or Subpopulations | Sensitive to changes in health determinant in a given context. Can include groups such as ethnic minorities, people with disabilities, people who are homeless, people living in poverty, those struggling with addiction and substance abuse, and isolated older people. |
| Wider Determinants of Health | Biological, behavioural, socio-economic, cultural or environmental factors which contribute to the health status of individuals or populations. |
| Wind Turbines | Power generating devices located within the DBD Array Area that convert kinetic energy from wind into electricity. |

# 29 Human Health

## 29.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary results of the Environmental Impact Assessment (EIA) of the Dogger Bank D Offshore Wind Farm Project (hereafter 'the Project' or 'DBD') on human health receptors.

2. **Chapter 4 Project Description** provides a description of the key infrastructure components which form part of the Project and the associated construction, operation and maintenance (O&M) and decommissioning activities.

3. The primary purpose of the PEIR is to support the statutory consultation activities required for a Development Consent Order (DCO) application under the Planning Act 2008. The information presented in this PEIR chapter is based on the baseline characterisation and assessment work undertaken to date. The feedback from the statutory consultation will be used to inform the final design where appropriate, presented in an Environmental Statement (ES), which will be submitted with the DCO application.

4. This chapter considers the public health implications of the onshore and offshore elements of the Project during the construction, O&M and decommissioning phases. Health in EIA takes a public health approach, meaning it reaches conclusions on the health outcomes to defined populations, rather than the health outcomes of individuals. Guidance explaining that this is the correct approach is set out in **Section 29.2**.

5. This PEIR chapter:

   - Describes the baseline environment relating to human health;
   - Presents an assessment of the likely significant effects on human health during the construction, O&M and decommissioning phases of the Project;
   - Identifies any assumptions and limitations encountered in compiling the environmental information; and
   - Sets out proposed mitigation measures to avoid, prevent reduce or, if possible, offset potential significant adverse environmental effects identified during the EIA process and, where relevant, monitoring measures or enhancement measures to create or enhance positive effects.

6. In this chapter, the terms human health, health and wellbeing are used interchangeably. Key definitions are set out in the methods presented in **Section 29.5.4**.

7. The chapter follows guidance and good practice, giving the public health perspective of impacts. In doing so, the chapter:

   - Takes a population health approach to assessing physical and mental health outcomes;
   - Considers the wider determinants of health, that may be significantly affected directly or indirectly;
   - Assesses the potential for health inequalities to vulnerable groups; and
   - Considers opportunities to improve population health.

8. This chapter should be read in conjunction with the following related chapters. Inter-relationships are discussed further in **Section 29.10.1**:

   - **Chapter 9 Marine Water and Sediment Quality;**
   - **Chapter 14 Commercial Fisheries;**
   - **Chapter 15 Shipping and Navigation;**
   - **Chapter 19 Geology and Ground Conditions;**
   - **Chapter 18 Other Marine Users;**
   - **Chapter 20 Air Quality and Dust;**
   - **Chapter 21 Water Resources and Flood Risk;**
   - **Chapter 22 Soils and Land Use;**
   - **Chapter 25 Noise and Vibration;**
   - **Chapter 26 Traffic and Transport;**
   - **Chapter 27 Landscape and Visual Impacts;**
   - **Chapter 28 Major Accidents and Disasters;**
   - **Chapter 30 Socio-Economics, Tourism and Recreation;** and
   - **Chapter 31 Climate Change.**

9. Additional information to support the human health assessment includes:

   - **Volume 2, Appendix 29.1 Consultation Responses for Human Health**

10. This chapter does not seek to repeat text or replicate data from these inter-related technical disciplines. The health assessment takes as its input the residual effect conclusions of these other EIA topic chapters. In this regard the health assessment relies on the mitigation measures set out in those chapters and does not repeat them. This avoids duplication and keeps the assessment proportionate.

## 29.2 Policy and Legislation

### 29.2.1 National Policy Statements

11. Planning policy on energy National Significant Infrastructure Projects (NSIP) is set out in the National Policy Statements (NPS). The following NPS are relevant to the human health assessment:

    - Overarching NPS for Energy (EN-1) (Department for Energy Security and Net Zero (DESNZ), 2023a) and
    - NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2023b).

12. The human health chapter has been prepared with reference to specific requirements in the above NPS. The relevant parts of the NPS are summarised in **Table 29–1**, along with how and where they have been considered in this PEIR chapter.

13. EN-3 (DESNZ, 2023c) has been reviewed and it is not considered that there are relevant policy positions in relation to human health that need to be taken into account for the Project.

*Table 29–1 Summary of Relevant National Policy Statement Requirements for Human Health*

| NPS Reference and Requirement | How and Where Considered in the PEIR |
|---|---|
| **NPS for Energy (EN-1)** | |
| Paragraphs 4.3.1-4.3.3:<br>"All proposals for projects that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project"<br>"The Regulations specifically refer to effects on population, human health, biodiversity, land, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them"<br>"The Regulations require an assessment of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, transboundary, short, medium, and long-term, permanent and temporary, positive and negative effects at all stages of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects". | This chapter provides the human health assessment. |
| Paragraph 4.3.4:<br>"To consider the potential effects, including benefits, of a proposal for a project, the applicant must set out information on the likely significant environmental, social and economic effects of the development, and show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy. This information could include matters such as employment, equality, community cohesion, health and wellbeing" | Employment is considered within this chapter, as well as **Chapter 30 Socio-Economics, Tourism and Recreation**. Well-being is an integral consideration throughout this chapter, reflecting that the World Health Organisation (WHO) define health in terms of states of wellbeing.<br>Community identity including community cohesion is scoped in during operation as explained in **Section 29.4.2** which is in line with the Scoping Opinion. |
| Paragraphs 4.4.1, 4.4.4 and 4.45:<br>"Energy infrastructure has the potential to impact on the health and well-being ('health) of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the construction of energy infrastructure and the production, distribution and use of energy may have negative impacts on some people's health".<br>"…where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any potential adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate"<br>"The impacts of more than one development may affect people simultaneously, so the applicant should consider the cumulative impact on health in the ES where appropriate". | Beneficial and adverse effects are discussed in **Section 29.7**. This includes the beneficial effects of energy infrastructure for population health are discussed in **Section 29.7.2.4**.<br>Cumulative effects to population health are considered in **Section 29.8**. |
| Paragraph 4.4.2:<br>"The direct impacts on health may include increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation". | The scope of the health assessment is set out in the **Section 29.4.2**. For this chapter, direct effects on health of particular relevance relate to traffic, air, water pollution, dust, noise, climate change and public understanding of electromagnetic field (EMF). It has been agreed through the Scoping Opinion that other direct effects are scoped out. It has been agreed through the Scoping Opinion that other direct effects are scoped out as not having the potential for likely significant effects on population health. The assessment of effects is set out in **Section 29.7**. |
| Paragraph 4.4.3:<br>"New energy infrastructure may also affect the composition and size of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport, or the use of open space for recreation and physical activity". | The scope of the health assessment is set out in **Section 29.4.2**. For this chapter in-direct health effects of particular relevance relate to physical activity, open space and leisure, climate change, wider societal infrastructure and resources, as well as employment and training opportunities. Assessments are set out in **Section 29.7**. It has been agreed through the Scoping Opinion that other indirect effects are scoped out as not having the potential for likely significant effects on population health. |

| NPS Reference and Requirement | How and Where Considered in the PEIR |
|---|---|
| Paragraph 4.4.6:<br>"Opportunities should be taken to mitigate indirect impacts, by promoting local improvements to encourage health and wellbeing, this includes potential impacts on vulnerable groups within society and impacts on those with protected characteristics under the Equality Act 2010, i.e. those groups which may be differentially impacted by a development compared to wider society as whole". | This chapter considers opportunities to promote health and wellbeing where proportionate and appropriate, see **Section 29.5** and **Section 29.7**.<br>The potential for differential effects to vulnerable groups are considered in **Section 29.5** and **Section 29.7**. |
| Paragraph 4.4.7 and 4.4.8:<br>"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 by themselves constitute a reason to refuse consent or require specific mitigation under the Planning Act 2008".<br>"However, not all potential sources of health impacts will be mitigated in this way and the Secretary of State may want to take account of health concerns when setting requirements relating to a range of impacts such as noise". | The assessment in **Section 29.7** has regard to statutory limits, e.g. for air quality, as well as non-threshold effects relevant to air quality and noise. In addition, consideration is given to the public understanding of risk (concern) relating to EMF effects during operation. |
| Paragraph 5.11.6:<br>"The Government's policy is to ensure there is adequate provision of high-quality open space and sports and recreation facilities to meet the needs of local communities. Connecting people with 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". | Potential health effects relating to physical activity, open space and leisure during construction and decommissioning are considered in **Section 29.7.1.1**. |
| Paragraph 5.12.1, 5.12.2 and 5.12.6:<br>"Excessive noise can have wide-ranging impacts on the quality of human life and health such as annoyance, sleep disturbance cardiovascular disease and mental ill health. It can also have an impact on the environment and the use and enjoyment of areas of value such as quiet places and areas with high landscape quality".<br>"The 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."<br>"Where noise impacts are likely to arise from the Project, the applicant should include the following… an assessment of any likely impact on health and quality of life / wellbeing where appropriate, particularly among those disadvantaged by other factors who are often disproportionately affected by noise sensitive areas". | Potential health effects related to noise are considered in **Section 29.7.1.7** and **Section 29.7.2.5**, as well as in **Chapter 25 Noise and Vibration**.<br>The human health assessment considers differential effects to vulnerable groups in all its assessments in **Section 29.7**. |
| Paragraph 5.16.2:<br>"During the construction, operation and decommissioning phases, developments can lead to … increased risk of spills and leaks of pollutants to the water environment. These effects could lead to adverse impacts on health." | Potential health effects in relation to increased risk of spills and leaks of pollutants to the water environment during construction and decommissioning are considered in **Section 29.7.1.6**, as well as **Chapter 9 Marine Water and Sediment Quality**, **Chapter 19 Geology and Ground Conditions**, **Chapter 21 Water Resources and Flood Risk**, and **Chapter 28 Major Accidents and Disasters**. |
| Paragraph 5.2.1 and 5.2.7:<br>"Infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emissions to air which could lead to adverse impacts on health."<br>"Proximity to emission sources can have significant impacts on sensitive receptor sites for air quality, such as education or healthcare sites, residential use or sensitive or protected ecosystems". | Potential health effects related to air quality are informed by **Chapter 20 Air Quality and Dust** and considered in **Section 29.7.1.5**. |

| NPS Reference and Requirement | How and Where Considered in the PEIR |
|---|---|
| **NPS for Electricity Networks Infrastructure (EN-5)** | |
| Paragraphs 2.9.46 and 2.9.56:<br>"EMFs can have both direct and indirect effects on human health."<br>"The balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease." | This chapter considers public understanding of EMF exposure during operation, in terms of mental health outcomes associated with concern, acknowledging that actual risks are unlikely to be significant for public health, see **Section 29.7.2.6**. |
| Paragraph 2.9.48:<br>"To prevent these known effects, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) developed health protection guidelines in 1998 for both public and occupational exposure…" | The Project will adopt the ICNIRP guidelines (ICNIRP, 1998, 2010) and adhere to other latest relevant international and national EMF regulations and standards, which will be detailed in an EMF Compliance Statement to be developed at ES stage and submitted with the DCO application. |
| Paragraph 2.9.51:<br>"The levels of EMFs produced by power lines in normal operation are usually considerably lower than the ICNIRP 1998 reference levels. For electricity substations, the EMFs close to the sites tend to be dictated by the overhead lines and cables entering the installation, not the equipment within the site." | This chapter notes the importance of giving the public relevant non-technical information such as this in order to mitigate against levels of concern about EMF, which could affect mental health. An EMF Compliance Statement will be developed at ES stage and submitted with the DCO application. |
| Paragraph 2.9.55:<br>"…Government policy is that exposure of the public should comply with the ICNIRP (1998) guidelines …." | The Project will adopt the ICNIRP guidelines (ICNIRP, 1998, 2010) and adhere to other latest relevant international and national EMF regulations and standards. An EMF Compliance Statement will be developed at ES stage and submitted with the DCO application. Public understanding of EMF exposure during operation, in terms of mental health outcomes associated with concern, acknowledging that actual risks are unlikely to be significant for public health, is assessed in **Section 29.7.2.6**. |
| Paragraph 2.11.9:<br>"Government has developed with the electricity industry a Code of Practice, "Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice" … that specifies the evidence acceptable to show compliance with ICNIRP (1998)…" | The Project will adopt the Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice (Department for Energy and Climate Change, 2012) and adhere to other relevant international and national EMF regulations and standards. An EMF Compliance Statement will be developed at ES stage and submitted with the DCO application. |
| Paragraph 2.10.13:<br>"Where EMF exposure is within the relevant public exposure guidelines, re-routeing a proposed overhead line purely on the basis of EMF exposure, or undergrounding a line solely to further reduce the level of EMF exposure are unlikely to be proportionate mitigation measures." | This chapter acknowledges the value of such information in reassuring the public that further design modification in relation to EMF would not be proportionate. An EMF Compliance Statement will be developed at ES stage and submitted with the DCO application. |

## 29.2.2 Other Policy and Legislation

14. Other policy and legislation relevant to the human health assessment is summarised in the following sections.

### 29.2.2.1 National

#### 29.2.2.1.1 National Planning Policy Framework

15. NPPF Paragraph 96 (Ministry of Housing, Communities & Local Government, 2024) states that planning polices and decisions should aim to achieve healthy, inclusive and safe places which:

- "Promote social interaction, including opportunities for meetings between people who might not otherwise come into contact with each other;
- Are safe and accessible, so that crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion; and
- Enable and support healthy lives, through both promoting good health and preventing ill-health, especially where this would address identified local health and well-being needs and reduce health inequalities between the most and least deprived communities".

16. NPPF Paragraphs 103 to 106 promotes access to opportunities for physical activity as important to health and wellbeing of communities, including protecting and enhancing public rights of way (Ministry of Housing, Communities & Local Government, 2024).

17. These policy aims are met through the scope of this assessment as set out in **Section 29.7**, for example through assessment of how people use open spaces and recreation, their access and connections, understanding of risks and environmental exposures. The assessment specifically considers health inequalities through assessment of effects to both the general population and to vulnerable sub-populations.

### 29.2.2.2 Regional

#### 29.2.2.2.1 East Inshore and East Offshore Marine Plan

18. The assessment of potential changes to human health has also been made with consideration to the specific policies set out in the East Inshore and East Offshore Marine Plans (Marine Management Organisation, 2014). Key provisions are set out in **Table 29–2** along with details as to how these have been addressed within the assessment.

*Table 29–2 East Inshore and East Offshore Marine Plan Policies Relevant to Human Health*

| Policy / Objective | Key Provisions | How and Where Considered in the PEIR |
|---|---|---|
| Policy SOC1 | "Proposals that provide health and social well-being benefits including through maintaining, or enhancing, access to the coast and marine area should be supported" | This chapter considers the health and wellbeing impacts of the Project including beneficial and adverse impacts. See **Section 29.7**. |
| Policy EC1 | "Proposals that provide economic productivity benefits which are additional to Gross Value Added currently generated by existing activities should be supported" | This chapter considers potential health effects related to socio-economic changes including employment opportunities and income are assessed in **Section 29.7.1.4** and **Section 29.7.2.3** as well as **Chapter 30 Socio-Economics, Tourism and Recreation**. |
| Policy EC2 | "Proposals that provide additional employment benefits should be supported, particularly where these benefits have the potential to meet employment needs in localities close to the marine plan areas" | This chapter considers potential health effects related to socio-economic changes including employment opportunities and income. These are assessed in **Section 29.7.1.4** and **Section 29.7.2.3** as well as **Chapter 30 Socio-Economics, Tourism and Recreation**. |
| Objective 6 | "Proposals should take account of any potential impacts on ecological and chemical water quality and consult the relevant River Basin Management Plans for more detailed information". | Potential health effects related to changes in water quality are assessed in **Section 29.7.1.6** as well as **Chapter 21 Water Resources and Flood Risk**. |

| Policy / Objective | Key Provisions | How and Where Considered in the PEIR |
|---|---|---|
| Policy TR1 | "Proposals for development should demonstrate that during construction and operation, in order of preference:<br>a) they will not adversely impact tourism and recreation activities,<br>b) how, if there are adverse impacts on tourism and recreation activities, they will minimise them,<br>c) how, if the adverse impacts cannot be minimised, they will be mitigated<br>d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts" | This chapter considers potential physical and mental health impacts related to changes recreational and healthy lifestyle behaviours. See **Section 29.7.1.1** as well as **Chapter 30 Socio-Economics, Tourism and Recreation**. |

### 29.2.2.3 Local

#### 29.2.2.3.1 East Riding Local Plan

19. The East Riding Local Plan Update 2025 - 2039, adopted 2025 (East Riding of Yorkshire Council, 2025) is the most relevant local planning policy applicable to human health based on the extent of the study areas for this assessment. Key provisions of the Local Plan as well as how these have been addressed in the health assessment are summarised in **Table 29–3**.

*Table 29–3 Summary of East Riding Local Plan (2025) Provisions Relevant to Human Health*

| Local Plan Key Provisions | Local Plan Reference | How and Where Considered in the PEIR |
|---|---|---|
| "National planning policy emphasises the importance of providing access to good quality open spaces, including opportunities for sport and recreation and protecting public rights of way, in order to promote the health and well-being of communities and facilitate social interaction and inclusion". | Paragraph 8.23 | Potential health effects related to changes in access to open space, recreation and leisure are assessed in **Section 29.7.1.1**. |
| "New development should seek to protect, extend and support existing and disused public transport, cycling, footpath and non-motorised users (NMU) networks (including public rights of way and the National Cycle Network), as well as encouraging alternatives to the single occupancy use of the private car". | Paragraph 4.118 | Potential health effects related to changes in transport modes, access and connections are assessed in **Section 29.7.1.2** as well as **Chapter 26 Traffic and Transport.** |
| "Proposals should, through the layout and design of new development, consider the needs of users, including equality of access, and how these needs would change for individuals and families through the different stages of their life. Proposals should be built to accessible and adaptable standards. It will also be important to consider whether the proposal would contribute to improving healthy lifestyles and help to reduce health inequalities.". | Paragraph 7.18 | Potential health effects of changes in healthy lifestyles are assessed in **Section 29.7.1.1**.<br>Health inequalities are considered through the assessment and are reported in **Section 29.7**. |
| "A shift towards low carbon and renewable energy generation over the plan period will help reduce emissions that cause climate change. This will contribute to fuel security and create opportunities for economic growth". | Paragraph 6.65 | Potential health effects related to renewable energy benefiting public health are assessed in **Section 29.7.2.4**. |
| "Some energy developments, particularly those involving significant underground works, have the potential to increase the risk of flooding on the site or elsewhere. They could also impact on geology and ground water sources, leading to water pollution and / or ground subsidence. These impacts will need to be satisfactorily addressed.". | Paragraph 6.78 | Potential health effects related to changes in water quality, including related to flooding, are assessed in **Section 29.7.1.6** as well as **Chapter 21 Water Resources and Flood Risk.** |
| "Proposals should also ensure they are located at an appropriate distance from noise sensitive uses, such as housing and quiet leisure-based uses, to ensure that increases in ambient noise levels are acceptable.". | Paragraph 6.75 | Potential health effects related to noise disturbance are assessed in **Section 29.7.1.7** and **Section 29.7.2.5** as well as **Chapter 25 Noise and Vibration.** |
| "Proposals for the development of the energy sector ..... will be supported where any significant adverse impacts are addressed satisfactorily, and the residual harm is outweighed by the wider benefits of the proposal. Developments and their associated infrastructure should be acceptable in terms of the land, including land stability, contamination, best and most versatile agricultural land and soil resources". | Policy EC5: Supporting the renewable and low carbon energy sector (Paragraph 114) | This chapter explains how adverse effects have been addressed and the benefits of the Project for public health. |

| Local Plan Key Provisions | Local Plan Reference | How and Where Considered in the PEIR |
|---|---|---|
| "Proposals will be supported where they would particularly benefit areas identified as being among the 20 per cent most deprived areas in the country, for example, by providing training or employment opportunities for local people." | Paragraph 6.11 | Potential health effects related to socio-economic changes including training and employment opportunities are assessed in **Sections 29.7.1.3** and **29.7.1.4** for construction and **Sections 29.7.2.2** and **29.7.2.3** for operation, as well as **Chapter 30 Socio-Economics, Tourism and Recreation**. |

## 29.3 Consultation

20. Topic-specific consultation in relation to human health has been undertaken in line with the process set out in **Chapter 7 Consultation**. A Scoping Opinion from the Planning Inspectorate (PINS) was received on 2nd August 2024, which has informed the scope of the assessment presented within this chapter (as outlined in **Section 29.4.2**).

21. **Volume 2, Appendix 29.1 Consultation Responses for Human Health** summarises how consultation responses received to date are addressed in this chapter.

22. This chapter will be updated based on refinements made to the Project Design Envelope and to consider where appropriate stakeholder feedback on the PEIR. The updated chapter will form part of the ES to be submitted with the DCO application.

## 29.4 Basis of the Assessment

23. The following sections establish the basis of the assessment of likely significant effects, which is defined by the Study Area(s), assessment scope, realistic worst-case scenarios and development scenarios.

24. This section should be read in conjunction with **Volume 2, Appendix 1.2 Guide to PEIR**, **Volume 2, Appendix 6.2 Impacts Register** and **Volume 2, Appendix 6.3 Commitments Register**.

### 29.4.1 Study Area

25. The Human Health Study Areas have been defined on the basis of relevant human populations that may be affected directly or indirectly by the Project.

26. Consistent with IEMA 2022 guidance (Pyper *et al.*, 2022a), this chapter uses Study Areas to determine the sensitivity of populations within those areas, rather than defining a limit on the full extent of all health effects. This means that Human Health Study Areas do not necessarily establish the boundaries of all potential health effects, such as those related to mental health. The Human Health Study Areas represent the locations which would identify any likely significant population health effect, i.e. where the great majority of the impact is anticipated to occur. Any effects beyond the Study Areas would not change the conclusions reached in relation to the likely significant population health effects of the Project.

27. The Offshore and Onshore Development Areas provide context in setting the Human Health Study Areas (see **Figure 4-1** and **Figure 4-2** within **Chapter 4 Project Description** for the Offshore and Onshore Development Areas respectively).

28. The Human Health Study Areas therefore reflect relevant indirect effects to onshore populations from the offshore activities and direct effects to onshore populations from the nearshore works at the landfall, onshore export cable corridor (ECC) and Onshore Converter Station (OCS) and Energy Storage and Balancing Infrastructure (ESBI).

29. The Human Health Study Areas that are used in the health assessment to indicate the relevant population and the expected maximum extent of any likely significant effects (**Figure 29-1** and **Figure 29-2**) are as follows:

- The local population is defined using the local authority area of East Riding of Yorkshire;
- The regional population is defined using the area of Yorkshire and the Humber;
- The national population is defined with reference to England, and the wider UK as relevant.
- The site-specific population is defined using the following wards:
  - E05001695 East Wolds and Coastal and E05001703 North Holderness (for the landfall), including Lower Layer Super Output Area (LSOA) East Riding of Yorkshire 010A (40% most deprived – landfall) and 006D (20% most deprived – adjoining more deprived area) (Ministry of Housing, Communities & Local Government, 2019a);

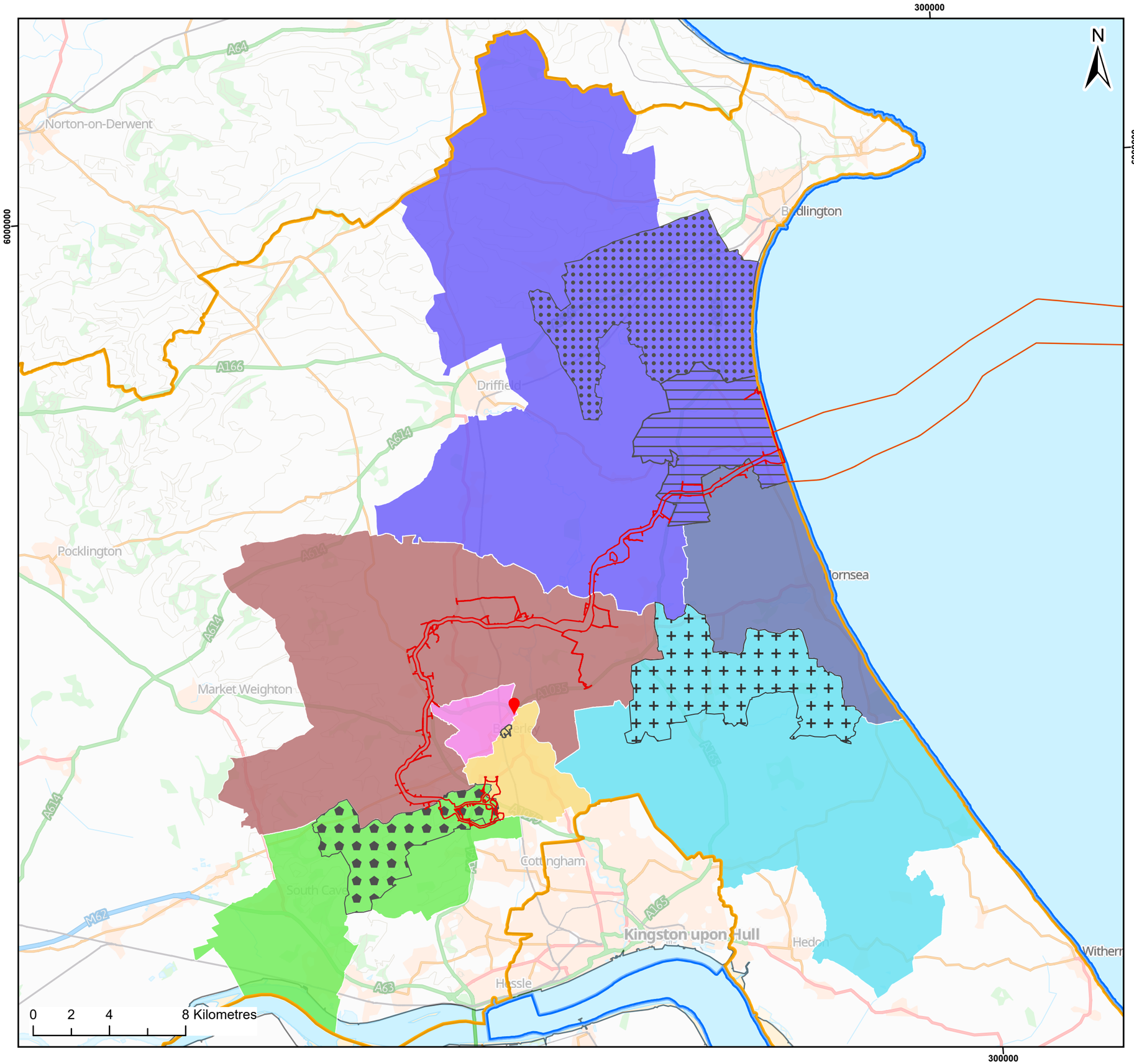
  - E05001687 Beverley Rural and E05001701 Mid Holderness (for the onshore ECC), including LSOA East Riding of Yorkshire 017A (20% most deprived – central Beverley) and 014D (50% least deprived – rural corridor) in relation to the index of multiple deprivation. Noting the location of East Riding Community Hospital as a sensitive receptor; and
  - E05001693 Dale, E05001705 St Mary's and E05001702 Minster and Woodmansey (for the OCS zone) including LSOA East Riding of Yorkshire 024B (which has higher health and environment deprivation than other surrounding LSOA).
- The international population is defined with reference to global effects relevant to climate change.

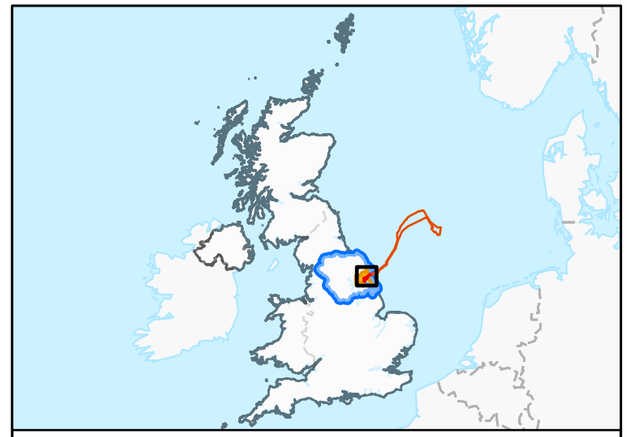
30. The shipping activities relating to the construction, O&M and decommissioning of the offshore infrastructure are expected to have potential for significant effects on population health, related to the port activities needed to support the wider offshore activities. Additionally, there will be likely significant positive health effects associated with the energy generation aspects of the Project (see **Section 29.7.2.8**). As a specific base port location(s) to support offshore construction and O&M activities has not yet been determined at this stage, the Regional Health Study Areas of Yorkshire and the Humber will be used indicatively.

31. The health assessment has also had regard to the zones of influence defined by other topic chapters. Those zones of influence are relevant and inform the health assessment's consideration of impact magnitude.

32. The wider determinants of health and health inequalities are key considerations when undertaking an assessment of human health as part of the EIA. The following population groups are present and will be considered:

- The 'general population', including residents, workers, service providers and service users; and
- The 'vulnerable group population', including potential vulnerability due to young age, older age, low income, poor health status, social disadvantage, restricted access or geographic proximity to the Project.



Legend:

- Onshore Development Area
- Offshore Development Area
- East Riding Community Hospital

Site Specific Health Study Area

- Beverley Rural Ward
- Dale Ward
- East Wolds and Coastal Ward
- Mid Holderness Ward
- Minster and Woodmansey Ward
- North Holderness Ward
- St. Mary's Ward

Lower Layer Super Output Areas

- East Riding of Yorkshire 006D
- East Riding of Yorkshire 010A
- East Riding of Yorkshire 014D
- East Riding of Yorkshire 017A
- East Riding of Yorkshire 024B
- Local Health Study Area - East Riding of Yorkshire
- Regional Health Study Area - Yorkshire and the Humber
- National Health Study Area - England and wider United Kingdom



Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Human Health Study Area

| Figure: | Drawing No: | | | | |
|---|---|---|---|---|---|
| 29-1 | 12793-0001-04 | | | | |
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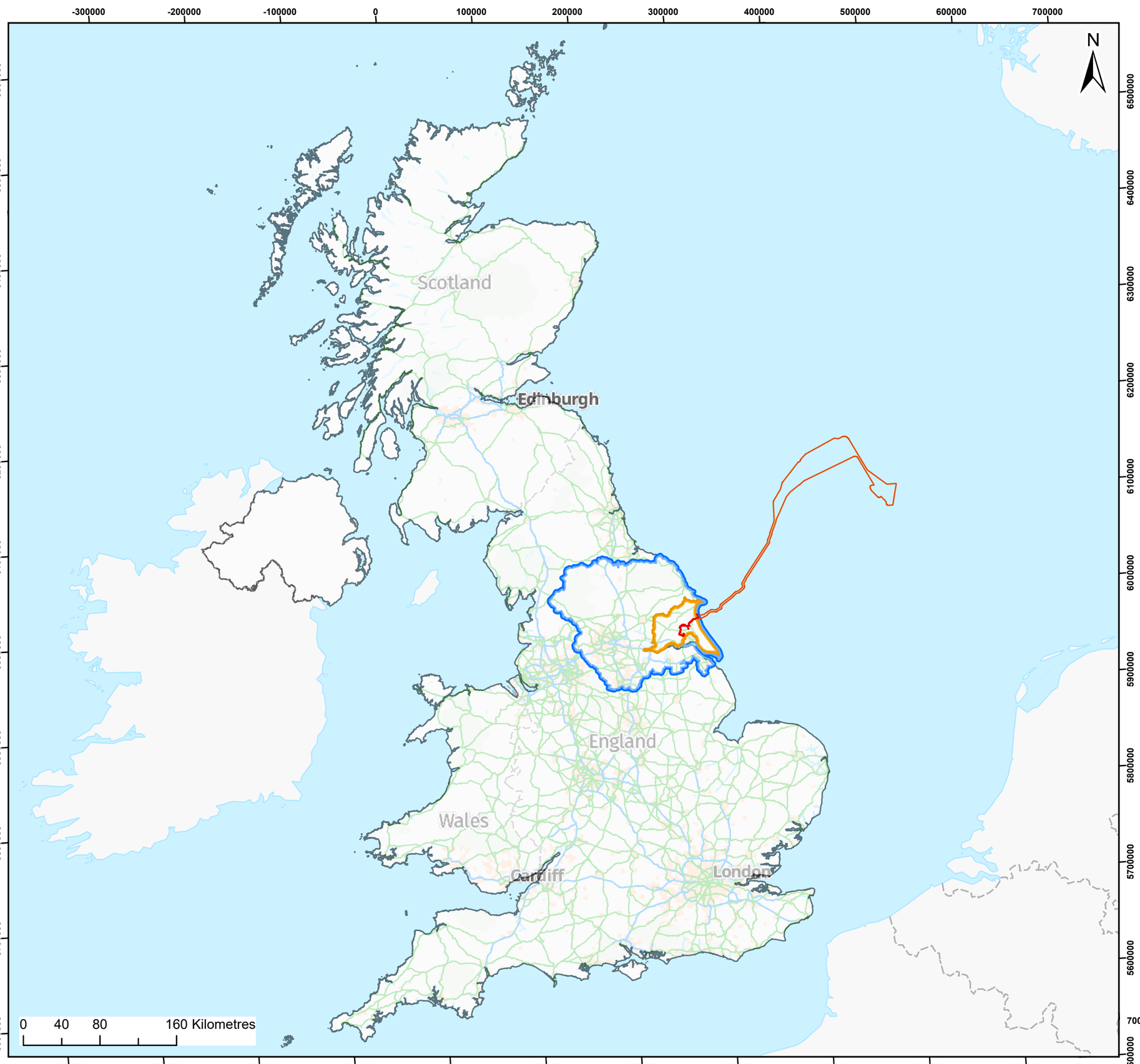


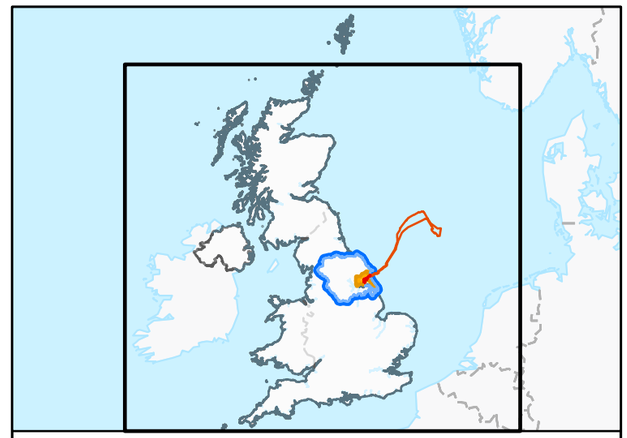

Legend:

- Onshore Development Area
- Offshore Development Area
- Local Health Study Area - East Riding of Yorkshire
- Regional Health Study Area - Yorkshire and the Humber
- National Health Study Area - England and wider United Kingdom



Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Human Health Study Area
Local, Regional, and National Areas

Figure: 29-2

Drawing No: 12793-0001-04

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## 29.4.2 Scope of the Assessment

33. A number of impacts have been scoped out of the human health assessment. These impacts are outlined in **Volume 2, Appendix 6.2 Impacts Register**, along with supporting justification. This approach aligns with the Scoping Opinion (discussed in **Section 29.3**) and the project description outlined in **Chapter 4 Project Description**.

34. Impacts scoped into the assessment relating to human health are outlined in **Table 29–4** and discussed further in **Section 29.7**. In addition, some impacts identified at scoping stage have been scoped out in **Table 29–4** as explained in the table.

35. A full list of impacts scoped in / out of the human health assessment is summarised in **Volume 2, Appendix 6.2 Impacts Register**. A description of how the Impacts Register should be used alongside the PEIR chapter is provided in **Volume 2, Appendix 1.2 Guide to PEIR** and **Chapter 6 Environmental Impact Assessment Methodology**.

*Table 29–4 Human Health – Impacts Scoped Into / Out of the Assessment*

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| **Construction** | | |
| ***Social Environment*** | | |
| HH-C-03 | Impacts on open space, leisure and play (onshore) - onshore construction activities | Construction, Onshore:<br>Onshore works may lead to temporary disruption of public open spaces (including beaches) and Public Rights of Way (PRoW) (e.g. footpaths along the coast or through green space), potentially affecting recreational activities. Temporary construction disruption to green open space access (e.g. publicly accessible woods and fields) and blue open space (e.g. publicly accessible beaches or surface water bodies) is scoped in. This includes consideration for any temporary or permanent provision for alternative space or access. |
| HH-C-05 | Impacts on transport modes, access and connections (onshore) - onshore construction activities and associated road vehicle movements | Construction, Onshore:<br>The impacts arising from construction of any new or amended highways junctions and from changes in traffic flow have been scoped in. There is the potential that construction works (construction site activities as well as vehicle traffic associated with construction activities) may disrupt local vehicle traffic (private and public transport) as well as active travel (pedestrians and cyclists). Effects to active travel from any temporary diversions and any new or amended highways junctions are scoped in. The assessment considers the potential for significant population health effects due to changes in routine or emergency health related journey travel times and road safety. |
| ***Economic Environment*** | | |
| HH-C-09 | Impacts on education and training (offshore and onshore) - offshore and onshore construction activities | Construction, Offshore and Onshore:<br>Construction activities have the potential for educational opportunities and support, leading to increases in socio-economic status and other outcomes influential for physical and mental health. The benefits extend to the local population, particularly young adults commencing employment.<br>Construction of the offshore and onshore infrastructure for the Project would support sizable workforces with upskilling and career development opportunities. Such opportunities may include apprenticeships and adult learning, with transferable skills between the construction and O&M phases. Such impacts are scoped in to consider how opportunities could be targeted for local and vulnerable groups to increase the public health benefit. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| HH-C-10 | Impacts on employment and income (offshore and onshore) - offshore and onshore construction activities | Construction, Offshore and Onshore:<br>Construction activities have the potential to cause changes in direct and indirect jobs and economic activity, with good quality employment (including wage, working conditions and job stability) providing more health supporting resources. The opportunities would relate to people of working age and their dependants.<br>Construction of the Project's offshore and onshore infrastructure will provide opportunities for employment during construction. The human health assessment considers the potential population health effects of direct and indirectly employment, including opportunities to enhance benefits for local and vulnerable groups, therefore this is scoped in. |
| ***Bio-Physical Environment*** | | |
| HH-C-14 | Impacts on air quality (onshore) - dust and fine particulate emissions, plant, equipment and road vehicle exhaust emissions associated with onshore construction activities | Construction, Onshore:<br>Construction activities have the potential to cause changes in air pollutants (particularly nitrogen dioxide ($NO_2$), particulate matter (PM), including $PM_{2.5}$ and $PM_{10}$), which may affect respiratory and cardio-metabolic outcomes. This potential impact could affect residents and long-term occupiers of nearby properties and community buildings. The health impacts from changes to onshore air quality during the construction phase, including dust, are scoped in. The human health chapter is informed by **Chapter 20 Air Quality and Dust**. UK statutory limits, i.e. health protection standards, are used as a benchmark. The potential for non-threshold health effects of some air pollutants is also discussed and taken into account. |
| HH-C-15 | Impacts on water quality and availability (offshore) - accidental pollution associated with offshore construction activities | **Chapter 9 Marine Water and Sediment Quality** confirms that effects on water quality arising from the Project are negligible and no topic specific mitigation measures are required. As such, it is proposed that marine water and sediment quality is not considered further in the EIA. In line with these findings no credible pollution linkage pathway exists for population health and so this issue is scoped out of the human health assessment. |
| HH-C-16 | Impacts on water quality and availability (onshore) - accidental pollution associated with onshore construction activities | Construction, Onshore:<br>A number of water impacts from onshore construction works is set out in **Chapter 21 Water Resources and Flood Risk**. Impacts associated with contamination of surface and groundwater are scoped in. These are also scoped into the human health assessment. |
| HH-C-19 | Impacts from noise and vibration (onshore) - noise and vibration associated with onshore construction activities and associated road vehicle movements | Construction, Onshore:<br>Noise associated with the construction of the onshore infrastructure is scoped in. Construction activities and associated vehicle movements have the potential to generate noise, which may affect mental wellbeing, sleep disturbance and educational outcomes. This potential impact could affect residents and long-term occupiers of nearby properties and community buildings.<br>The human health assessment is informed by the noise and vibration assessment of changes to daytime and night-time noise (see **Chapter 25 Noise and Vibration**). Consideration is given to population health effects, for example related to annoyance and sleep disturbance. |
| **Operation and Maintenance** | | |
| ***Social Environment*** | | |
| HH-O-08 | Impacts on community identity, culture, resilience and influence (onshore) - presence of onshore workforce during routine and unplanned O&M activities, presence of onshore infrastructure during operation and onshore routine and unplanned O&M activities | Operation & Maintenance, Onshore:<br>**Chapter 27 Landscape and Visual Impacts** scopes in views of the OCS and ESBI within the OCS zone, whilst the potential for a scale of visual impact that could affect population health outcomes is considered limited, effects of the OCS and ESBI on community identity are scoped in, including to consider the potential for cumulative effects with other projects. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| ***Economic Environment*** | | |
| HH-O-09 | Impacts on education and training (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | Operation & Maintenance, Offshore and Onshore:<br>O&M activities associated with the offshore infrastructure for the Project would support sizable workforces with upskilling and career development opportunities. This may include apprenticeships and adult learning, with transferable skills between construction and O&M phases. Operation of the OCS and ESBI will involve a limited number of long-term good quality green economy upskilling and career development opportunities. Such impacts are scoped in to consider how opportunities could be targeted for local and vulnerable groups to increase the public health benefit. |
| HH-O-10 | Impacts on employment and income (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | Operation & Maintenance, Offshore and Onshore:<br>O&M activities associated with the offshore infrastructure for the Project will provide opportunities for good quality employment (including wage, working conditions and job stability). Operation of the OCS and ESBI will involve a limited number of opportunities for good quality employment as well. The human health assessment will consider the potential population health effects of direct and indirect employment, including opportunities to enhance benefits for local and vulnerable groups, therefore this impact is scoped in. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| ***Bio-Physical Environment*** | | |
| HH-O-12 | Impacts on climate change and adaptation (offshore and onshore) - provision of renewable energy during operation of the wind farm and other potential carbon benefits enabled by the ESBI | Operation & Maintenance, Offshore and Onshore:<br>The Project would produce renewable energy during the operation of the wind farm and other carbon benefits from energy balancing and storage services enabled by the ESBI, which contributes to a reduction in climate-altering pollutants associated with climate change. Population health is influenced by temperature, crop yields, productivity and disease prevalence. The effects would extend to the international global population, particularly deprived populations in low- and middle-income countries.<br>The Project would be a part of a wider energy sector transition that reduces the severity of climate change. The offshore electrical generation would allow for renewable electricity provision to the UK grid with wider decarbonisation benefits. The benefits to population health will be discussed, including reducing adverse physical and mental health effects of climate change for deprived populations, particularly in low- and middle-income countries globally. Therefore, health benefits associated with climate change and adaptation are scoped in. This is informed by the climate change assessment (see **Chapter 31 Climate Change**). |
| HH-O-14 | Impacts on air quality (onshore) - dust and fine particulate emissions, plant, equipment and road vehicle exhaust emissions associated with routine and unplanned O&M activities | Operation & Maintenance, Onshore:<br>**Chapter 20 Air Quality and Dust** confirms that operational onshore air quality effects due to the Project are negligible. In line with these findings this issue is scoped out of the human health assessment, as there is not the potential for a likely significant effect on population health, including vulnerable groups. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| HH-O-15 | Impacts on water quality and availability (offshore) - accidental pollution associated with offshore routine and unplanned O&M activities | Operation & Maintenance, Offshore:<br>**Chapter 9 Marine Water and Sediment Quality** confirms that effects on water quality arising from the Project are negligible and no topic specific mitigation measures are required. As such, it is proposed that marine water and sediment quality is not considered further in the EIA. In line with these findings no credible pollution linkage pathway exists for population health and so this issue is scoped out of the human health assessment. |
| HH-O-19 | Impacts from noise and vibration (onshore) - noise and vibration associated with onshore O&M activities and associated road vehicle movements | Operation & Maintenance, Onshore:<br>The potential operational noise impacts of the OCS and ESBI are scoped in. The health chapter is informed by the noise and vibration assessment (**Chapter 25 Noise and Vibration**). UK regulatory standards are used as a benchmark. |
| HH-O-21 | Impacts from public perception of electro-magnetic field risk (onshore) - presence of onshore electrical infrastructure during operation | Operation & Maintenance, Onshore:<br>Public understanding of risk in relation to operational EMF is scoped in. In addition to the actual physical health risk, the Project would introduce electrical equipment, which may lead to concern about field strength (including the OCS and ESBI) for some residents in the local community, particularly those living in close proximity to new electrical infrastructure. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| ***Institutional and Built Environment*** | | |
| HH-O-25 | Impacts on built environment (onshore) - disruption to third-party assets during onshore routine and unplanned O&M activities and presence of onshore infrastructure during operation | Operation & Maintenance, Onshore:<br>In relation to the OCS and ESBI, appropriate buffer zones would be maintained between infrastructure and surrounding communities, and the design would be resilient to accidents and disasters. The ESBI would include appropriate design, mitigation and management measures related to risks to population health, which will be outlined within the ES as appropriate. This issue is scoped in.<br>The health assessment coverage will include appropriate signposting, including to **Chapter 28 Major Accidents and Disasters**. However, in line with IEMA guide: Effective Scoping of Human Health in Environmental Impact Assessment (Pyper *et al.*, 2022a) Paragraph 5.5, issues of emergency planning of the ESBI are scoped out as being covered by other potential future permitting requirements and / or risk management processes. This is consistent with Overarching National Policy Statement for Energy EN-1 Paragraph 4.4.7 (DESNZ, 2023a), which confirms that matters subject to separate regulation will generally constitute sufficient mitigation in relation to their potential health effects. |
| HH-O-26 | Impact on wider societal infrastructure and resources (offshore)- provision of renewable energy during operation of the wind farm | Operation & Maintenance, Offshore:<br>During operation, the generating aspects of the Project would provide energy infrastructure that supports many aspects of public health. A reliable supply of electricity is required in relation to health-supportive factors including, population food safety, thermal comfort, healthcare, learning, income generation and social support. This issue is scoped in. |

| Impact ID | Impact and Project Activity | Rationale |
|---|---|---|
| **Decommissioning** | | |
| HH-D-03 | Impacts on open space, leisure and play (onshore) - decommissioning activities not yet defined | Decommissioning impacts are scoped in; however, details of offshore and onshore decommissioning activities are not known at this stage. As discussed in **Section 29.7.3**, decommissioning impacts will be assessed in detail through the Offshore Decommissioning Programme and Onshore Decommissioning Plan (see **Table 29–5**, Commitment IDs CO21 and CO56) where relevant, which will be developed prior to the construction of the offshore works and the commencement of onshore decommissioning works respectively.<br><br>In this assessment, it is assumed that most decommissioning activities would be the reverse of their construction counterparts, and that their impacts would be of similar nature to, and no worse than, those identified during the construction phase. |
| HH-D-05 | Impacts on transport modes, access and connections (onshore) - decommissioning activities not yet defined | |
| HH-D-09 | Impacts on education and training (offshore and onshore) - decommissioning activities not yet defined | |
| HH-D-10 | Impacts on employment and income (offshore and onshore) - decommissioning activities not yet defined | |
| HH-D-14 | Impacts on air quality (onshore) - decommissioning activities not yet defined | |
| HH-D-15 | Impacts on water quality and availability (offshore) - decommissioning activities not yet defined | |
| HH-D-16 | Impacts on water quality and availability (onshore) - decommissioning activities not yet defined | |
| HH-D-19 | Impacts from noise and vibration (onshore) - decommissioning activities not yet defined | |

### 29.4.3 Embedded Mitigation Measures

36. The Project has made several commitments to avoid, prevent, reduce or, if possible, offset potential adverse environmental effects through mitigation measures embedded into the evolution of the Project Design Envelope. These embedded mitigation measures include actions that will be undertaken to meet other existing legislative requirements and those considered to be standard or best practice to manage commonly occurring environmental effects. The assessment of likely significant effects has therefore been undertaken on the assumption that these measures are adopted during the construction, O&M and decommissioning phases.

37. As the assessment of effects presented in **Section 29.7** considers potentially significant effects identified by the topic chapters outlined in **Section 29.1**, relevant embedded mitigation measures for human health impacts includes the embedded mitigation measures outlined in these chapters.

38. In particular, the human health assessment has been undertaken on the assumption that the following measures are adopted:

- Code of Construction Practice (CoCP) (Commitment ID CO39), with regard to management of new or historic contamination, dust management, pollution and spills prevention;
- Construction Noise and Vibration Management Plan (CNVMP) (Commitment ID CO70), with regard to human health effects of construction noise and vibration;
- Drilling Fluid Breakout Management Plan (Commitment ID CO38) and the use of trenchless installation techniques as outlined in Commitment ID CO77, with regard to trenchless crossings at sensitive locations such as sensitive roads;
- Construction Traffic Management Plan (CTMP) (Commitment ID CO73), with regard to temporary road diversions, disruption to transport and minimising air quality impacts from construction vehicles, including the appointment of a Traffic Management Coordinator (TMCo) with regard to traffic management and information sharing with the local community;
- Public Rights of Way (PRoW) Management Plan (Commitment ID CO57), with regard to disturbance to PRoW and cycle route users;
- Employment and Skills Plan (ESP) (Commitment ID CO67), with regard to potential socio-economic benefits of the Project and measures to increase benefits to vulnerable groups;
- Landscape Management Plan (LMP) (Commitment ID CO65), with regard to screening or filtering of views of built infrastructure, construction site lighting and operational lighting; and
- Communications Plan (Commitment ID CO80), with regard to the provision of information to local communities and other relevant stakeholders during construction and a grievance mechanism for complaints received, and a commitment to liaise with fishermen in relation to offshore activities (Commitment ID CO15, as part of the Fisheries Liaison and Coexistence Plan (FLCP).

39. In addition to the measures set out in other chapters, embedded mitigation measures relevant to the human health assessment are outlined in **Table 29–5**. An EMF Compliance Statement will also be developed at ES stage and submitted with the DCO application. This document will demonstrate the Project's compliance with the latest relevant public health protection standards and regulations on EMF emissions such as the ICNIRP guidelines (ICNIRP, 1998 and 2010) and Government voluntary Code of Practice on EMF public exposure (Department for Energy Security & Net Zero, 2012) in the design and siting of onshore electrical infrastructure.

40. Full details of all commitments made by the Project are provided within the Commitments Register in **Volume 2, Appendix 6.3 Commitments Register**. A description of how the Commitments Register should be used alongside the PEIR chapter is provided in **Volume 2**, **Appendix 1.2 Guide to PEIR** and **Chapter 6 Environmental Impact Assessment Methodology**. In addition, a list of draft outline management plans which are submitted with the PEIR for consultation is provided in **Section 1.10** of **Chapter 1 Introduction**. These documents will be further refined and submitted along with the DCO application. See **Volume 2, Appendix 1.2 Guide to PEIR** for a list of all PEIR documents.

41. The Commitments Register is provided at PEIR stage to give stakeholders an early opportunity to review and comment on the proposed commitments. Proposed commitments may evolve during the pre-application phase as the EIA progresses and in response to refinements to the Project Design Envelope and stakeholder feedback. The final commitments will be confirmed in the Commitments Register which will be submitted with the DCO application.

*Table 29–5 Embedded Mitigation Measures Relevant to Human Health*

| Commitment ID | Proposed Embedded Mitigation | How the Embedded Mitigation will be Secured | Relevance To Human Health Assessment | Relevance to Impact ID |
|---|---|---|---|---|
| CO21 | An Offshore Decommissioning Programme will be provided prior to the construction of the offshore works and implemented at the time of decommissioning, based on the relevant guidance and legislation. | DCO Requirement - Offshore Decommissioning Programme | The Offshore Decommissioning Programme will include an assessment of impacts of offshore decommissioning works on human health receptors, where relevant, and appropriate mitigation measures to avoid significant effects. | HH-D-03<br>HH-D-05<br>HH-D-09<br>HH-D-10<br>HH-D-14<br>HH-D-15<br>HH-D-16<br>HH-D-19 |
| CO56 | An Onshore Decommissioning Plan will be developed prior to commencement of onshore decommissioning works based on the relevant available guidance and legislative requirements. The scope and methodology of onshore decommissioning works and appropriate mitigation measures will be detailed in the plan. | DCO Requirement - Onshore Decommissioning Plan | The Onshore Decommissioning Plan will include an assessment of impacts of onshore decommissioning works on human health receptors, where relevant, and appropriate mitigation measures to avoid significant effects. | |
| CO68 | A protocol on workforce access to occupational health, hygiene and emergency services to minimise the use of local National Health Service (NHS) primary healthcare providers and inappropriate use of Accident and Emergency (A&E) services, appropriate communicable disease prevention measures and a workforce code of conduct will be included in the Project Environmental Management Plan (PEMP) for offshore construction works and the Code of Construction Practice (CoCP) for onshore construction works. | DCO Requirement - Code of Construction Practice<br>DML Condition - Project Environmental Management Plan | The workforce management plan(s) will ensure the offshore and onshore construction workforce have access to occupational healthcare services and minimise impacts on local NHS facilities. | N/A |
| CO79 | A Battery Safety Management Plan (BSMP) will be developed in accordance with the Outline BSMP. The BSMP will provide a health and safety risk assessment of the Energy Storage and Balancing Infrastructure (ESBI) and detail appropriate prevention, monitoring and contingency measures for any identified hazards, including fire and chemical leak containment, to ensure compliance with latest relevant regulations and standards. The BSMP will also include measures for provision of information to the local community on ESBI risks and how these risks are appropriately mitigated and managed. | DCO Requirement - Battery Safety Management Plan | Limits the potential impacts of an event caused by battery storage on both on- and off-site receptors and also the impacts of an off-site event impacting the ESBI within the OCS zone.<br>Information will be provided to the local community on ESBI risk and how these are mitigated and managed. | HH-O-25 |

### 29.4.4 Enhancement Measures

42. In addition to embedded mitigation measures, the Project has also made commitments to create or enhance positive benefits to the environment and communities where relevant. Enhancement measures are above and beyond measures required to avoid, prevent, reduce or, if possible, offset potential adverse environmental effects and are therefore set out separately in this chapter. **Table 29–6** identifies the proposed enhancement measure relevant to human health. Full details of all commitments made by the Project are provided in **Volume 2, Appendix 6.3 Commitments Register**.

*Table 29–6 Enhancement Measure Relevant to Human Health*

| Commitment ID | Proposed Enhancement Measure | How the Enhancement Measure Will be Secured | Relevance to Human Health Assessment | Relevance to Impact ID |
|---|---|---|---|---|
| CO67 | An Employment and Skills Plan (ESP) will be developed in accordance with the Outline ESP. The ESP will set out how the Applicant aims to maximise the potential local socio-economic benefits of the Project and work with the supply chain to boost opportunities for UK suppliers and workers. The ESP will also include measures to increase benefits to vulnerable groups, including Not in Education, Employment or Training (NEET) population group, disadvantaged adults and local unemployed adults. | DCO Requirement – Employment and Skills Plan | Provides socio-economic benefits as well as benefits to vulnerable groups. | HH-C-09<br>HH-O-09<br>HH-D-09<br>HH-C-10<br>HH-O-10<br>HH-D-10 |

43. Indicative enhancement measures which are under consideration for inclusion within the Outline ESP (Commitment ID CO67) are set out in **Table 29–7**. The Outline ESP will be developed at ES stage and submitted with the DCO application.

*Table 29–7 Indicative Enhancement Measures to be Included in the Outline Employment and Skills Plan*

| Outline ESP: Enhancement Measures for Human Health (to be developed at ES stage) |
|---|
| Employment and Education: NEET Population Group<br>As far as reasonably practicable (e.g. subject to standards and security checks), provide a targeted scheme of access to:<br>• Construction, O&M and decommissioning employment opportunities in the local and regional area for people who are NEET.<br>• Construction, O&M and decommissioning training schemes and apprenticeships for young people in the local and regional area who are NEET.<br>Monitoring of the proportion of NEET taking up and completing training opportunities with the Project would be undertaken to confirm the benefit and further tailor the targeting of local vulnerable groups. This information would be shared on an annual basis with the County's public health team via ERYC. |
| Employment and Education: Disadvantaged Adults<br>Work with local education and training providers to support opportunities to provide local adult employment linked to construction, O&M and decommissioning job opportunities relevant to disadvantaged adults facing skills barriers to employment opportunities.<br>Monitoring of the proportion of local people with long-term unemployment, high job instability or low-income characteristics who enter employment with the Project would be undertaken as part of the project monitoring to confirm the benefit and further tailor the targeting of local vulnerable groups. |
| Employment and Education: Local Unemployed Adults<br>As far as reasonably practicable (e.g. subject to standards and security checks) work with local employment schemes to support opportunities to provide local unemployed adults with access to interviews for construction, O&M and decommissioning job opportunities. This may include advertising and interviewing for jobs locally and using approaches that facilitate access for people with disabilities or social disadvantage. |

### 29.4.5 Realistic Worst-Case Scenarios

44. To provide a precautionary, but robust, assessment at this stage of the Project's development process, a realistic worst-case scenario has been defined for each impact scoped into the assessment as outlined in **Section 29.4.2**. The realistic worst-case scenarios are derived from the range of parameters included in the Project Design Envelope. They ensure that the assessment of likely significant effects is based on the maximum potential impact on the environment. Should an alternative development scenario be taken forward in the final design of the Project, the resulting effects would not be greater in effect significance. Further details on the Project Design Envelope are provided in **Chapter 6 Environmental Impact Assessment Methodology**.

45. For human health, the worst-case scenario concerning public concerns and understanding of EMF and the impact on community identity, culture, resilience and influence due to visual impacts is defined by the largest scale of infrastructure, the least level of screening or the longest period before screening is established, and the least effective noise-reducing housing associated with the OCS and ESBI. This scenario would result in greater public awareness of the Project's infrastructure.

46. The worst-case scenario for climate change and wider societal infrastructure is defined by the lowest level of energy generation, thereby producing the lowest achievable public health benefit from renewable energy security.

47. The worst-case scenarios for potential impacts on open space, leisure and play, transport modes, access and connections, education and training, employment and income, noise and vibration and the built environment are outlined in other topic chapters (as detailed in **Section 29.1**). Residual significant effects from these areas are accounted for in the assessment within this chapter. It is therefore not necessary to define a single worst-case scenario for these impacts here. To reflect this, this assessment will account for potential detrimental impacts identified in the other chapters based on the worst-case scenario described in each of these chapters.

48. Following the PEIR publication, further design refinements will be made based on ongoing engineering studies and considerations of the EIA and stakeholder feedback. Therefore, realistic worst-case scenarios presented in the PEIR may be updated in the ES. The Project Design Envelope will be refined where possible to retain design flexibility only where it is needed.

### 29.4.6 Development Scenarios

49. Consideration is also given to the different development scenarios with respect to the OCS zones. At this stage, two OCS zone options remain in the Project Design Envelope (see **Chapter 4 Project Description** for further details) noting that only one option will be developed. The two development scenarios are:

- Infrastructure located in OCS Zone 4; or
- Infrastructure located in OCS Zone 8.

50. With respect to the human health assessment, it is noted that the assessment of likely significant effects is not materially affected by the two development scenarios, as the same broad receptors, realistic worst-case scenarios and potential effects are applicable to both OCS zone options. Therefore, the assessment outcomes presented in **Section 29.7** remain the same for both development scenarios.

## 29.5 Assessment Methodology

### 29.5.1 Guidance Documents

51. The following guidance documents have been used to inform the baseline characterisation, assessment methodology and mitigation design for human health:

- Institute of Environmental Management and Assessment (IEMA) 2022 guidance on health in EIA series, effective scoping (Pyper *et al.*, 2022a) and determining significance (Pyper *et al.*, 2022b). These are practitioner guidance on the coverage of human health in EIA for England, Wales, Scotland, Northern Ireland and the Republic of Ireland. They include methods for determining population health sensitivity, magnitude and significance. They are the key methods citation.
- IEMA 2024 Guide: Competent Expert for Health Impact Assessment (HIA) including Health in Environmental Assessments (Pyper *et al.*, 2024). A guide to meeting the EIA requirement to use competent experts in preparing the EIA Human Health chapter.
- Institute of Public Health (IPH), Guidance, Standalone HIA and health in environmental assessment (IPH, 2021). The guidance sets current good practice for the assessment of human health in EIA, including assessment methods. This updates the 2009 guidance from the IPH. This guidance for Northern Ireland and Republic of Ireland can be applied more broadly in the UK. The guidance informed the IEMA 2022 methods cited above.
- International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA). A reference paper on addressing human health in EIA (IAIA and EUPHA, 2020). This international consensus piece informed the IPH 2021 guidance. The publication explains EIA for public health stakeholders and sets out transparent assessment approaches adopted by the IPH.
- IAIA, HIA International Best Practice Principles (IAIA, 2021). The guidance confirms the relationship between HIA and EIA. It also confirms the application of HIA principles when undertaking health in EIA.
- Public Health England (PHE), HIA in spatial planning (PHE, 2020). The guidance confirms that where EIA is undertaken the requirements for HIA should be met through the EIA health chapter. *"First, establish whether the project is subject to EIA. If yes, follow health in EIA process"* (Page 28, final paragraph).
- PHE, Advice on the content of Environmental Statements accompanying an application under the NSIP Regime (PHE, 2021). The guidance assists applicants preparing an ES as part of their NSIP submission. Themes of access, traffic and transport, socio-economics and land use are discussed in addition to bio-physical health determinants.

- The Department for Environment Food and Rural Affairs (Defra) Environmental Improvement Plan 2023 (DEFRA, 2023) amends the national $PM_{2.5}$ standards. The Environmental Improvement Plan includes a long-term target for reducing population exposure to $PM_{2.5}$ concentrations to meet an annual mean of 10µg/m$^3$, as recommended by the World Health Organization's (WHO) 2005 guideline. The Plan therefore aims to achieve a target of 12µg/m$^3$ annual mean concentration by 2028 and a target of 10µg/m$^3$ annual mean concentration by 2040.

## 29.5.2 Local Health Priorities

### 29.5.2.1 Health and Wellbeing Strategy 2023 – 2028

52. The East Riding Health and Wellbeing Strategy 2023 – 2028 (East Riding Health and Wellbeing Board, 2023) is a strategic framework developed to improve the health and wellbeing of residents in the East Riding of Yorkshire. The strategy identifies the following priorities which have informed the assessment:

- For children and young people to enjoy good health and wellbeing, including improving school readiness, improving mental health, raising the education attainment of disadvantaged pupils, and encouraging and supporting healthy behaviours;
- For working age adults to reduce their risk of ill health including equipping people with skills they need to progress in the labour market; providing employment and income; and providing support to maintain healthy behaviours;
- For residents to achieve healthy, independent ageing including reducing social isolation particularly for the vulnerable groups and supporting creation of 'active communities' to help reduce, prevent and delay the need for services and improve healthy happy years of life; and
- For health inequalities to be reduced including engaging those furthest from employment or education and deliver higher level skills, building strong and effective community networks and providing ease of access to healthy lifestyle choices.

53. All these local health priorities are important and have informed the assessment.

### 29.5.2.2 Joint Strategic Needs Assessment 2024 and Local Healthcare Needs

54. The East Riding Joint Strategic Needs Assessment (JSNA) (East Riding Health and Wellbeing Board, 2024) identifies the following vulnerable groups as priorities, which have been taken into account by the assessment:

- **Young Age**: The JSNA emphasises the importance of addressing the needs of children and young people, including:
  - Mental health support for children and adolescents, particularly those experiencing anxiety and depression;
  - Support for children with special educational needs, including social, emotional, and mental health needs;
  - Children living in low-income households or experiencing poverty;
  - Looked after children, children with special needs and disability, young people aged 16 to 17 NEET;
  - Young carers and children with physical and developmental disabilities, including autism; and
  - Vulnerabilities related to environmental factors, such as lack of access to green spaces, traffic safety risks, and health issues like asthma exacerbated by poor air quality.
- **Old Age**: The assessment highlights priorities for older adults, including:
  - People in old age living with multiple long-term conditions, older people living alone and older people in poverty;
  - Support for individuals living with dementia and other cognitive impairments;
  - Addressing income deprivation and poverty among older populations;
  - Management of long-term health conditions and sensory impairments; and
  - Focus on frailty, falls prevention, and end-of-life care;
- **Low Income**: Key priorities related to low-income populations include:
  - Working age population who are unemployed, veterans including physical and mental health and wellbeing, and unpaid carers;
  - Support for low-income families and individuals receiving Jobseeker's Allowance;
  - Addressing the needs of unpaid carers and those facing unemployment; and
  - Tackling housing costs and promoting equitable access to secure income and housing.

- **Poor Health:** The JSNA identifies priorities for those experiencing poor health, including:
  - Individuals from lower socioeconomic backgrounds facing high rates of complex mental and physical health issues;
  - Children with special needs and long-term conditions; and
  - Older adults living with multiple health conditions, including mobility issues.
- **Social Disadvantage**: Priorities related to social disadvantage include:
  - Addressing the needs of children with special educational needs and those living in poverty; and
  - Supporting women, minority ethnic groups, migrants, and individuals with disabilities who are underrepresented in well-paid employment.
- **Access and Geographical Factors**: The JSNA notes challenges faced by:
  - Individuals living in the most deprived areas of East Riding of Yorkshire; and
  - Residents in rural areas who may have limited access to healthcare services and resources.

55. The vulnerable groups identified above (**Paragraph 54**) align with and have informed the population groups considered in this assessment (see **Section 29.5.4.1.4**).

## 29.5.3 Data and Information Sources

### 29.5.3.1 Desk Study

56. A desk study has been undertaken to compile baseline information in the previously defined Human Health Study Areas (see **Section 29.4.1**) using the sources of information set out in **Table 29–8**.

*Table 29–8 Desk-Based Sources for Human Health Data*

| Data Source | Spatial Coverage | Year(s) | Summary of Data Contents |
|---|---|---|---|
| OHID | National, regional, local and ward level | 2016-2024 | Public health intelligence data, notably from the Fingertips tools for Local Authority Health Profiles and Local Health (ward level) |
| Ministry for Housing, Communities and Local Government (MHCLG) | LSOA | 2019 | LSOA resolution data on community deprivation |
| Office of National Statistics (ONS) and official labour market statistics (NOMIS) statistics. | National, regional, local and ward level | 2016-2024 | Census data (2021 used where released at time of baseline work) |
| East Riding of Yorkshire Health and Wellbeing Strategy | Local | 2023-2028 | Local public health priorities |
| East Riding of Yorkshire Joint strategic needs assessment (JSNA) | Local | 2022-2023 | Local vulnerable groups and local health challenges |

## 29.5.4 Impact Assessment Methodology

57. **Chapter 6 Environmental Impact Assessment Methodology** sets out the overarching approach to the impact assessment methodology. The topic-specific methodology for the human health assessment is described in this section.

58. The health assessment methodology uses best practice from the IEMA's 2022 guidance on health in EIA:

- IEMA Guide: Effective Scoping of Human Health in Environmental Impact Assessment ; and
- IEMA Guide: Determining Significance for Human Health in Environmental Impact.

59. The health assessment is a qualitative analysis, following the IEMA's 2022 guidance approach, which draws on qualitative and quantitative inputs from other topic chapters. This is considered the most appropriate methodology for assessing wider determinants of health proportionately, consistently and transparently.

60. As set out in guidance, the assessment methods allow a consideration of the effect on population health outcomes and what this means for public health, drawing on scientific literature, health baseline change, local health priorities, health policy context, compliance with regulatory or statutory standards and consultation as relevant.

61. The approach taken ensures that wider requirements for HIA are embedded within this EIA health assessment in line with good practice.

62. Where proportionate, the need for monitoring has been considered, including relevant governance.

### 29.5.4.1 Impact Assessment Criteria

#### 29.5.4.1.1 Determinants of Health, Risk Factors and Health Outcomes

63. The chapter uses the WHO definition of health, which states that health is a "*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.*" (WHO, 1948).

64. The chapter also uses the WHO definition for mental health, which is 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 her or his community."* (WHO, 2022).

65. Health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.

66. Impacts of the Project that result in changes 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.

67. A change in a determinant of health affects does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The health assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Project. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

68. Typically, the change in a risk factor may need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

#### 29.5.4.1.2 Definitions

69. For each potential impact, the health assessment identifies receptors (populations) sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the health assessment are provided in **Table 29–9** and **Table 29–10**.

70. The health assessment conclusions are presented in terms of EIA categories of significance, such as major, moderate, minor or negligible, along with a narrative that explains this score. This explanation includes references to evidence, local context and any inequalities. The approach follows the IEMA's 2022 guidance**. Table 29–9**, **Table 29–10** and

71. **Table 29–12** summarise the health assessment criteria. The assessment uses professional judgement, based on consistent and transparent criteria for sensitivity and magnitude, and incorporates relevant contextual evidence to explain the significance of the findings for human health in terms of public health.

72. Judgments are based on the most relevant criteria in **Table 29–9**, **Table 29–10** and

73. **Table 29–12** and it is likely in any given analysis that some criteria will span score categories. Within the assessment, key terms that qualitatively describe levels in the criteria used in the methods table are italicised in accordance with the IEMA's 2022 guidance.

*Table 29–9 Definition of Sensitivity for a Human Health Receptor*

| Sensitivity | Definition (Indicative Criteria) |
|---|---|
| **High** | High levels of deprivation (including pockets of deprivation); reliance on resources shared (between the population and the Project); existing wide inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or concern; people who are prevented from undertaking daily activities; dependants; people with very poor health status; and / or people with a very low capacity to adapt. |
| **Medium** | Moderate levels of deprivation; few alternatives to shared resources; existing widening inequalities between the most and least healthy; a community whose outlook is predominantly uncertainty with some concern; people who are highly limited from undertaking daily activities; people providing or requiring a lot of care; people with poor health status; and / or people with a limited capacity to adapt. |
| **Low** | Low levels of deprivation; many alternatives to shared resources; existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern; people who are slightly limited from undertaking daily activities; people providing or requiring some care; people with fair health status; and / or people with a high capacity to adapt. |
| **Very Low** | Very low levels of deprivation; no shared resources; existing narrow inequalities between the most and least healthy; a community whose outlook is predominantly support with some concern; people who are not limited from undertaking daily activities; people who are independent (not a carer or dependant); people with good health status; and / or people with a very high capacity to adapt. |

*Table 29–10 Definition of Magnitude of Impacts*

| Magnitude | Definition (Indicative Criteria) |
|---|---|
| **High** | High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness / injury outcomes; majority of population affected; permanent change; substantial service quality implications. |
| **Medium** | Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications. |
| **Low** | Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications. |
| **Negligible** | Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication. |

29.5.4.1.3 Significance of Effect

74. The assessment of significance of an effect is informed by the sensitivity of the receptor and the magnitude of the impact (see **Chapter 6 Environmental Impact Assessment Methodology** for further detail). The determination of significance is guided by the use of a human health significance of effect matrix, as shown in **Table 29–11**. Definitions of each level of significance are provided in

75. **Table 29–12**. For the purposes of this assessment, any effect that is of major or moderate significance is considered to be significant in EIA terms, whether this be adverse or beneficial. Any effect that has a significance of minor or negligible is not significant. Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.

76. For the health assessment, following IEMA's 2022 guidance, a single conclusion on significance is reached that takes into account the sensitivity of both the general population and the vulnerable group population. In this regard the significance conclusion takes into account the potential for health inequalities between these groups. For the purposes of applying the significance matrix shown in **Table 29–11**, the sensitivity is driven by the vulnerable population group score.

*Table 29–11 Human Health Significance of Effect Matrix*

| | | Adverse Magnitude | | | | Beneficial Magnitude | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | High | Medium | Low | Negligible | Negligible | Low | Medium | High |
| Sensitivity | High | Major | Major / Moderate | Moderate / Minor | Minor / Negligible | Minor / Negligible | Moderate / Minor | Major/ Moderate | Major |
| | Medium | Major / Moderate | Moderate | Minor | Minor / Negligible | Minor / Negligible | Minor / Negligible | Moderate | Major / Moderate |
| | Low | Moderate / Minor | Minor | Minor | Negligible | Negligible | Negligible | Minor | Moderate / Minor |
| | Very Low | Minor / Negligible | Minor / Negligible | Negligible | Negligible | Negligible | Negligible | Minor / Negligible | Minor / Negligible |

*Table 29–12 Definition of Effect Significance (IEMA 2022)*

| Category / Score | Indicative Criteria |
|---|---|
| **Major (Significant)** | The narrative explains that this is significant for public health because (statements applied as appropriate):<br>Changes, due to the Project, have a substantial effect on the ability to deliver current health policy and / or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show consensus on the importance of the effect.<br>Change, due to the Project, could result in a regulatory threshold or statutory standard being crossed (if applicable).<br>There is likely to be a substantial change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a causal relationship between changes that would result from the Project and changes to health outcomes.<br>In addition, health priorities for the relevant study area are of specific relevance to the determinant of health or population group affected by the Project. |

| Category / Score | Indicative Criteria |
|---|---|
| **Moderate (Significant)** | The narrative explains that this is significant for public health because (statements applied as appropriate):<br>Changes, due to the Project, have an influential effect on the ability to deliver current health policy and / or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show mixed views.<br>Change, due to the Project, could result in a regulatory threshold or statutory standard being approached (if applicable).<br>There is likely to be a small change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a clear relationship between changes that would result from the Project and changes to health outcomes.<br>In addition, health priorities for the relevant study area are of general relevance to the determinant of health or population group affected by the Project. |
| **Minor (Not Significant)** | The narrative explains that this is not significant for public health because (statements applied as appropriate):<br>Changes, due to the Project, have a marginal effect on the ability to deliver current health policy and / or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and / or that no relevant consultation themes emerge among stakeholders.<br>Change, due to the Project, would be well within a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable).<br>There is likely to be a slight change in the health baseline of the population, including as evidenced by the effect size and / or scientific literature showing there is only a suggestive relationship between changes that would result from the Project and changes to health outcomes.<br>In addition, health priorities for the relevant study area are of low relevance to the determinant of health or population group affected by the Project. |
| **Negligible (Not Significant)** | The narrative explains that this is not significant for public health because (statements applied as appropriate):<br>Changes, due to the Project, are not related to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the project having no responses on this issue among stakeholders.<br>Change, due to the Project, would not affect a regulatory threshold, statutory standard or guideline (if applicable).<br>There is likely to be a very limited change in the health baseline of the population, including as evidenced by the effect size and / or scientific literature showing there is an unsupported relationship between changes that would result from the Project and changes to health outcomes.<br>In addition, health priorities for the relevant study area are not relevant to the determinant of health or population group affected by the Project. |

77. The temporal scope of this chapter used the following summary terms:

- Very short term relates to effects measured in hours, days or weeks;
- Short term relates to effects measured in months, (up to 24 months duration);
- Medium term relates to effects measured in years; and
- Long term relates to effects measured in decades (e.g. the long-term effects on health from long-term employment).

29.5.4.1.4 Impact Receptors

78. The principal receptors with respect to human health are population groups located onshore who may be affected by onshore, nearshore and offshore activities of the Project.

79. The specific groups and characteristics of these populations that are taken into account by the health assessment are listed in **Table 29–13.**

*Table 29–13 Receptors*

| Receptor Group | Receptor | Relevant Features | Closest Distance from the Project |
|---|---|---|---|
| Human Population | General Population | • Residents<br>• Visitors<br>• Workforce<br>• Energy consumers | Offshore, the nearest point from the Array Area to shore is approximately 210km.<br>In some locations, the Onshore Development Area is adjacent to or directly interacts with some PRoW. |
| | Vulnerable Group Population | • Age<br>• Income status<br>• Health status<br>• Social disadvantage<br>• Access / geographical | |

80. In line with IEMA, IPH and IAIA / EUPHA guidance, a population health approach has been taken, informed by discussion of receptors within the other topic chapters.

81. That there is variation between people is widely acknowledged in public health. Public health frames this variation in terms of a likely distribution of effects within a population. This distribution can be applied conceptually or statistically as a way of describing how most individuals are likely to be affected. This links to the general population analysis.

82. Because there are invariably people towards the extremes of the distribution, e.g. experiencing much smaller or larger effects, it is relevant to also consider sub-populations who may be more likely to experience such extremes because of certain characteristics. This links to the vulnerable group analysis.

83. The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the health assessment. These groups are broadly defined to facilitate a consistent discussion across health issues. People falling into more than one group may be especially sensitive:

- Young age: Children and young people (including pregnant women and unborn children);
- Old age: Older people (particularly frail elderly);
- Low income: People on low income, who are economically inactive or unemployed / workless;
- Poor health: People with existing poor health and those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities;
- Social disadvantage: People who suffer discrimination or other social disadvantage, including relevant protected characteristics under the Equality Act 2010 or groups who may experience low social status or social isolation for other reasons; and
- Access and geographical factors: People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and / or health indicators.

84. The following general characterisations of how the general population may differ from vulnerable group populations have been considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction and operation.

- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).
- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.
- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Project. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources.
- The general population includes the proportion of the community whose outlook on the Project includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Project.

85. As all development has the potential for adverse effects to some particularly vulnerable individuals, the role of EIA significance conclusions is not to set a threshold of no harm from development, but to show where, at a population level, the harm should weigh strongly in the balance alongside the development's benefits for health and other outcomes. The assessment's population health conclusions take into account that all populations are likely to include some particularly sensitive individuals, including relating to sensory impairments, reduced mobility, disability, neuro-diversity, learning disabilities, chronic physical health conditions or mental health conditions.

86. As stated by guidance: *"Where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change."*

87. The following establishments in the site-specific Human Health Study Area (see **Section 29.4.1**) have been identified as facilities associated with vulnerable groups:

- Schools:
  - Beverley High School;
  - Beverley Manor Nursery School;
  - Molescroft Primary School;

- Beverley Grammar School;
- Longcroft School and Sixth Form College;
- St. Nicholas Primary School;
- St Mary's Church of England Primary School;
- St John of Beverley R C Primary School;
- Keldmarsh Primary School;
- Horton School Beverley;
- Hutton Cranswick Primary School;
- Swinemoor Primary School;
- Minster Primary School;
- Woodmansey Primary School;
- Hornsea School and Language College;
- Little Gruffalo's Pre-school;
- Beverley Minster Primary;
- Queensgate Pre-school;
- Keldmarsh Primary School;
- Scallywags Day Nursery; and
- Beverley St Nicholas Community Primary School

- Nursing Homes:
  - Andrews Court - Lifestyle Living - McCarthy Stone;
  - Apple Tree House Residential Care Home;
  - Barchester - Lindum House Care Home;
  - Beverley & Hull Based Farndale Care & Support Services;
  - Beverley Grange Nursing Home;
  - Beverley Manor Care Home;
  - Beverley Parklands Care Home;
  - Chapter House Care Home - Care UK;
  - Claremont House;
  - Figham House Care Home;
  - Home Instead Beverley & Hull | Home Care & Live-in Care;
  - Hornsea Nursing Home;
  - New House;
  - The Old School House; and
  - Westwood Park
- Healthcare Facilities:
  - East Riding Community Hospital;
  - Beverley Medical Centre;
  - Hornsea Medical Practice; and
  - North Holderness Medical Practice
- Organisations representing and supporting vulnerable populations:
  - Age UK East Riding;
  - East Riding of Yorkshire Council Social Services;
  - Beverley Food Bank;
  - Beverley and Holderness Citizens Advice Bureau;
  - Mind (local mental health services); and
  - East Riding Young Carers

#### 29.5.4.2 In-Combination Effects

88. The analysis considers how, due to the Project, the same populations may be affected by more than one change in relevant health determinants. For example, it considers the combined effects of changes in air and water quality on population health outcomes due to the Project's activities. These combined effects have regard to the nature of the interactions and the extent to which the same individuals are likely to be affected.

### 29.5.5 Cumulative Effects Assessment Methodology

89. The cumulative effect assessment (CEA) considers other plans and projects that may act collectively with the Project to give rise to cumulative effects on human health receptors. The general approach to the CEA for human health involves screening for potential cumulative effects, identifying a short list of plans and projects for consideration and evaluating the significance of cumulative effects. **Chapter 6 Environmental Impact Assessment Methodology**, **Volume 2, Appendix 6.4 Cumulative Effects Screening Report – Offshore** and **Volume 2, Appendix 6.5 Cumulative Effects Screening Report – Onshore** provide further details on the general framework and approach to the CEA.

### 29.5.6 Transboundary Effects Assessment Methodology

90. The transboundary effect assessment considers the potential for effects to occur as a result of the Project on human health receptors within the Exclusive Economic Zone (EEZ) of other European Economic Area (EEA) member states or other interests of EEA member states. **Chapter 6 Environmental Impact Assessment Methodology** provides further details on the general framework and approach to the transboundary effect assessment.

91. For human health, the potential for transboundary effects has been scoped out in line with the Scoping Opinion.

### 29.5.7 Assumptions and Limitations

92. This chapter provides a preliminary assessment of the likely significant effects of the Project in relation to human health using information available at the time of drafting as described in **Chapter 6 Environmental Impact Assessment Methodology**. This assessment will be refined where relevant and presented in the ES to be submitted with the DCO application.

93. This assessment is based on publicly available statistics and evidence sources. No new primary research or bespoke analysis of non-public data was undertaken for the health assessment.

94. The health and wellbeing assessment partially draws from and builds upon, the technical outputs from inter-related technical disciplines, listed in **Section 29.1**.

95. As a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter (e.g. for modelling work undertaken by other EIA specialists in their topic chapters). It is, however, considered that the information available provides a suitable basis for assessment.

96. All decision-making occurs within the context of imperfect information and therefore involves uncertainty. Reducing this uncertainty is a key part of the assessment. Whilst not all uncertainty can be removed, the following steps have been taken to allow confidence in the health assessment conclusions:

- Methods are used that triangulate evidence sources and professional perspectives;
- The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence;
- Quantitative inputs for other assessments have been used, which included model validation, as described in other chapters;
- The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings; and
- The health assessment has been transparent in its analysis and follows good practice.

97. Regarding the application of the precautionary principle in public health, this is discussed by the WHO (WHO, 2004). The WHO note how the precautionary principle is a two-stage test, requiring both uncertainty and serious threats to health, i.e. large effect sizes indicated by available evidence. The WHO describe health impact assessments (such as this health assessment) as a "*compass to guide public health decisions under uncertainty*" and that *"a centrepiece of precautionary assessment is environment and health assessment, which weighs the science of hazards and exposure. In this step, evidence of risk and uncertainty is examined to determine the possibility (and plausibility) of a significant health threat and the need for precautionary action*." Such an approach has been taken by this health assessment, which considers the potential for sources of hazards, levels of exposure (including mediated my mitigation), extent of the population exposed and the scale of change in relevant risk factors for health outcomes.

## 29.6 Baseline Environment

### 29.6.1 Existing Baseline

#### 29.6.1.1 The Coastal Context

98. Coastal communities within the vicinity of the Project's onshore infrastructure may face specific public health challenges that are commonly observed in similar coastal areas across England. The natural environment, combined with relatively lower housing costs compared to inland regions, has historically drawn older, retired populations. This demographic trend can contribute to higher rates of age-related health conditions, increasing demand for local health and social care services. Housing trends in coastal regions, including the conversion of properties into holiday lets or Houses of Multiple Occupation (HMO) have been linked to concentrations of socio-economic deprivation and associated health inequalities.

99. Within the vicinity of the Project, this could manifest as pockets of poorer health outcomes, particularly in more economically disadvantaged areas. Recruiting and retaining healthcare professionals to cater to these peripheral areas can be challenging due to geographical remoteness and the limited availability of public transport. These factors can contribute to reduced accessibility of essential healthcare services to local residents, especially those who are older and have mobility issues.

100. Economic factors may also play a role in shaping public health outcomes in these communities. Many coastal towns and villages within the vicinity of the Project were historically dependent on industries such as fishing, agriculture, or seasonal tourism. Over time, these industries have either declined or become less common, leading to fluctuations in employment rates.

101. Seasonal or precarious employment can further impact the health and wellbeing of residents, contributing to long-term socio-economic and health disparities. While the coastal environment offers potential benefits for mental wellbeing and physical activity, these advantages can be offset by challenges related to social isolation, limited infrastructure, and economic hardship (Chief Medical Officer, 2021).

#### 29.6.1.2 Site-Specific Wards

102. Different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstances. The aim of the following information is primarily to put into context the local health circumstances of the communities surrounding the Project (see **Figure 29-1** and **Figure 29-2**), drawing from available statistics.

103. Most outcomes of the Project relate to localised effects at landfall, along the onshore ECC or at the OCS zones. There are relatively few public health indicators that are available at this small area geographic resolution. The site-specific baseline draws on available indicators and in line with proportionate reporting summarises the site-specific health baseline relative to local (East Riding of Yorkshire), regional (Yorkshire and Humber) and national (England) benchmarks.

104. Where possible, information has been collected for the 'site-specific Human Health Study Area' comprising of the seven wards described in **Section 29.4.1** and presented in **Table 29–14**. Where ward level data is not available, local authority data describing the 'local population' has been used to compare with the national average.

#### 29.6.1.3 Wider Population Characteristics

105. **Table 29–14** presents site-specific and local population profile characteristics compared against regional and national statistics.

*Table 29–14 Site-Specific and Local Population Profiles Compared against Regional and National Statistics (OHID, 2024; ONS, 2021)*

| Indicators | Seven Wards (Site-Specific) | East Riding of Yorkshire (Local) | Yorkshire and Humber (Regional) | England (National) |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 49.0% | 49.0% | 49.1% | 51.0% |
| Female | 51.0% | 51.0% | 50.9% | 49.0% |
| **Age** | | | | |
| Aged 0 to 15 | 15.3% | 15.8% | 18.5% | 18.5% |
| Aged 16 to 64 | 58.5% | 57.7% | 62.3% | 63.0% |
| Aged 64 and over | 27.3% | 26.4% | 19.0% | 18.3% |
| **General Health** | | | | |
| Very good health | 46.0% | 44.9% | 46.2% | 48.5% |
| Good health | 35.4% | 35.4% | 34.3% | 33.7% |
| Fair health | 13.7% | 14.4% | 13.7% | 12.7% |
| Bad health | 3.6% | 4.1% | 4.5% | 4.0% |
| Very bad health | 1.0% | 1.3% | 1.3% | 1.2% |
| **Long Term Health Problem or Disability** | | | | |
| Disabled under the Equality Act: Day-to-day activities limited a lot | 6.9% | 7.7% | 8.1% | 7.3% |
| Disabled under the Equality Act: Day-to-day activities limited a little | 10.9% | 10.9% | 10.5% | 10.0% |
| Not disabled under the Equality Act: Has long term physical or mental health condition but day-to-day activities are not limited | 8.1% | 7.7% | 6.9% | 6.8% |
| Not disabled under the Equality Act: No long term physical or mental health conditions | 74.1% | 73.7% | 74.4% | 75.9% |

| Indicators | Seven Wards (Site-Specific) | East Riding of Yorkshire (Local) | Yorkshire and Humber (Regional) | England (National) |
|---|---|---|---|---|
| **Economic Activity** | | | | |
| Economically active (excluding full-time students) | 50.1% | 55.0% | 56.2% | 58.6% |
| Economically active (excluding full-time students): In employment | 48.6% | 52.9% | 53.5% | 55.7% |
| Economically active (excluding full-time students): Unemployed | 1.7% | 2.0% | 2.7% | 2.9% |
| Economically inactive | 44.6% | 43.5% | 41.4% | 39.1% |
| **Lower Income** | | | | |
| Income deprivation | 7.8% | 9.6% | 14.6% | 12.9% |
| **Ethnic Origin** | | | | |
| Asian, Asian British or Asian Welsh | 0.9% | 1.1% | 8.9% | 9.6% |
| Black, Black British, Black Welsh, Caribbean or African | 0.3% | 0.3% | 2.1% | 4.2% |
| Mixed or Multiple ethnic groups | 0.9% | 0.9% | 2.1% | 3.0% |
| White | 97.6% | 97.4% | 85.4% | 81.0% |
| Other ethnic group | 2.0% | 0.4% | 1.4% | 2.2% |
| **Language Proficiency** | | | | |
| Population who cannot speak English well or at all | 0.1% | 0.4% | 1.6% | 1.7% |
| Social isolation | | | | |
| Older people living alone | 26.2% | 27.3% | 32.2% | 31.5% |
| **Mortality** | | | | |
| Deaths from all causes, under 75 years (Standardised mortality ratio (SMR)) | 77.9 | 89.0 | 110.1 | 100.0 |
| Deaths from causes considered preventable, under 75 years ((SMR) | 70.3 | 82.6 | 113.5 | 100.0 |

106. Based on the data presented in **Table 29–14** the population profile characteristics associated with the seven wards (site-specific Human Health Study Area) compared to regional and national characteristics is:

- Sex
  - The site-specific population has a balanced gender distribution, with males at 49.0% and females at 51.0%. This is consistent with regional and national averages.
- Age
  - The site-specific population has a proportion of people aged 0-15 years of 15.3%, which is lower than the regional national average of 18.5%.
  - For the working age group (aged 16-64), the site-specific population has a proportion of 58.5%, which is lower than the regional average of 62.3% and the national average of 63.0%.
  - The proportion of people aged 65 and over in the site-specific population is 27.3%, which is higher than the regional average of 19.0% and the national average of 18.3%.
- General health
  - The majority of the site-specific population reports very good or good health. The proportion of individuals reporting very good health is 46.0%, which is slightly lower than the regional average of 46.2% and the national average of 48.5%. The site-specific population has a proportion of individuals reporting good health at 35.4%, which is slightly higher than the regional average of 34.3% and the national average of 33.7%.
  - The proportion of individuals reporting fair health is 13.7%, which is consistent with the regional average of 13.7% but slightly higher than the national average of 12.7%.
  - The site-specific population reports bad health at 3.6%, which is lower than the regional average of 4.5% and the national average of 4.0%. The proportion of individuals reporting very bad health is 1.0%, which is slightly lower than the regional average of 1.3% and the national average of 1.2%.

- Long term health problem or disability
  - The site-specific population has a proportion of individuals disabled under the Equality Act, with day-to-day activities limited a lot at 6.9%, which is lower than the regional average of 8.1% and the national average of 7.3%.
  - The proportion of individuals whose day-to-day activities are limited a little is 10.9%, which is slightly higher with the regional average of 10.5% and slightly higher than the national average of 10.0%.
  - The site-specific population has a proportion of individuals not disabled under the Equality Act, with long-term physical or mental health conditions, but not with day-to-day activities not limited at 8.1%, which is higher than the regional average of 6.9% and the national average of 6.8%.
  - The proportion of individuals not disabled under the Equality Act with no long-term physical or mental health conditions is 74.1%, which is slightly lower than the regional average of 74.4% and the national average of 75.9%.
- Economic activity
  - The site-specific population has a proportion of economically active individuals (excluding full-time students) at 50.1%, which is lower than the regional average of 56.2% and the national average of 58.6%.
  - The proportion of economically active individuals (excluding full-time students) in employment is 48.6%, which is lower than the regional average of 53.5% and the national average of 55.7%.
  - The unemployment rate among economically active individuals (excluding full-time students) is 1.7% in the site-specific area, which is lower than the regional average of 2.7% and the national average of 2.9%.
  - The economically inactive population in the site-specific area is 44.6%, which is higher than the regional average of 41.4% and the national average of 39.1%.
- Lower income
  - The site-specific population has a proportion of individuals in income deprivation at 7.8%, which is lower than the regional average of 14.6% and the national average of 12.9%.
- Ethnic origin
  - The majority of the site-specific study area population is White (97.6%), which is higher than the regional average (85.4%) and the national average (81.0%).
  - The proportion of individuals identifying as Asian, Asian British, or Asian Welsh is 0.9%, which is lower than the regional average of 8.9% and the national average of 9.6%.
  - The proportion of individuals identifying as Black, Black British, Black Welsh, Caribbean, or African is 0.3%, which is lower than the regional average of 2.1% and the national average of 3.0%.
  - The proportion of individuals identifying as Mixed or Multiple ethnic groups is 0.9%, which is lower than regional average of 2.1% and the national average of 3.0%.
  - The proportion of individuals identifying as other ethnic groups is 2.0%, which is higher than the regional average of 1.4%, but lower than the national average of 2.2%.
- Language proficiency
  - The site-specific population has a proportion of individuals who cannot speak English well or at all at 0.1%, which is lower than the regional average of 1.6% and the national average of 1.7%.
- Social isolation
  - The proportion of older people living alone, which can increase vulnerability, in the site specific area (26.2%) is lower than both the regional (32.2%) and national (31.5%) percentages.
- Mortality
  - For deaths from all causes under 75 years (standardised mortality ratio, (SMR)), the site-specific population has a ratio of 77.9, which is significantly lower than the regional average of 110.1 and national average of 100.0. This indicates that the site-specific population experiences lower all causes (under 75 years) mortality rates compared to both the regional and national averages.
  - In terms of preventable mortality, a similar trend is observed. The deaths from all causes, under 75 years (standardised mortality ratio) for the site-specific study area of 70.3 is significantly lower than the regional (113.5) and national (100.0) ratios.

107. Across the indicators the site-specific level performs well, indicating the presence of vulnerable groups, but also a generally good state of population health. Local benchmarks also tend to outperform the regional, but not the national, benchmark, indicating the greatest health challenges are at the regional level.

#### 29.6.1.4 East Riding of Yorkshire Population Health Profile

108. **Table 29–15** provides additional public health outcomes framework indicators that are available from the local authority, but not ward level. The data is from the OHID Fingertips data tool. In the following summary the comparative terminology of ‘similar’, ‘better’ or ‘worse’ in relation to the national benchmark is a Fingertips classification.

*Table 29–15 East Riding of Yorkshire Population Health Profile (Public Health Outcomes Framework OHID, 2024)*

| Indicator Name | Time Period | East Riding of Yorkshire | England | Recent Trend | Compared to England |
|---|---|---|---|---|---|
| Healthy life expectancy at birth (male) | 2021 – 2023 | 61.3 | 61.5 | Healthy life expectancy at birth (for the four HLE indicators) in 2021 to 2023 remained lower than in 2017 to 2019 in East Riding of Yorkshire | Slightly worse |
| Healthy life expectancy at birth (female) | 2021 – 2023 | 61.6 | 61.9 | | Slightly worse |
| Healthy life expectancy at age 65 (male) | 2021 – 2023 | 10.0 | 10.1 | | Similar |
| Healthy life expectancy at age 65 (female) | 2021 – 2023 | 11.2 | 11.2 | | Similar |
| Inequality in life expectancy at birth (male) | 2018 - 2020 | 6.80 | 9.70 | Cannot be calculated | 2nd lowest quintile |
| Inequality in life expectancy at birth (female) | 2018 - 2020 | 3.20 | 7.90 | Cannot be calculated | Lowest quintile |
| Percentage of children in absolute low income families (under 16s) | 2022 / 2023 | 11.5 | 15.6 | Decreasing and getting better | Better |
| Percentage of 16 to 17 year olds NEET or whose activity is not known | 2022 / 2023 | 2.9 | 5.2 | Decreasing and getter better | Better |
| Percentage of people in employment (16-64 years old) | 2023 / 2024 | 76.8 | 75.7 | No significant change | Similar |
| Killed and seriously injured (KSI) casualties on England's roads (per billion vehicle miles) | 2023 | 79.5 | 91.9 | No significant change | Similar |
| Violent crime - violence offences per 1,000 population | 2022 / 2023 | 20.4 | 34.94 | Decreasing | Lowest quintile |
| The rate of complaints about noise per 1,000 population | 2020 / 2021 | 5.46 | 12.0 | No significant change | Better |
| The percentage of the population exposed to road, rail and air transport noise of 65dB(A) or more, during the daytime | 2016 | 1.95 | 5.50 | - | Lowest quintile |
| The percentage of the population exposed to road, rail and air transport noise of 55 dB(A) or more during the night-time | 2016 | 2.88 | 8.48 | Cannot be calculated | Lowest quintile |
| Utilisation of outdoor space for exercise / health reasons (16+ years old) (percentage) | March 2015 - February 2016 | 16.78 | 17.92 | Cannot be calculated | Similar |
| Fuel poverty (low income, low energy efficiency methodology) (percentage) | 2022 | 15.2 | 13.1 | Cannot be calculated | 2nd worst quintile |
| Loneliness: Percentage of adults who feel lonely often or always or some of the time (16+ years old) | 2019 / 2020 | 13.86 | 22.26 | Cannot be calculated | Better |
| Reception: Prevalence of overweight (including obesity) (4-5 years old) (percentage) | 2023 / 2024 | 24.8 | 22.1 | Increasing and getting worse | Worse |
| Year 6: Prevalence of overweight (including obesity) (10-11 years old) (percentage) | 2023 / 2024 | 34.3 | 35.8 | Increasing and getting worse | Worse |
| Percentage of adults (aged 18+) classified as overweight or obese | 2022 / 2023 | 71.2 | 64.0 | Cannot be calculated | Worse |
| Percentage of physically active adults (aged 19+) | 2022 / 2023 | 66.8 | 67.1 | Cannot be calculated | Similar |
| Percentage of physically inactive adults (aged 19+) | 2022 / 2023 | 22.6 | 22.6 | Cannot be calculated | Similar |

| Indicator Name | Time Period | East Riding of Yorkshire | England | Recent Trend | Compared to England |
|---|---|---|---|---|---|
| Self reported wellbeing: people with a high anxiety score (aged 16+) (percentage) | 2022 / 2023 | 23.7 | 23.3 | Cannot be calculated | Similar |
| Emergency hospital admissions due to falls in people aged 65 and over (directly standardised rate per 100,000 people) | 2022 / 2023 | 1,607 | 1,933 | Decreasing and getting better | Better |
| Fraction of mortality attributable to particulate air pollution (new method) (aged 30+) (percentage) | 2022 | 4.7 | 5.8 | Cannot be calculated | Values not compared |
| Under 75 mortality rate from cardiovascular diseases considered preventable (2019 definition) (directly standardised rate per 100,000 people) | 2021 – 2023 | 28.3 | 30.5 | Cannot be calculated | Similar |
| Under 75 mortality rate from respiratory disease considered preventable (2019 definition) (directly standardised rate per 100,000 people) | 2021 – 2023 | 14.9 | 15.8 | No significant change | Better |
| Winter mortality index | August 2021 – July 2022 | 8.0 | 8.1 | Cannot be calculated | Similar |

109. Overall health can be informed by life expectancy indicators. For both men and women, healthy life expectancy is slightly worse in East Riding of Yorkshire compared to the national benchmark. Health inequalities are an important public health consideration, reflecting how health varies by social gradient. Inequalities in life expectancy, an indicator of levels of variation between those with and without additional pressures and barriers to achieving good health, is similar in East Riding of Yorkshire compared to the national benchmark. These indicators are a general measure of health and of existing inequalities.

110. Socio-economic status has correlations with health, both for those directly employed and their dependants. The number of children in low-income families in East Riding of Yorkshire is better compared to the national benchmark. The recent trend has been for decreasing numbers, i.e. an improving situation with this indicator. Similarly, the percentage of 16 to 17 year olds NEET in East Riding of Yorkshire (2.9%) is better than the national average (5.2%). The overall trend is that this percentage is decreasing in East Riding of Yorkshire, indicating better outcomes for this indicator.

111. Exposure to transport noise, complaints about noise and particulate air pollution attributable mortality are all lower in East Riding of Yorkshire than the national benchmark. Measures of respiratory and cardiovascular disease are also lower in East Riding of Yorkshire than the national benchmarks. These indicators are relevant to disruption and disturbance associated with construction works and associated traffic.

112. Road injury rates, hospital admissions for falls in the elderly and measures of social isolation (adult loneliness) are all lower in East Riding of Yorkshire than national benchmarks. These indicators are relevant to transport modes, access and connection changes due to the Project, including pedestrian and cyclist amenity. Injury rates can be used as a road safety indicator.

113. Changes to the physical environment can influence health behaviours. Health related utilisation of outdoor space in East Riding of Yorkshire is slightly below, but similar to, the national benchmark. Prevalence of being overweight at age 4-5 years old is worse than the national benchmark, the same is observed for those aged of 10-11 years old. For adults the proportion who are overweight is also higher than the national benchmark. Adult physical activity levels are similar to national benchmarks. These indicators are relevant to changes in access to physical activity, outdoor space or leisure due to the Project.

114. A relevant public health indicator relates to excess deaths at times of extreme cold temperatures when home heating is a factor. Fuel poverty is higher and excess winter deaths are similar in East Riding of Yorkshire than the national benchmarks.

115. Levels of anxiety within the population are higher than the national benchmark. This indicator is relevant to changes in public understanding of risk due to the Project.

116. Deprivation can be used as a health resilience indicator. Deprivation mapping (2019) indicates relatively low levels of deprivation in the majority of the East Riding of Yorkshire. For overall deprivation the East Riding of Yorkshire is in the second lowest quintile compared to England.

117. The East Riding Health and Wellbeing Strategy 2023 – 2028 (East Riding Health and Wellbeing Board, 2023) outlines priorities for improving health across demographics, focusing on children's wellbeing, reducing health risks for working-age adults, and promoting healthy aging by addressing social isolation. It also aims to reduce health inequalities by engaging marginalised groups. Overall, the health indicators suggest higher resilience in the population compared to national benchmarks, highlighting the need to maintain physical activity opportunities while addressing challenges like low-income households and fuel poverty. The East Riding Health and Wellbeing Strategy 2023 – 2028 priorities are outlined in **Section 29.5.2.1**.

### 29.6.1.5 Baseline by Health Determinant

#### 29.6.1.5.1 Health and Wellbeing Effects from Changes to Open Space and Recreation

118. **Table 29–16** shows overall, health and wellbeing outcomes related to open space, leisure and play for children and young adults are variable compared to the national averages. It is also noted there are fewer statistics reported in the site-specific wards.

*Table 29–16 Baseline Summary Indicators Relevant to Open Space, Leisure and Play (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Utilisation of outdoor space for exercise/health reasons (16+ years) %) | 2015 / 2016 | - | - | - | 16.8 | 17.5 | 17.9 |
| Reception: Prevalence of overweight (including obesity) (%) (4-5 years) | 2021 / 2022 – 2023 / 2024 | 23.7 | 24.0 | 22.1 | 23.9 | 23.3% | 21.9 |
| Reception: Prevalence of obesity (including severe obesity) (%) | 2021 / 2022 – 2023 / 2024 | 9.1 | 11.6 | 8.0 | 9.8 | 10.5 | 9.9 |
| Year 6: Prevalence of overweight (including obesity) (%) | 2021 / 2022 – 2023 / 2024 | 37.8 | 32.9 | 33.2 | 35.7 | 39.5 | 35.8 |
| Year 6: Prevalence of obesity (including severe obesity) (%) | 2017 / 2018 – 2019 / 2020 | 22.4 | 19.5 | 19.9 | 21.5 | 24.2 | 21.6 |

**Legend**

| | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

119. The prevalence of overweight (including obesity) amongst children aged 4 to 5 years in East Wolds and Coastal and North Holderness (representative of the landfall) is 23.7% which is higher than the regional average of 23.3% and the national average of 21.9%, indicating that children in this area are more likely to be classified as overweight compared to the national trend. In Beverley Rural and Mid Holderness (representative of the onshore ECC), the prevalence is 24.0%, which is also higher than both the regional and the national average, suggesting a more concerning situation in this ward. On the other hand, Dale, St Mary's and Minster and Woodmansey (representative of the OCS zones) have the lowest prevalence at 22.1%, which, while still higher (worse) than both the national and regional averages, is relatively comparable.

120. In terms of obesity (including severe obesity), East Wolds and Coastal and North Holderness has a prevalence of 9.1%, which is lower than the regional average (10.5%) and the national average of 9.9%. Similarly, Dale, St Mary's and Minster and Woodmansey report a lower rate of 8.0% which is better (lower) than the regional and national averages. Beverley Rural and Mid Holderness report higher rates at 11.6% which is worse than the regional and national averages. This shows variability among the wards, with Dale performing better than both the national and regional averages.

121. For Year 6, the prevalence of overweight (including obesity) in in East Wolds and Coastal and North Holderness is 37.8%, which is lower than the regional average of 39.5% but higher (worse) than the national average of 35.8%. Beverley Rural and Mid Holderness show a prevalence of 32.9%, which is lower (better) than the regional and national averages. Similarly, the Dale, St Mary's and Minster and Woodmansey (for the OCS zones) rate is at 33.2%. All three wards are below the regional average of 39.5%, indicating that they are performing better than the regional context for this indicator.

122. Regarding obesity and severe obesity in Year 6, East Wolds and Coastal and North Holderness report a prevalence of 22.4%, which is lower (better) than the regional average of 24.2% and higher (worse) but comparable to the national average of 21.6%. Similarly, Beverley Rural and Mid Holderness report 19.5% which is lower (better) than the regional and national averages. The rate for Dale, St Mary's and Minster and Woodmansey of 19.9% is lower (better) than the regional and national averages.

#### 29.6.1.5.2 Health and Wellbeing Effects from Changes to Air Quality

123. **Table 29–17** shows overall, air quality related health outcomes in the site-specific and local population are variable compared to the national averages.

*Table 29–17 Baseline Summary Indicators Relevant to Air Quality Health Outcomes (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Fraction of mortality attributable to particulate air pollution (new method) (30+ years) (%) | 2022 | - | - | - | 4.7 | 5.1 | 5.8 |
| Air pollution: fine particulate matter (new method - concentrations of total $PM_{2.5}$) ($\mu g/m^3$) | 2022 | - | - | - | 6.2 | 6.8 | 7.8 |
| Emergency hospital admissions for Chronic Obstructive Pulmonary Disease (COPD) (Standardised Admission Ratio*) | 2016 / 2017 – 2020 / 2021 | 78.2 | 47.9 | 57.5 | 79.8 | 118.2 | 100 |
| Emergency hospital admissions for coronary heart disease (SAR*) | 2016 / 2017 – 2020 / 2021 | 92.8 | 78.1 | 77.9 | 100.2 | 117.6 | 100 |
| Emergency hospital admissions for Myocardial Infarction (heart attack) (SAR*) | 2016 / 2017 – 2020 / 2021 | 87.8 | 86.2 | 80.7 | 97.0 | 119.9 | 100 |

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Under 75 mortality rate from respiratory diseases considered preventable (per 100,000 people) | 2021 - 2023 | - | - | - | 14.9 | - | 18.0 |
| Under 75 mortality rate from cardiovascular diseases considered preventable (per 100,000 people) | 2021 - 2023 | - | - | - | 28.3 | 35.5 | 30.5 |

**SAR - The Standardised Admission Ratio is a summary estimate of admission rates relative to the national average and takes into account differences in population's age, sex and socioeconomic deprivation.*

| Legend | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

124. The fraction of mortality attributable to particulate air pollution (30+ years) is 4.7% in East Riding of Yorkshire, which is below the regional (5.1%) and national (5.8%) averages.

125. Air pollution, in terms of fine particulate matter (concentrations of total $PM_{2.5}$) is lower in East Riding of Yorkshire (6.2) than in Yorkshire and Humber (6.8) and England (7.8).

126. Emergency hospital admissions for Chronic Pulmonary Diseases (COPD) (SAR) are lower in all site-specific areas, as well as East Riding of Yorkshire, than the regional and national averages. The ratio is particularly lower in Beverley Rural and Mid Holderness (47.9) and Dale, St Mary's and Minster and Woodmansey (57.5) compared to the regional (118.2) and national (100) averages, indicating significantly better performance in this respiratory disease in the site-specific area.

127. Similarly, the emergency hospital admissions for coronary heart disease are lower in Beverley Rural and Mid Holderness and Dale, St Mary's and Minster and Woodmansey (77.9) compared to the local (100.2), regional (117.6) and national (100.0) averages. For East Wolds and Coastal and North Holderness the ratio (92.8) is also lower than the local average (100.2), regional (117.6) and the national averages (100.0).

128. Emergency hospital admissions for myocardial infarction (heart attack) are lower in the site specific and local areas, compared with the regional and national averages.

129. All the hospital admissions for coronary heart disease and heart attack, and mortality rates from respiratory and cardiovascular diseases considered preventable.

29.6.1.5.3 Health and Wellbeing Effects from Changes to Socio-Economics (Employment and Training Opportunities)

130. As shown in

**Table 29–**18, the health and wellbeing outcomes related to socio-economic opportunity in the Study Area are variable compared to the national averages. There is better performance shown in East Riding of Yorkshire. It is noted there are fewer statistics available for the site-specific population.

*Table 29–18 Summary Indicators Relevant to Socio-Economic Health Outcome (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Average Attainment 8 score (15-16+ years) (score across 8 qualifications) | 2022 / 2023 | - | - | - | 46.4 | 44.7 | 36.1 |
| Percentage of people in employment (16-64 years) (%) | 2023 / 2024 | - | - | - | 76.5 | 73.1 | 75.7 |
| 16-to-17-year old's not in education, employment, or training (NEET) or whose activity is not known (%) | 2022 / 2023 | - | - | - | 2.9 | 6.5 | 5.2 |
| 19–24-year old's not in education, employment, or training (%) | 2022 / 2023 | - | - | - | - | 14.5 | 13.2 |
| Inequality in life expectancy at birth (male) (years) | 2018 – 2020 | - | - | - | 6.8 | 10.7 | 9.7 |
| Inequality in life expectancy at birth (female) (years) | 2018 - 2020 | - | - | - | 2.3 | 8.8 | 7.9 |
| Income deprivation (IMD Score (%) | 2019 | 10.5% | 6.0% | 7.2% | 9.6% | - | 12.9% |
| Children in absolute low-income families (under 16s) (%) | 2022 / 2023 | - | - | - | 11.5 | 19.3 | 15.6 |

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Child Poverty Income Deprivation Affecting Children (%) | 2019 | 13.5 | 7.2 | 8.9 | 11.8 | - | 17.1 |
| Older People in poverty, Income deprivation affecting older people Index (IDAOPI) (%) | 2019 | 11.3 | 7.6 | 9.1 | 10.8 | - | 14.2 |
| Modelled estimates of the proportion of households in fuel poverty (%) | 2020 | 16.3 | 13.8 | 11.0 | 14.7 | - | 13.2 |
| Winter mortality index* (%) | August 2021 – July 2022 | - | - | - | 8.0 | 6.9 | 8.1 |

**The Winter mortality index is a measure expressed as a ratio of the difference in all-cause mortality during winter months (December-March) compared to the average in the non-winter months (the preceding August-November and following April-July).*

| Legend | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

131. In relation to educational attainment and employment, the percentage of population with average educational attainment score in East Riding of Yorkshire is lower (worse) than the national average including the regional population of Yorkshire and the Humber and England.

132. The overall percentage of people in employment in East Riding of Yorkshire, is higher (better) than the national average. Statistics for 16-to-17 year olds and 19-24 year olds NEET suggest better outcomes locally (76.5%) in East Riding of Yorkshire than regionally, 73.1% for Yorkshire and Humber. However, both percentages fall below the national average of 75.7% for England. Data shows a mixed picture in the sensitivity of the local population with high sensitivity suggested to socio-economic opportunity in the Study Area.

133. Local public health data on life expectancy at birth suggests that inequalities between the most and least deprived people are lower in East Riding of Yorkshire, and higher in Yorkshire and the Humber, than the national average.

134. The overall percentage of income deprivation Beverley Rural and Mid Holderness (6.0) and Dale, St Mary's and Minster and Woodmansey (7.2) compared to East Riding of Yorkshire (9.6%) and England (12.9%). For East Wolds and Coastal and North Holderness (10.5%), the percentage is slightly higher than for East Riding of Yorkshire (9.6%) but lower than for England (12.9%).

135. Similarly, the percentage of child poverty income deprivation affecting children is lower in Beverley Rural and Mid Holderness (7.2) and Dale, St Mary's and Minster and Woodmansey (8.9) compared to East Riding of Yorkshire (11.8%) and England (17.1%). For East Wolds and Coastal and North Holderness (13.5%), the percentage is slightly higher than for East Riding of Yorkshire (11.8%) but lower than for England (17.1%).

136. The percentage of older people in poverty income deprivation affecting older people is lower in Beverley Rural and Mid Holderness (7.6) and Dale, St Mary's and Minster and Woodmansey (9.1) compared to East Riding of Yorkshire (11.8%) and England (17.1%). For East Wolds and Coastal and North Holderness (11.3%), the percentage is slightly higher than for East Riding of Yorkshire (10.8%) but lower than for England (14.2%).

137. The percentage of households in fuel poverty (as a modelled estimate) in both the districts and regions in the Study Area is relatively higher than the national average. On the other hand, the proportion of winter deaths across the Study Area is lower than the average of England in all the reported data.

138. Data suggests less sensitivity to socio-economic opportunity in the site-specific wards and a mixed picture in the local population of the Study Area. Employment and income deprivation levels in the Study Area are generally high as reported by the Deprivation Indices of England (Ministry of Housing, Communities & Local Government, 2019b).

29.6.1.5.4 Health and Wellbeing Effects from Changes to Transport Modes, Connections and Access

139. **Table 29–19** shows overall, health and wellbeing outcomes related to transport are variable compared to the national average. It is noted there are no statistics available for the site-specific population.

*Table 29–19 Baseline Summary Indicators Relevant to Transport Health Outcomes (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| Killed and seriously injured (KSI) casualties on England's roads (per billion vehicle miles) | 2023 | - | - | - | 79.5 | 119.8 | 91.9 |
| Percentage of adults cycling for travel at least three days per week (16+ years) (%) | 2019 / 2020 | - | - | - | 2.1 | 1.8 | 2.3 |
| Percentage of adults walking for travel at least three days per week (16+ years) (%) | 2019 / 2020 | - | - | - | 15.3 | 14.2 | 15.1 |
| Percentage of physically active children and young people (5-16 years) (%) | 2023 | - | - | - | 52.2 | 47.5 | 47.0 |
| Percentage of physically active adults (19+ years) (%) | 2022 / 2023 | - | - | - | 66.8 | 65.7 | 67.1 |
| Depression: QOF prevalence (18+ years) (%) | 2022 / 2023 | - | - | - | 12.0 | 13.7 | 13.2 |
| Self-reported wellbeing: people with a high anxiety score (16+ years) (%) | 2022 / 23 | - | - | - | 23.7 | 24.2 | 23.3 |

**Legend**

| | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

140. Considering the local population, the percentage of the population killed and seriously injured on roads is significantly lower in East of Riding of Yorkshire showing better performance than the average of England.

141. Considering active travel, local public health data shows no significant different performance in East Riding of Yorkshire compared to national averages. The percentage of the population who walks or cycle for travel at least three times a week in East Riding of Yorkshire is similar to England. Regionally, in Yorkshire and the Humber and the North East, the performance in active travel is poor, compared with England. A mixed picture is shown in the sensitivity of the local population to changes in transport modes, access and connections regarding active travel, however data generally suggests low sensitivity in the local area.

142. Considering physical activity, and the sensitivity of the local population to changes in transport and access to health promoting services, the proportion of physically active children, young people and adults in East Riding of Yorkshire, is slightly higher (better) than national average, and that of physically active adults is slightly lower (worse) compared to the national average.

143. Considering the sensitivity of the population to mental health influences, noting that change in transport is only one contributing factor to these mental health metrics, the proportion of the population diagnosed with depression in East Riding of Yorkshire is lower than the national average. On the other hand, the proportion of people with a high self-reported anxiety score is slightly higher (worse) but similar in East Riding of Yorkshire compared to that of England.

29.6.1.5.5 Health and Wellbeing Effects from Changes to Noise and Vibration

144. As shown in **Table 29–20**, there are fewer statistics available for the site-specific area. Overall, health outcomes in site-specific area are better and those in the local population area are variable as compared to national average.

*Table 29–20 Baseline Summary Indicators Relevant to Noise Health Outcomes (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall ) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | Yorkshire and Humber | England |
| The rate of complaints about noise (per 1,000 people) | 2020 / 2021 | - | - | - | 5.5 | 8.1 | 12.0 |
| The percentage of the population exposed to road, rail, and air transport noise of 65dB(A) or more, during the daytime (%) | 2016 | - | - | - | - | 4.1 | 5.5 |
| The percentage of the population exposed to road, rail, and air transport noise of 55 dB(A) or more during the night-time (%) | 2016 | - | - | - | - | 6.5 | 8.5 |
| Self-reported wellbeing: people with a high anxiety score (16+ years) (%) | 2022 / 2023 | - | - | - | 23.7 | 24.2 | 23.2 |
| Under 75 mortality rate from cardiovascular diseases considered preventable (2021 definition) (per 100,000 people) | 2023 | - | - | - | 28.3 | 35.5 | 30.5 |
| Hypertension: QOF prevalence (all ages) (%) | 2023 / 2024 | - | - | - | 19.9 | 15.7 | 14.8 |
| Depression: QOF prevalence (18+ years) (%) | 2022 / 2023 | - | - | - | 12.0 | 15.7 | 14.8 |
| Emergency hospital admissions for intentional self-harm (SAR) | 2016 / 2017 – 2020 / 2021 | 102.9 | 43.5 | 80.9 | 83..7 | - | 100.0 |

**Legend**

| | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

145. The rate of complaints about noise in East Riding of Yorkshire is lower (better) than the national average. Considering transport noise, the percentage of population exposed to elevated road, rail and air transport noise during the daytime and night-time is lower in the Yorkshire and the Humber than the national comparative, notably during the daytime which the local public health data reports as significantly better than England.

146. In relation to the sensitivity of the local population to noise, measured by the mental health outcomes of the population, the percentage of people diagnosed with depression East Riding of Yorkshire district is slightly lower than England suggesting low localised sensitivity to noise, noting that it is only one contributing factor to this mental health metric. On the other hand, emergency hospital admissions for intentional self-harm in Beverley Rural and Mid Holderness (43.5.7), Dale, St Mary's and Minster and Woodmansey (80.9) and East Riding of Yorkshire (83.7) are lower than the national average. However, the rate is higher in East Wolds and Coastal and North Holderness (102.9) than the national average. Overall, local public health data shows a mixed picture in the sensitivity of the local population to mental health influences.

147. In relation to measures relevant to physiological effects of noise, the under 75 mortality rate from cardiovascular diseases considered preventable is lower in East Riding of Yorkshire compared to the national average. On the other hand, the proportion of the population with a hypertension diagnosis (high blood pressure) is higher in East Riding of Yorkshire compared to the national average. Data therefore shows a mixed picture in the sensitivity of the local population to physical health influences.

29.6.1.5.6 Health and Wellbeing Effects from Changes to Understanding of Risk

148. **Table 29–21** shows health and wellbeing outcomes related to understanding of risk (i.e. risk perception). Overall, the health and wellbeing outcomes in the site-specific area are better than regional and national averages. It is noted there are fewer statistics reported for the site-specific wards.

*Table 29–21 Baseline Summary Indicators Relevant to Understanding of Risk Health Outcomes (OHID, 2024)*

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) |
| Population who cannot speak English well or at all (%) | 2011 | 0.15 | 0.1 | 0.2 | 0.4 | - | 1.7 |
| Self-reported wellbeing: people with a high anxiety score (16+ years) (%) | 2022 / 2023 | - | - | - | 23.7 | 24.2 | 23.2 |
| Depression: QOF prevalence (18+ years) (%) | 2022 / 2023 | - | - | - | 12.0 | 15.7 | 14.8 |
| Emergency hospital admissions for intentional self-harm (SAR) | 2016 / 2017 – 2020 / 2021 | 102.9 | 43.5 | 80.9 | 83..7 | - | 100.0 |

| Indicators | Years | Site-Specific Wards | | | Local | Regional | National |
|---|---|---|---|---|---|---|---|
| | | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) | Dale, St Mary Minster and Woodmansey (for the OCS zones) | East Riding of Yorkshire | East Wolds and Coastal, North Holderness (for the landfall) | Beverley Rural, Mid Holderness (for the onshore ECC) |

**Legend**

| | |
|---|---|
| | Better than England average |
| | Similar to England average |
| | Worse than England average |
| | Comparative analysis unavailable |

149. The percentage of people who cannot speak English well or at all is much lower in all site-specific areas than the national average, an indicator relevant to the extent to which the actual risks of the Project may be understood by the population. The data suggests generally lower sensitivity to changes in mental health associated with public understanding of risk in the local Study Area.

150. Emergency hospital admissions for intentional self-harm in Beverley Rural and Mid Holderness (43.5.7), Dale, St Mary's and Minster and Woodmansey (80.9) and East Riding of Yorkshire (83.7) are lower than the national average. However, the rate is higher in East Wolds and Coastal and North Holderness (102.9) than the national average. The percentage of the population with a clinical diagnosis of depression is slightly lower in East Riding of Yorkshire district as compared to the national average.

### 29.6.2 Predicted Future Baseline

151. In the event that the Project is not developed, an assessment of future conditions for human health has been carried out and is described within this section.

152. Population health data presents a snapshot at a particular time. It is widely recognised that population health is continuously influenced by various factors at both the individual and community level. Influences may be environmental, such as seasonal variations in wellbeing or the spread of communicable diseases, as well as socio-economic factors, such as migration and the availability of jobs.

153. Longer term trends and interventions in population health may influence the future baseline. Health and social care, public health initiatives and government policies aim to reduce inequalities and improve quality of life. The historic success of such interventions is increasingly challenged by national trends such as an aging population, rising levels of obesity and the impact of the COVID-19 pandemic. The implications of COVID-19 on public health will take years to be reflected in statistical data, but it is expected that the pandemic has worsened public health challenges. Vulnerable groups, especially those affected by age and ill-health, were disproportionately impacted by the pandemic.

154. For assessment purposes, the current health baseline is considered a suitable representation of the future baseline. The current baseline used in this assessment includes appropriate health indicators to reflect the types of health outcomes that that would also be applicable to the future population (e.g. in relation to age and long-term conditions). The health assessment methodology includes a categorisation of vulnerable population groups, which, for example, allows for the effects of older people and people with existing poor health to be distinguished from the general population. The sensitivity score for each vulnerable group in the health assessment is independent of the population size within that group, which would be the main change between the current and future baseline. The sensitivity scores within the health assessment therefore account for both current and future population characteristics.

155. Climate change may also exacerbate physical and mental health risk factors, particularly around flooding and extremes of temperature. The impacts of climate change including extreme temperatures, flooding, increase in atmospheric pollutants and drought are well documented, as set out in the following bullets. These noted impacts on the future human health baseline are summarised below and taken into account by the assessment.

- Without adaptation, heat and cold-related deaths are forecasted to rise in the UK due to climate change and sociodemographic factors. Mortality risk from extreme temperatures rises with age, and despite fewer cold days expected mortality due to moderate cold is projected to increase with the ageing population with heat-related mortality increasing over time (UKHSA, 2023a).
- Flood-affected individuals are prone to adverse health effects including death, injury, increased risk of infectious disease, and mental health effects including depression, anxiety and post-traumatic stress disorder. Increase in flood risk in the UK is largely driven by coastal flooding (UKHSA, 2023b).

- Weather pattern shifts, notably in temperature, rainfall, and wind speed, are anticipated to influence the dispersion and concentration of air pollutants like PM and $O_3$. Implementing climate change mitigation strategies to cut greenhouse gas emissions will aid in lowering air pollution levels, thus enhancing health outcomes. While long-term exposure to $PM_{2.5}$ and $NO_2$ is forecasted to decrease by around 25% to 37% compared to 2018 levels, localised urban increases in $O_3$ could heighten health risks (UKHSA, 2023c).
- Climate has a significant impact on infectious diseases, influencing pathogen behaviour, human susceptibility and transmission periods. Warmer temperatures can expand disease distribution and transmission windows. Weather and climate also play a significant role in influencing the presence and activity of disease-carrying ticks and mosquitoes. Rising temperatures are extending their range and activity periods, affecting the spread of pathogens and their habitats including potential expansion of tick species like *Ixodes ricinus*, which spread Lyme disease and tick-borne encephalitis, and invasive mosquitoes like *Aedes albopictus*, capable of transmitting diseases such as dengue and Zika. Climate change also increases the risk of diseases like West Nile virus in the UK, highlighting the need for collaborative efforts across sectors to address these climate-related public health challenges (UKHSA, 2023d).
- Climate change poses a threat to food supplies, increasing the risk of public health issues as the UK becomes more reliant on climate-vulnerable food-producing countries. This dependence on imports, especially plant-based foods, may lead to shortages of nutritious options and unhealthy dietary changes unless local production is strengthened. While initial benefits like crop diversification and extended growing seasons may occur due to warmer, drier conditions, inadequate adaptation measures could decrease overall yields in the long run. As climate impacts intensify, fluctuations in food imports and prices may make it challenging to access healthy foods and follow dietary guidelines (UKHSA, 2023e).

156. It would not be proportionate (or consistent with the qualitative assessment approach taken) to quantitatively model the population's future health. This reflects the complexities of interactions between the wider determinants of health, as well as the potential for macro-economic changes in the next decade that are hard to predict. Any prediction would have such wide error margins that it would greatly limit the value of the exercise. Annual national population health trend forecasting is undertaken as a government public health activity (Chief Medical Officer, 2021 and 2023; HM Government, 2021) and has been taken into account by the health assessment.

## 29.7 Assessment of Effects

157. The likely significant effects to human health receptors that may occur during construction, operation and decommissioning of the Project are assessed in the following sections. The assessment follows the methodology set out in **Section 29.5** and is based on the realistic worst-case scenarios defined in **Section 29.4.5**, with consideration of embedded mitigation measures identified in **Section 29.4.3**, and where relevant, enhancement measures identified in **Section 29.4.4**.

158. As noted in **Section 29.4.6**, the assessment of likely significant effects for the OCS zone infrastructure will remain the same for both development scenarios.

### 29.7.1 Potential Effects during Construction

#### 29.7.1.1 Social Environment: Open Space, Leisure and Play (HH-C-03) (Onshore)

159. This section considers the population health implications of construction activities (at landfall and nearshore activities) affecting nearshore and onshore recreational and leisure activities. Relevant activities may lead to temporary disruption of public open spaces (including beaches) and PRoW, potentially affecting recreational activities. Consideration has also been given to the influences on nearshore recreation, e.g. bathing, sailing, fishing and other water sports.

160. The landfall is situated in a coastal community featuring stretches of beach. The inland areas are predominantly agricultural with holiday accommodation and small settlements scattered throughout. There is a network of PRoW, national trails and cycle routes, as detailed in **Table 22-16** in **Chapter 22 Soils and Land Use.**

161. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points. The availability of a natural environment and attractive views of nature within an individual's living environment are important contributors to physical activity. People's experiences in using the natural environment can enhance attitudes toward physical activity and perceived behavioural control via positive psychological states and stress-relieving effects, which lead to firmer intentions to engage in physical activity (Calogiuri and Chroni, 2014). Improvements in health behaviour influence health outcomes like mortality, chronic diseases, mental and obesity disorders (Salgado *et al.*, 2020). Physical activity can improve cognitive and mental health, particularly improvements in physical self-perceptions, which accompany enhanced self-esteem (Lubans *et al.*, 2016).

162. The health benefits of recreation and leisure include physical activity, as well as general wellbeing benefits. Health outcomes span physical health (e.g. cardiovascular health) and mental health (e.g. stress, anxiety or depression). Use of such locations may be affected by not only physical barriers but also changes in the amenity or setting of the destination.

163. This section has been informed by **Chapter 18 Other Marine Users**, **Chapter 22 Soils and Land Use**, and **Chapter 30 Socio-Economics, Tourism and Recreation**, which set out relevant assessment findings and mitigation measures that have been taken into account.

164. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is disruption and disturbance by construction activities;
- The pathway is behavioural change in levels of use of leisure and recreation, affecting physical activity and wellbeing outcomes; and
- Receptors are coastal and inland populations of residents and visitors.

165. Furthermore, the theoretical effect is considered applicable in the context of this Project.

166. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

##### 29.7.1.1.1 Receptor Sensitivity

167. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**.

168. The general population comprise those members of the community with a high capacity to adapt to changes, for example due to greater resources and good physical and mental health. Additionally, most people in the local area would only make occasional use of the affected marine, coastal and inland recreational and leisure opportunities, including PRoW. It also includes those with access to many alternatives that are not affected.

169. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to having fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on the affected recreational and leisure opportunities with greater likelihood that any additional disruption or disturbance could affect use and behaviours. For example, vulnerable groups living in Skipsea, including users of caravans and similar holiday accommodation.

#### 29.7.1.1.2 Impact Magnitude

170. **Chapter 18 Other Marine Users** concludes:

- No significant effects on other marine users receptors overlapping / in the vicinity of the Project are expected to occur.

171. **Chapter 22 Soils and Land Use** concludes:

- In relation to PRoW, Coastal Path and National Cycle Networks routes (SLU-C-07) (See **Figure 22-4** of **Chapter 22 Soils and Land Use**), the effect is minor adverse.

172. **Chapter 30 Socio-Economics, Tourism and Recreation** concludes:

- The effect of the construction of the Project on onshore recreational assets is assessed to be no change. The effect of the construction of the Project on marine recreational assets is assessed to be no change (SOC-C-05).

173. In terms of population health, the magnitude of low reflects that there is a *small* scale of change over the *medium-term* from construction activities, including shipping movements and land access, affecting marine, nearshore and onshore recreational and leisure activities. Any such effect is likely to be characterised as an *occasional* effect on opportunities to be active at a given location, e.g. due to transitory cable laying. It is likely there would be *rapid* reversal of any effect once the given construction activity concluded, with limited potential to cause lasting behavioural change. The outcome is likely to be a *minor* change in *quality of life* and / or *cardiovascular related morbidity* for a *small minority* of the affected population. No effect on healthcare services would be expected. Overall, the magnitude of change for population health due to the Project is **low** (with no differences between OCS Zone 4 and OCS Zone 8).

#### 29.7.1.1.3 Effect Significance

174. As set out in **Chapter 4 Project Description**, open spaces (offshore, nearshore and onshore) and PRoW onshore will be reinstated following construction activities that require temporary closures or access restrictions. This will be secured in the PRoW Management Plan (Commitment ID CO57).

175. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

176. The effect is characterised as being *adverse* in direction, *temporary* and *indirect*. Although the scientific literature supports a *clear* association between recreational and leisure activities and health outcomes, there is likely to be at most a *slight* change in the population health baseline due to the Project. This would have no more than a *marginal* effect on health policy delivery and is *not* expected to change population health inequalities.

### 29.7.1.2 Social Environment: Transport Modes, Access and Connections (HH-C-05) (Onshore)

177. This section considers the onshore population health implications of changes in construction activities affecting highway safety and access as well as other PRoW and cycle routes. This includes road works, temporary diversions and traffic volumes required due to construction of the onshore infrastructure.

178. Active travel health effects may relate to physical health (e.g. cardiovascular health) and mental health conditions (e.g. stress, anxiety or depression) associated with obesity and levels of physical activity.

179. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points relevant to potential exposures and health outcomes. For road safety, health effects may be associated with the severity or frequency of road traffic incidents. For accessibility, health effects may be associated with emergency response times or non-emergency treatment outcomes associated with delays or non-attendance. For active / sustainable travel, health effects may relate to physical health (e.g. cardiovascular health) and mental health conditions (e.g. stress, anxiety or depression) associated with obesity and levels of physical activity.

180. Factors that constrain access to healthcare are an important issue for public health, particularly where they affect those with lower incomes. These can lead to rescheduled or missed appointments, delayed care, and missed or delayed medication use. These consequences may lead to poorer management of chronic illness and thus poorer health outcomes (Syed *et al.*, 2013).

181. Walking and cycling for transportation (i.e. active transportation), provide substantial health benefits from increased physical activity. Health gains exceed detrimental effects of traffic incidents and air pollution exposure (Mueller *et al.*, 2015). Active transport to work or school is significantly associated with improved cardiovascular health and lower body weight (Xu *et al.*, 2013). The provision of convenient, safe and connected walking and cycling infrastructure is at the core of promoting active travel (Winters *et al.*, 2017). Physically active transport (i.e. walking or cycling) has been directly related to increased residential density, street connectivity, mixed land use and amenities within a walkable distance (Thomson *et al.*, 2008).

182. The health assessment has had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, pregnant women and cyclists (particularly older cyclists) are generally more vulnerable in terms of road safety. People with lower socio-economic status typically face more transportation barriers in accessing health care.

183. This section has been informed by **Chapter 26 Traffic and Transport** which sets out relevant assessment findings and mitigation measures that have been considered.

184. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is potential construction disruption and disturbance, including to PRoW and cycle routes;
- The pathway is behavioural change in levels of physical activity, driver delay and accidents and safety; and
- Receptors are coastal and inland populations of residents and visitors.

185. Furthermore, the theoretical effect is considered applicable in the context of this Project.

186. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and Humber and the City of Hull; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

187. Regard has been had to the potential for effects to the regional population of Yorkshire and Humber (including the city of Hull). Whilst transport effects, as assessed in **Chapter 26 Traffic and Transport**, would extend to this area, it is not considered that there is the potential for a significant effect on public health at a regional level due to the Project's transport impacts. The health assessment focus is on road safety, health-related travel times and accessibility effects at the site-specific and local level.

#### 29.7.1.2.1 Receptor Sensitivity

188. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. Most residents are unlikely to make regular use of the PRoW and cycle routes affected by the Project and would likely have a high capacity to adapt by selecting alternative routes or physical activity opportunities to avoid any temporary disruption or disturbance. Measures are proposed to be implemented to keep the PRoW and local roads open or provide alternative arrangements during the construction works (Commitment ID CO39 (CoCP), Commitment ID CO57 (PRoW Management Plan) and Commitment ID CO73 (Construction Traffic Management Plan (CTMP)). The general population comprise those members of the community with a high capacity to adapt to changes in access, including changes in healthcare access, for example due to greater resources and good physical and mental health.

189. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. This sub-population may have fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on the affected routes with greater likelihood that any disruption or disturbance could affect physical activity behaviours. Vulnerability is linked to mode of travel, including pedestrians and cyclists being more sensitive to road safety changes. It also relates to age groups (young people and older people) being more vulnerable to accident severity, as well as to those who are reliant on services accessed on affected sections of the road network (e.g. traveling to schools).

190. Vulnerability may be increased in areas of greater deprivation. Deprived populations may already face more access barriers compared to general population and therefore be more sensitive to access changes. Low incomes may compound access barriers by limiting adaptive response. Vulnerability also includes those accessing health services (emergency or non-emergency) at times and locations affected by congestion. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient). Ambulances are generally less affected by congestion due to the priority given to them travelling under blue lights. People in poor or very poor health may be more frequent users of healthcare service and therefore be more sensitive to access changes.

29.7.1.2.2 Impact Magnitude

191. The magnitude of change due for population health to the Project is **low**. **Chapter 26 Traffic and Transport** details a worst case of 40 heavy vehicle (HV) movements at peak over a 6-month construction duration of the anticipated five-year onshore construction period and identifies no significant construction traffic and transport effects.

192. **Chapter 26 Traffic and Transport** concludes:

- With the adoption of the additional mitigation measures outlined in the Outline CTMP (Commitment ID CO73), the residual effect of the Project on severance (TT-C-01) is negligible to minor adverse.
- With the adoption of additional mitigation measures outlined in the Outline CTMP (Commitment ID CO73), the residual effect of the Project on amenity (TT-C-02) is minor adverse.
- The effect on fear and intimidation (TT-C-03) is negligible to minor adverse.
- With the adoption of additional mitigation measures for Road Links 17, 31, 38, 39 and 41 outlined in the Outline CTMP (Commitment ID CO73), the residual effect of the Project on road safety (including hazardous loads (TT-C-04) is negligible to minor adverse.
- With the adoption of additional mitigation measures outlined in the Outline CTMP (Commitment ID CO73), the residual effect of the Project on driver delay (highway geometry) (TT-C-06) is negligible to minor adverse.
- With the adoption of additional mitigation measures outlined in the Outline CTMP (Commitment ID CO73), the residual effect of the Project on driver delay (road closures) (TT-C-07) is minor adverse.

193. In relation to active travel, as reported in **Chapter 26 Traffic and Transport,** there would be appropriate diversions of active travel routes to maintain access and provide early notice of any route changes. Such measures would be secured through the Outline CTMP (Commitment ID CO73). In terms of population health, the scale of change to active travel is therefore considered *small* and *medium-term*, albeit of limited duration at any given location, including due to the transitory nature of construction works, e.g. open cut trenching for cable duct installation. Only *very minor* changes in *morbidity* for *cardiovascular* and *mental health* outcomes would be expected for a *small minority* of the population due to the temporary disruption during construction works. Most adverse effects on health behaviours and outcomes would be expected to *reverse* on completion of the construction works. A **low** magnitude is assigned to active travel effects for population health.

194. In relation to road safety at the population level the scale of change in accidents would be *small*. The frequency of any incidents would *be occasional*, with severity related to a *very minor change in risk of injury or mortality* (though with outcome reversal gradual or permanent). The expectation is that *very few* people would be affected, with *no or slight* implications for healthcare services. As noted in **Chapter 26 Traffic and Transport** there are currently identified a number of locations where accident risk is elevated by the Project during construction, but mitigation measures are proposed (see **Table 26-6** of **Chapter 26 Traffic and Transport**) to reduce these risks as outlined in the Outline CTMP. Reflecting the residual effects reported in **Chapter 26 Traffic and Transport** the health chapter identifies a **low** magnitude of change on this issue.

195. In relation to health-related travel times and accessibility the scale of change in delays is expected to be *small*. The frequency with which health related journeys may be affected is likely to be *occasional* for most people though for a few people, severity could relate to a *small* change in risk for morbidity or mortality associated with time critical treatment. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient). Even with the delays described in **Chapter 26 Traffic and Transport**, the priority given to ambulances travelling under blue lights would be expected to reduce any changes in journey times. Additional mitigation in terms of early and ongoing information sharing with emergency and healthcare services is outlined within the Outline CTMP (Commitment ID CO73)**.** Due to the temporary nature of the work and ability for people to adapt to known planned diversions or delays means, there is a low magnitude of change in access to social infrastructure such as shops, employment and educational facilities. A **low** magnitude is assigned to health-related travel times for population health.

29.7.1.2.3 Effect Significance

196. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

197. In relation to active travel, health-related travel times and road safety, the professional judgment is that, whilst physical activity, healthcare access and road safety are public health priorities and the scientific literature on these issues is well established, there would, at most, be a *slight* adverse change in the health baseline. This conclusion reflects that the Project's effects are appropriately mitigated by standard good practice measures to reduce disruption and risk. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, *no* widening of health inequalities would be expected, and *no* influence is expected on the ability to deliver local or national health policy.

#### 29.7.1.3 Economic Environment: Education and Training (HH-C-09) (Offshore and Onshore)

198. This section considers the population health implications of additional upskilling and educational support to the construction workforce.

199. Increased educational attainment is associated with better health outcomes and delayed mortality. Education is an important indicator of socio-economic status and is associated with subsequent income, employment, social networks, and behaviours.

200. The Project is associated with general construction workforce upskilling opportunities.

201. This section has been informed by **Chapter 30 Socio-Economics, Tourism and Recreation**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

202. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is potential for educational training and upskilling opportunities and support;
- The pathway is good quality education and training supporting socio-economic status and other outcomes, which are influential for health; and
- Receptors are the area's population, particularly young adults commencing employment and vulnerable groups that may disproportionately benefit.

203. Furthermore, the theoretical effect is considered applicable in the context of this Project.

204. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and Humber; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

205. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points relevant to potential effects and health outcomes. Increased educational attainment is associated with better health outcomes and delayed mortality. Education is an important indicator of socio-economic status and is associated with subsequent income, employment, social networks, and behaviours (Byhoff *et al.*, 2017). Training improves the likelihood of good earnings (Lindeboom *et al.*, 2009) and is generally associated with better health (Behrman *et al.*, 2011).

##### 29.7.1.3.1 Receptor Sensitivity

206. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. This reflects that most people in the area would make use of alterative educational or training opportunities or have existing educational attainment appropriate to their vocation and career progression.

207. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to adults with barriers to career progression, e.g. due to low-income status or other disadvantage, who would disproportionately benefit from apprenticeship and training opportunities. For these groups those who are from disadvantaged backgrounds would be particularly sensitive to educational interventions that provide knowledge, new skills or personal development. Young people leaving education or early in their careers may have the most to gain from an increase in training opportunities as a pathway into good quality local employment.

##### 29.7.1.3.2 Impact Magnitude

208. As stated in **Table 29–6** and **Table 30-4** of **Chapter 30 Socio-Economics, Tourism and Recreation**, an Outline ESP will be developed at ES stage and submitted with the DCO application (Commitment ID CO67). The Outline ESP will set out how the Applicant aims to maximise the potential beneficial socio-economic benefits of the Project and work with the supply chain to boost opportunities for UK suppliers and workers.

209. In terms of population health, the scales of new training opportunities are expected to be *small* over the *medium-term*. The opportunities would vary with some being *one-off* and others being *continuous* learning opportunities, e.g. apprentices. The health effect is characterised as a *minor* change in *morbidity* for risk factors related to educational outcomes for a small minority of the population. Overall, the magnitude of change for population health due to the Project is **negligible**.

29.7.1.3.3 Effect Significance

210. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **negligible**. The effect, accounting for health inequalities, is therefore of **minor beneficial** significance for population health, which is **not significant** in EIA terms.

211. The effect is characterised as being *beneficial* in direction, *permanent* in supporting ongoing future career progression and *indirect*. This conclusion reflects the scientific literature (as per IEMA's 2022 guidance) supports a *clear* association between educational outcomes and health outcomes, with the potential for a *slight* change in the population health baseline due to the potential for lasting effects over the life-course due to improved employment opportunities following upskilling. This change is likely to have a marginal supportive influence on delivering health policy, including narrowing inequalities where vulnerable groups are targeted by and take-up the training opportunities.

29.7.1.3.4 Enhancement and Residual Effect

212. Considering that an Outline ESP has been committed to, but the detail of its contents is still being developed at this stage, further opportunities to enhance the public health benefit are being considered, as noted in **Table 29–6**. If a high proportion of construction training opportunities were targeted to local vulnerable groups, notably young people NEET then there is the potential locally for a **moderate beneficial** (**significant** in EIA terms) population health residual effect (however this will be re-considered within the ES following development of the Outline ESP (Commitment ID CO67)). This reflects the potential to achieve long-term benefits though from a targeted training intervention at a critical stage in the life course for this group. Monitoring of the proportion of NEET taking up, and completing, training opportunities with the Project could be undertaken to confirm the benefit and further tailor the targeting of local vulnerable groups.

### 29.7.1.4 Economic Environment: Employment and Income (HH-C-10) (Offshore and Onshore)

213. This section considers the beneficial and adverse population health implications of the Project, including benefits of increased employment and potential adverse economic impacts during construction.

214. Employment is an important determinant of health and well-being both directly and indirectly by making health-promoting resources available to an employee and any dependants. The socio-economic benefits associated with employment are improved living conditions and the potential to make healthier choices, e.g. eating a healthier diet and undertaking more physical activity. If members of the community are employed, this can also generate indirect economic activity.

215. Economic effects may also arise from disruption caused by the Project's construction activities to local trades and businesses e.g. relating to traffic and noise. The area around the landfall south-east of Skipsea includes holiday accommodation, such as caravan parks, associated retail and services that cater to visitors. Offshore and nearshore, there is also the potential to affect commercial leisure and fisheries activities that support the local economy. Inland, adverse effects are less likely, though may be influenced by construction traffic.

216. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points. There is strong evidence for a protective effect of employment on depression and general mental health. Statistics showed favourable effects on depression (OR = 0.52; 95% CI 0.33 to 0.83) and psychological distress (OR = 0.79; 95% CI 0.72 to 0.86) (van der Noordt *et al.*, 2014). Unemployment is associated with poor health outcomes, with more negative health effects linked to lower socio-economic status and unemployment due to health reasons, whilst a strong social network is beneficial in reducing the health effects of unemployment (Norström *et al.*, 2014).

217. This section has been informed by **Chapter 14 Commercial Fisheries**, **Chapter 15 Shipping and Navigation**, and **Chapter 30 Socio-Economics, Tourism and Recreation** which set out relevant assessment findings and mitigation measures that have been taken into account.

218. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is changes in direct and indirect jobs and economic activity;
- The pathway is good quality employment providing more health supporting resources; and
- Receptors are people of working age (and their dependants), including vulnerable groups that may be disproportionately affected.

219. Furthermore, the theoretical effect is considered applicable in the context of this Project.

220. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and Humber; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

29.7.1.4.1 Receptor Sensitivity

221. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. This reflects that most people would already be within stable employment that would be unaffected by the Project (or being a dependant of such a person).

222. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case relates to people and their dependants who are on low incomes, have poor job security, poor working conditions or who are unemployed. Future young or older people may also come to rely on those employed. Owners and employees of business experiencing large direct or indirect effects, positive or negative, due to the Project would be particularly sensitive.

29.7.1.4.2 Impact Magnitude

223. **Chapter 14 Commercial Fisheries** concludes:

- Following additional mitigation, the residual effect for reduction in access to, or exclusion from established fishing grounds (CF-C-02) is negligible to minor adverse for all receptor groups.
- Following additional mitigation, the residual effect for displacement leading to gear conflict and increased fishing pressure on adjacent / alternative grounds (CF-C-03) is negligible to minor adverse for all receptor groups.
- The effect for displacement or disruption of commercially important fish and shellfish resources (CF-C-04) is minor adverse for all receptor groups.
- The effect of increased vessel traffic associated with the Project within fishing grounds leading to interference with fishing activity (CF-C-05) is considered minor adverse for all receptor groups.
- The effect of additional steaming to alternative fishing grounds (CF-C-07) is considered to be minor adverse for all receptor groups.

224. **Chapter 15 Shipping and Navigation** concludes:

- Impact activity conclusions for construction activities associated with the Project for the DBD Array Area and the offshore ECC are as follows:
  - For vessel displacement (SN-C-01), the effect is minor and tolerable with mitigation for both the Array Area and offshore ECC.
  - For increased vessel to vessel collision risk between third-party vessels due to vessel displacement (SN-C-02), the effect is moderate and tolerable with mitigation for the Array Area and moderate and broadly acceptable for the offshore ECC.
  - For increased vessel to vessel collision risk between a third-party vessel and a project vessel (DBD Array Area and offshore ECC activities), the effect is moderate and broadly acceptable for both the Array Area and offshore ECC.

225. **Chapter 30 Socio-Economics, Tourism and Recreation** concludes:

- The effect of the Project on increase in employment (SOC-C-02) in the Local Socio-Economic Area (LSESA), defined as East Riding of Yorkshire and Kingston upon Hull, is assessed as major (beneficial).
- The effect of the Project on increase in employment (SOC-C-02) in the Regional Study Area (RSA) is assessed as minor (beneficial).
- The effect of the Project on increase in employment (SOC-C-02) in the UK is assessed as negligible (beneficial).

226. In terms of population health, there are anticipated to be relatively *small scales* of change in direct and indirect employment, beneficial or adverse, in the context of the local labour market. The direct construction employment is likely to be *medium-term* and on a continuous basis, whether full-time or part-time. The duration of disruption that could adversely affect local businesses, whether related to leisure, tourism or fisheries, is likely to be shorter term due to the transitionary nature of works at any given location. Where effects are localised, e.g. at landfall or the OCS zones, there is unlikely to be a widescale adverse effect due to the temporary works that could significantly affect population health. Employment and economic effects, both beneficial and adverse, are likely to be associated with *minor* changes in *morbidity* and *quality* of life for a *small minority* of the population. Overall, the magnitude of change for population health due to the Project is **low**.

29.7.1.4.3 Effect Significance

227. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **low** (both beneficial and adverse). The effect, accounting for health inequalities, is therefore of **minor beneficial** and **minor adverse** significance for population health, which are both **not significant** in EIA terms.

228. The effect is characterised as being *beneficial* and *adverse* in direction, *temporary* and *indirect*. This conclusion reflects that employment has a *clear* association with better health outcomes in the scientific literature and the Project is likely to make *slight* positive and negative contribution to the local health baseline. Such effects are likely to have a *marginal* effect on delivering health policy and on narrowing health inequalities.

#### 29.7.1.4.4 Enhancement and Residual Effect

229. Considering that an Outline ESP has been committed to , but the detail of its contents is still being developed at this stage, further opportunities to enhance the public health benefit are being considered, as noted in **Table 29–6**. If a high proportion of good quality construction employment opportunities were targeted to local vulnerable groups, notably people who are unemployed, on low incomes, or who have high job instability, including young adults early in their careers, then there is the potential locally for a **moderate beneficial** (**significant** in EIA terms) population health residual effect (however this will be re-considered within the ES following development of the Outline ESP (Commitment ID CO67)). This reflects the potential to achieve long-term benefits though avoiding adverse physical and mental health effects (including to dependants) associated with long-term unemployment, high job instability or low income. Monitoring of the proportion of local people with these characteristics who enter good quality stable employment with the Project could be undertaken to confirm the benefit and further tailor the targeting of local vulnerable groups.

### 29.7.1.5 Bio-Physical Environment: Air Quality (HH-C-14) (Onshore)

230. This section discusses changes to local air quality during construction of the Project, and related effects on human health. Construction activities (such as earthworks and trackout) have the potential to result in localised dust emissions, as well as vehicle emissions from construction traffic and emissions from non-road mobile machinery.

231. The scientific literature indicates that there is an association between air quality emissions and health and wellbeing effects. The link is primarily between particulate matter and health effects. Whilst the literature supports the existence of thresholds set for health protection purposes, it also acknowledges that for particulate matter (PM) there are non-threshold health effects (i.e. when there is no known level of exposure below which adverse health effects may not occur). There are population groups that may be particularly sensitive to air quality effects. For example, young children are particularly susceptible to air pollution because of their developing lungs, high breathing rates per bodyweight, and amount of time spent exercising outdoors. Other vulnerable groups include people with existing health conditions (e.g. people with type 2 diabetes and/or pulmonary diseases), the elderly, and pregnant women.

232. This section has been informed by **Chapter 20 Air Quality and Dust**, which sets out the relevant assessment findings and mitigation measures that have been taken into account.

233. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is air pollutants (including dust) from construction emissions;
- The pathway is diffusion through the air; and
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

234. Furthermore, the theoretical effect is considered applicable in the context of this Project.

235. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and Humber; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people living, studying or working in proximity to construction activities).

236. Regard has been had to the potential effects on the regional population of Yorkshire and Humber. Whilst transport related air quality effects would extend to this area, it is not expected that these would have the potential to affect public health at a regional level. The health assessment focus is on effects at the site-specific and local level.

237. Construction activities that produce dust tend to relate to the coarser fractions of $PM_{10}$ and potential nuisance from dust deposition on property. The great majority of anthropogenic $PM_{2.5}$ health effects relate to combustion-related processes, particularly changes in transport patterns, solid fuel burning from space heating or industrial processes that use fossil fuels.

238. Whilst the focus of discussion in this chapter differentiates between coarse PM during construction and fine PM during operation, the health outcomes of $PM_{10}$ and $PM_{2.5}$ are not distinguished in this assessment. This reflects that both are typically present (though the relative proportions change) and that the evidence base does not consistently distinguish their effects particularly given that $PM_{2.5}$ is a subset of $PM_{10}$. However, generally, elevated concentrations of $PM_{2.5}$ are considered of greater concern due to their greater potential to interact within the body.

239. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points. Environmental air pollution is associated with an increased risk of respiratory and cardiovascular diseases. Environmental pollution exerts its detrimental effects on the heart by developing pulmonary inflammation, systemic inflammation, oxidative stress, endothelial dysfunction and prothrombotic changes (Meo and Suraya, 2015). The adverse effects on health of PM and $NO_2$ indicates that the effects occur at air pollution concentrations lower than those in guidelines (WHO, 2013a). Long term exposure to particulate matter is linked to an increased risk of coronary events, and this link remains even at levels of exposure below the current limit values (Cesaroni *et al.*, 2014). The magnitude of the long-term effects of $NO_2$ on mortality is at least as important as that of $PM_{2.5}$.

240. For construction dust, the main health outcomes are likely to relate to an exacerbation of existing conditions, such as asthma or COPD (i.e. airway inflammation by coarse PM) and to reductions in wellbeing associated with annoyance or reduced amenity. Whilst other outcomes (e.g. cardiovascular events) may be relevant in the event of brief high concentrations, such elevated exposures are expected to be avoided though the use of standard good practice mitigation such as adoption of the Institute of Air Quality Management (IAQM) dust guidance as discussed in **Chapter 20 Air Quality and Dust** (Commitment ID CO55 for an Air Quality Management Plan (AQMP)).

29.7.1.5.1 Receptor Sensitivity

241. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. The general population comprise those members of the community who live, work and study at a distance where high levels of dispersion and deposition would greatly limit the effects of any change in exposure due to the Project. Furthermore, most people enjoy good respiratory health (e.g. do not have asthma) and are not at a life stage (e.g. infant or frail elderly) with particular sensitivity to air quality.

242. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, including both children, elderly and those receiving care due to poor health. For example, existing respiratory conditions including asthma, COPD and type 2 diabetes would increase sensitivity. People likely to be most affected by the Project are those living close to the construction works (see receptors listed in **Section 20.6.3** of **Chapter 20 Air Quality and Dust**).

29.7.1.5.2 Impact Magnitude

243. **Chapter 20 Air Quality and Dust** finds that with the implementation of the mitigation measures detailed in the Outline CoCP (Commitment ID CO39), the potential risk of dust impacts on human health from earthworks, construction and trackout is considered to be not significant.

244. In terms of population health, the potential for effects is expected to be *occasional* and limited in extent. Such changes during construction are expected to be medium-term at any given location during the construction period, with a very minor influence on quality of life and / or morbidity risk for respiratory and cardiovascular conditions for a small minority of the population. The transitory nature of the works along the onshore ECC is relevant and indicates that at any given location exposures would be of shorter duration. Most effects would rapidly reverse, with no discernible influence for healthcare services. Overall, the magnitude of change for population health due to the Project is **negligible** (this does not differ between OCS Zone 4 and OCS Zone 8).

29.7.1.5.3 Effect Significance

245. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **negligible**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

246. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. For the health assessment, the construction air quality effects are considered minor adverse (not significant in EIA terms). This assessment conclusion reflects that whilst the scientific literature establishes a causal effect relationship between changes in air quality and health outcomes, the changes would result in a very limited effect in the health baseline of the local population. This finding takes into account potential for mobilisation of new or historic contaminants in construction dusts. The conclusion also takes account of non-threshold effects of some air pollutants. The temporary and slight reduction in air quality is not expected to affect health inequalities. All air quality changes are predicted to be well within statutory standards set for health protection.

#### 29.7.1.6 Bio-Physical Environment: Water Quality or Availability (HH-C-16) (Onshore)

247. This section considers water quality implications for population health from potential pollution releases during construction.

248. During construction, there is the potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels. Bentonite, which is an inert clay-based material used at the drill head during the installation of trenchless crossings, can breakout during use and cause smothering of habitats, although it is inert and not a pollutant.

249. Pollution of surface water or groundwater bodies which are subsequently used as a potable source could pose a risk to public health. The Onshore Development Area is predominately agricultural, and food safety could be compromised by contamination affecting agricultural land directly, or indirectly contaminating agricultural water sources. This includes contamination that occurs during flood events.

250. Changes to water quality onshore may be due to either new accidental pollutant spills or mobilisation of historic pollutants. In both cases, standard good practice pollution control measures form part of construction management plans (Commitment IDs CO38 and CO49 for a Drilling Fluid Breakout Management Plan and Pollution Prevention Plan respectively).

251. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points relevant to potential exposures and health outcomes. Recreational exposure to natural toxins by skin contact, accidental swallowing of water or inhalation can cause a wide range of acute or chronic illnesses (Koreivienė *et al.*, 2014). One of the main channels of human exposure to microorganisms and pollutants is through contact with polluted bathing water (Efstratiou, 2001). Several studies have concluded that a number of symptoms of ill health mainly affecting the gastrointestinal tract, ear, skin, eye and upper respiratory tract have been associated with direct contact with contaminated bathing water (Efstratiou, 2001; Eregno *et al.*, 2016; Iñiguez-Armijos *et al.*, 2020).

252. Drinking water supplies from both surface water and groundwater sources may also be contaminated during flooding events (Andrade *et al.*, 2018) including irrigation water for agricultural purposes which is a risk factor for microbial and chemical contamination of fruits and vegetables (Park *et al.*, 2012).

253. This section has been informed by **Chapter 9 Marine Water and Sediment Quality** and **Chapter 21 Water Resources and Flood Risk**, which set out relevant assessment findings and mitigation measures that have been taken into account.

254. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is mobilisation of contaminants or sediment or new leaks or spills of pollutants;
- The pathway is transmission through marine or onshore waters. Exposure includes ingestion and dermal contact; and
- Receptors are populations of residents and visitors.

255. Furthermore, the theoretical effect is considered applicable in the context of this Project.

256. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The local population of East Riding of Yorkshire; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people living, or undertaking leisure in proximity to construction activities).

##### 29.7.1.6.1 Receptor Sensitivity

257. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. This reflects many people would make limited use of coastal waters for bathing or related recreation. The potential for any effect to public water supplies is considered very limited. The general population includes those who are in good health and less likely to be adversely affected by contaminants.

258. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case relates to people more sensitive due to life stage or health status. For example, children and young people may spend more time in coastal waters and due to developmental stage or relative body size have increased risks from a given toxin exposure. Increase sensitivity to exposure may also apply to older people and those with existing poor health (e.g. long-term illness).

##### 29.7.1.6.2 Impact Magnitude

259. **Chapter 9 Marine Water and Sediment Quality** concludes:

- The effect from the construction of the Project on suspended sediment concentrations (MWS-C-01) is negligible.

- The effect from the construction of the Project on remobilisation of existing contaminated sediments in the offshore ECC (MWS-C-03) is negligible.

260. **Chapter 21 Water Resources and Flood Risk** concludes:

- The effect of direct disturbance on surface water bodies (WRF-C-01) during construction is assessed to be no change, negligible or minor adverse across the catchment areas..
- The effect of increased sediment supply (WRF-C-02) during construction is assessed to be negligible to minor adverse.
- The effect of supply of contaminants to surface and groundwater (WRF-C-03) is assessed to be negligible to minor adverse.
- The effect of changes to surface and groundwater flows and flood risk (WRF-C-04) is assessed to be negligible to minor adverse.

261. This reflects that nearshore works would result in high dispersion in relation to bathing waters and the use of standard good practice mitigations to avoid and contain any spills or appropriately respond to historic contamination encountered. It is considered unlikely that suspended sediment concentrations would be directly harmful or could have secondary effects, e.g. via toxic algal blooms.

262. In terms of population health, the level of exposure to any contaminants would likely be *very low*, *short-term* and associated with *one-off* events. The severity of health outcomes would likely relate to a *minor* change in *morbidity* related risk factors associated with toxin exposures for a *very few* people. At most there may be *slight* healthcare service implications. Overall, the magnitude of change for population health due to the Project is **negligible** (this does not differ between OCS Zone 4 and OCS Zone 8).

#### 29.7.1.6.3 Effect Significance

263. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **negligible**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

264. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. This conclusion reflects that although there are credible pathways in the scientific literature by which bathing waters and onshore waters (surface or ground) may be affected, these are addressed by mitigation and there is therefore potential for only a very limited effect on the population health baseline. Water quality is expected to be well within standards for bathing and drinking water and the changes are not expected to affect delivery of health policy or influence inequalities.

### 29.7.1.7 Bio-Physical Environment: Noise and Vibration (HH-C-19) (Onshore)

265. There is the potential for noise and vibration effects from onshore construction activities, which may result in changes to baseline levels during the day and at night. Some specific activities such as concrete pouring and trenchless installation works may require periods of night-time working, however the majority of works would occur during normal daytime core working hours.

266. Consistent with the IEMA's 2022, guidance scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points. In general, the scientific literature generally suggests that exposure to environmental noise has the potential to cause annoyance and stress (Guski *et al.*, 2017). Annoyance describes negative reactions such as disturbance, irritation, dissatisfaction, and nuisance (Guski, 1999). Environmental noise can initiate physiological stress responses in an individual that leads to a cascade of effects including a rise in heart rate and in levels of stress hormones (Guski *et al.*, 2017). These responses influence risk factors for cardiometabolic health issues including blood pressure, blood sugar and blood fats and long-term exposure that may affect mental health and lead to diseases such as diabetes, heart attack, and stroke (Münzel *et al.*, 2018a, 2018b, 2017).

267. Night-time noise may disrupt the total sleep time and the required physiological and mental restoration in an individual even at low levels (Guski *et al.*, 2017). Evidence therefore suggests a relationship between environmental noise and annoyance (Guski *et al.*, 2017), sleep disturbance (Basner and McGuire, 2018), cardiometabolic health (Van Kempen, 2018), learning outcomes (Clark, 2020) and mental health (Brink, 2008). Factors that can influence an observed annoyance response to exposure may include the source of the noise, sound level, perceived danger and fear associated with noise source, ability to cope, individual noise sensitivity, expectations, and individual factors that may increase vulnerability such as age, social disadvantage and employment status (Fenech 2021; Notley, 2014; UK Civil Aviation Authority, 2021).

268. This section has been informed by **Chapter 25 Noise and Vibration** which sets out relevant assessment findings and mitigation measures that have been taken into account.

269. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is noise and vibration generated by construction activities and vehicle movements;
- The pathway is pressure waves through the air and ground vibrations; and
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

270. Furthermore, the theoretical effect is considered applicable in the context of this Project.

271. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1;**
- The local population of East Riding of Yorkshire; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people living, studying or working in proximity to construction activities).

272. The human health assessment has had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, the elderly, the chronically ill, people with a hearing impairment, shift-workers and people with mental illness (e.g. schizophrenia) or conditions that may be associated with elevated noise sensitivity (e.g. autism).

29.7.1.7.1 Receptor Sensitivity

273. The sensitivity of the general population is considered to be **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to change. Additionally, most people live, work or study at a distance from the construction works where noise and vibration would be unlikely to be a source of concern.

274. The sensitivity of the vulnerable group population is **high**. The sub-population more sensitive to noise includes children, elderly and those receiving care due to poor health. This sub-population may experience existing widening inequalities due to living in areas with increased noise and elevated deprivation, with limited capacity to adapt to changes. Vulnerability particularly relates to those living close to the construction activities, including those spending more time in affected dwellings, e.g. due to low economic activity, shift work or poor health. People who are concerned or have high degrees of uncertainty about noise and its effect on their wellbeing may be more sensitive to changes in noise. The small population living at the coastal edge may experience nearshore noise (noise can travel longer distances across water than land) as well as night-time landfall construction noise. People in dwellings with limited acoustic insulation, such as caravans, may be more sensitive to noise effects.

29.7.1.7.2 Impact Magnitude

275. Construction along the onshore ECC would involve activities that are mobile (i.e. only temporarily taking place at a given location during the construction period) such as open cut trenching for cable duct installation. Mobile works would impact receptors for short periods of time.

276. **Chapter 25 Noise and Vibration** concludes:

- For construction noise (NV-C-01), with the adoption of embedded and additional mitigation measures, the residual effect is minor adverse for most construction activities and at most receptors. The only exception is receptors within 150m of potential trenchless crossing entry pits where night-time working may last for at least ten consecutive days at which the residual effect remains major adverse and receptors between 150m and 180m of these potential night-time crossing entry pits at which the residual effect remains moderate adverse. Additional site-specific mitigation measures will be identified as required at ES stage to reduce the identified significant effects.
- For construction vibration (NV-C-02), the effect is minor adverse.

277. Embedded best practicable means and site-specific mitigation and monitoring measures to be adopted during construction to control noise and vibration emissions will be included in the Construction Noise and Vibration Management Plan (CNVMP) (Commitment ID CO70).

278. In terms of population health, the *small* scale of change in noise levels is likely to predominantly relate to a *minor* change in quality of life and / or cardiovascular and mental wellbeing morbidity for a *small minority* of the community populations. The changes would be over the *medium-term* construction period, albeit short-term at any given location due to the transitory nature of works, and relate to *frequent* construction related noise exposures. The greatest potential for effects is likely for the *few people* close to areas with potential for continuous working such as at the landfall construction compound or the OCS zone. Overall, the magnitude of change for population health due to the Project is **low** (this does not differ between OCS Zone 4 and OCS Zone 8).

29.7.1.7.3 Effect Significance

279. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

280. The effect is characterised as being *adverse* in direction, *temporary* and *direct*. This assessment conclusion reflects that although the scientific literature indicates a *clear* association between elevated and sustained noise disturbance and reduced health outcome, the changes would result in a *very limited* effect in the health baseline of the population. The temporary construction noise is *not* expected to affect health inequalities. The level of effect is *not* expected to affect the ability to deliver local or national health policy. The score takes into account the subjective, and therefore non-threshold, nature of noise, including that tonal and other characteristics influence the effect on wellbeing.

## 29.7.2 Potential Effects during Operation

### 29.7.2.1 Social Environment: Community Identity, Culture, Resilience and Influence (HH-O-08) (Onshore)

281. The O&M phase of the Project may lead to effects on visual impact and community identity. The realistic worst-case scenario is represented by the greatest visual impact of the Project and is summarised in **Table 27-7** of **Chapter 27 Landscape and Visual Impacts**.

282. Impact will result from visibility of static above-ground infrastructure occupying the OCS zone, including the OCS and ESBI, which have the potential to affect peoples' appreciation of the surrounding landscape.

283. Community identity as a determinant of health has a strong subjective dimension that varies between individuals. Consequently, it is likely that the visibility of the Project's infrastructure would be interpreted differently by different people, influenced by experiential and contextual factors. Health effects may be associated with mental health conditions (e.g. stress, anxiety or depression) due to underlying social determinants influencing community identity and wellbeing.

284. This section has been informed by **Chapter 27 Landscape and Visual Impacts** which sets out relevant assessment findings and mitigation measures that have been taken into account.

285. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is visual change associated with the operational OCS and ESBI;
- The pathway is factors that contribute to behaviour and a sense of identity; and
- Receptors are residents in the surrounding communities.

286. Furthermore, the theoretical effect is considered applicable in the context of this Project.

287. The population groups relevant to this assessment are:

- The site-specific population, see **Section 29.4.1**;
- The 'local' population of East Riding of Yorkshire; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

#### 29.7.2.1.1 Receptor Sensitivity

288. The sensitivity of the general population is considered to be **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. This reflects that for most people in the area, the Project would not be a strong driver of community identity given many other influences on the social, economic and environmental landscape. For most people, there would be no regular views of the OCS or ESBI.

289. The sensitivity of the vulnerable group population is considered to be **high.** Vulnerability in this case is linked to the proportion of people who have expectations that their community or way of life would be changed to a large degree, positively or negatively, by visual change caused by the Project. This includes those with views of the infrastructure of multiple existing operational energy developments in the area.

#### 29.7.2.1.2 Impact Magnitude

290. **Chapter 27 Landscape and Visual Impacts** concludes:

- The effect of the Project's onshore ECC (LV-O-03) on visual receptors are predicted to be minor adverse. The effect on landscape character and designated landscapes is minor adverse.
- The effect of the OCS and ESBI in OCS Zone 4 on visual receptors (LV-O-04) is assessed to be moderate to major adverse across all viewpoints. The effect on landscape character and designated landscape (LV-O-02) is major adverse within the immediate area of the OCS zone, reducing with distance and falling below the threshold of significance at no more than 1km from the OCS zone.
- The effect of the OCS and ESBI in OCS Zone 8 on visual receptors (LV-O-04) is assessed to be moderate to major adverse at all but one viewpoint. A minor adverse effect is identified at one viewpoint in Little Weighton. The effect on landscape character and designated landscape (LV-O-02) is major adverse within the immediate area of the OCS zone, reducing with distance and falling below the threshold of significance at no more than 1km from the OCS zone.

- Additional mitigation measures, including hedgerow and woodland planting, and the residual effect of the presence of the OCS and ESBI during operation will be determined at ES stage. It is anticipated that these measures will reduce impacts over time as vegetation matures (Commitment ID CO65 for Landscape Management Plan (LMP)).

291. In terms of population health, impact is predicted to be localised in spatial extent, *long-term* duration and *continuo*us during the O&M phase. However, the scale of visual change of the Project would be *small* with few people experiencing unfiltered near views of the OCS and ESBI from their dwellings. The change is likely to have a *minor* influence on quality of life and morbidity risk factors linked to wellbeing for a *small minority* of the population. No healthcare services implications are anticipated. The assessment gives weight to the context of there being other electric infrastructure views within the landscape and the Project's commitments on landscaping and visual screening, which limits the extent to which the Project represents a change in existing community identity. Overall, the magnitude of change for population health due to the Project is **low** (this does not differ between OCS Zone 4 and OCS Zone 8).

#### 29.7.2.1.3 Effect Significance

292. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

293. The effect is characterised as being both a*dverse* in direction, *permanent* (albeit with increasing screening over time as new planting matures) and *direct*. The level of change in sense of place and community cohesion is unlikely to be of a scale to discernibly influence health policy delivery or inequalities. Any change to the population health baseline is likely to be *sligh*t, reflecting that the literature is suggestive of a relationship that is strongly influenced by subjective factors.

### 29.7.2.2 Economic Environment: Education and Training (HH-O-09) (Offshore and Onshore)

294. This section considers the population health implications of implications of additional upskilling and educational support to the operational workforce. This includes both offshore and onshore employment, with offshore O&M jobs having a greater potential to provide training and upskilling opportunities.

295. Scientific literature identifies that increased educational attainment is associated with better health outcomes as set out in **Section 29.7.1.3**.

296. This section has been informed by **Chapter 30 Socio-Economics, Tourism and Recreation**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

297. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is upskilling and career development opportunity;
- The pathway is good quality education and skills development which is influential for health; and
- Receptors are local communities particularly young people and people of working age.

298. Furthermore, the theoretical effect is considered applicable in the context of this Project.

299. The population groups relevant to this assessment are:

- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and the Humber; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

#### 29.7.2.2.1 Receptor Sensitivity

300. The sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is high on the same basis as set out in **Section 29.7.1.3.1**.

#### 29.7.2.2.2 Impact Magnitude

301. While details of apprenticeship and training opportunities are not known at this stage, it is recommended that these are, and anticipated that they would be, provided during the O&M phase (Commitment ID CO67 for an ESP).

302. Overall, the magnitude of change for population health due to the Project is **negligible** on the same basis as set out in **Section 29.7.1.3.2**.

#### 29.7.2.2.3 Effect Significance

303. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **negligible**. The effect, accounting for health inequalities, is therefore of **negligible beneficial** significance for population health, which is **not significant** in EIA terms.

304. The effect is characterised as being *beneficial*, *permanent* in supporting future career progression and *indirect*. This conclusion aligns with scientific literature which shows a clear association between educational and upskilling outcomes and improved health outcomes, primarily through better employment quality. Based on current commitments, the potential for change in the population health baseline is minimal. This change could have a supportive influence on delivering health policies, addressing health priorities and reducing inequalities.

#### 29.7.2.2.4 Enhancement and Residual Effect

305. An Outline ESP has been committed to, though its details are still being developed at this stage. Additional opportunities to enhance public health benefits are being considered, as noted in **Table 29–6**. If a high proportion of O&M training opportunities are aimed at local vulnerable groups, notably young people NEET then there is potential for a **moderate beneficial** (**significant** in EIA terms) impact on local population health. However, this potential will be reassessed within the ES after the Outline ESP is fully developed (see Commitment ID CO67). This reflects the potential to offer targeted training to provide long-term benefits for NEET at a critical stage in their lives. To confirm this, monitoring the uptake and completion rates of training opportunities with the Project by NEET could be conducted, to confirm the benefit and allowing further tailoring of outreach efforts to local vulnerable groups.

### 29.7.2.3 Economic Environment: Employment and Income (HH-O-10) (Offshore and Onshore)

306. This section considers the population health implications of increased employment and economic impacts during operation. This includes both offshore and onshore employment, with offshore O&M jobs having a greater potential to provide good quality long term employment opportunities.

307. Employment is an important determinant of health and well-being. Adverse effects on local businesses and livelihoods, including commercial fisheries, leisure and tourism are not expected.

308. Scientific literature identifies the relevant association of increased employment with better health outcomes as set out in **Section 29.7.1.4**.

309. This section has been informed by **Chapter 30 Socio-Economics, Tourism and Recreation**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

310. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is changes in direct and indirect jobs and economic activity;
- The pathway is good quality businesses, employment and income providing more health supporting resources; and
- Receptors are people of working age (and their dependants).

311. Furthermore, the theoretical effect is considered applicable in the context of this Project.

312. The population groups relevant to this assessment are:

- The local population of East Riding of Yorkshire;
- The regional population of Yorkshire and Humber; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

#### 29.7.2.3.1 Receptor Sensitivity

313. The sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high** on the same basis as set out in **Section 29.7.1.4.1**.

#### 29.7.2.3.2 Impact Magnitude

314. As shown in **Chapter 30 Socio-Economics, Tourism and Recreation,** the O&M phase of the Project is expected to support annual employment equivalent to <0.01% of the RSA economy and <0.01% of the UK economy. **Chapter 30 Socio-Economics, Tourism and Recreation** concludes the effect from increase in employment during operation (SOC-O-02) is therefore negligible (beneficial) in the RSA and negligible (beneficial) at the UK level.

315. In terms of population health, the negligible magnitude of change conclusion reflects that there will be a relatively small scale of change in operational employment in the context of the local and regional labour market. These opportunities would be of *long-term* duration and reflect employment that is on a continuous basis, whether *full-time* or *part-time*. Such jobs are likely to be associated with *very minor* changes in morbidity and quality of life for a *small minority* of the population due to improved socio-economic status and increased spend on health supporting resources and activities. The magnitude of change for population health due to the Project is **negligible**.

#### 29.7.2.3.3 Effect Significance

316. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **negligible**. The effect, accounting for health inequalities, is therefore of **negligible beneficial** significance for population health, which is **not significant** in EIA terms.

317. The effect is characterised as being *beneficial* in direction, *permanent* and *indirect*. This conclusion reflects that employment has a clear association with better health outcomes in the scientific literature and the Project is likely to make *slight* positive contribution to the local health baseline. Such effects are likely to have a marginal effect on delivering health policy and on narrowing health inequalities.

#### 29.7.2.3.4 Enhancement and Residual Effect

318. An Outline ESP has been committed to, though its details are still being developed at this stage. Additional opportunities to enhance public health benefits are being considered, as noted in **Table 29–6**. If a high proportion of O&M employment opportunities are aimed at local vulnerable groups, notably young people NEET then there is potential for a **moderate beneficial** (**significant** in EIA terms) impact on local population health. However, this potential will be reassessed within the ES after the Outline ESP is fully developed (Commitment ID CO67). This reflects the potential to offer targeted training to provide long-term benefits for NEET at a critical stage in their lives. To confirm this, monitoring the uptake and completion rates of training opportunities with the Project by NEET could be conducted, to confirm the benefit and allowing further tailoring of outreach efforts to local vulnerable groups. x

### 29.7.2.4 Bio-Physical Environment: Climate Change and Adaptation (HH-O-12) (Offshore and Onshore)

319. This section considers the population health implications of the contribution of the Project to reducing the effects of climate change.

320. Renewable energy generation supports avoiding adverse health effects associated with climate change. These include extreme temperature effects, infectious diseases occurrence, food insecurity and injury. These effects relate to the UK population, but also the global population, particularly deprived populations in low- and middle-income countries.

321. There are important global inequalities in the effects of climate change, with the greatest adverse effects on health expected in the some of the poorest and least economically developed populations. In contrast, populations that benefit from rapid social and economic development are expected to experience reduced (but not eliminated) adverse effects to health from climate change. Changes in health outcomes related to climate change are therefore expected to be relatively small in the UK. When considering health and well-being, there is a global responsibility to reduce the effect of climate-altering pollutants that are expected to reduce health outcomes in low- and middle-income countries. The Intergovernmental Panel on Climate Change states that there are opportunities to achieve co-benefits from actions that reduce emissions of climate altering pollutants and at the same time improve health.

322. This section has been informed by **Chapter 31 Climate Change**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

323. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- Source: renewable energy generated by the wind farm during the operation of the Project and other potential carbon benefits associated with energy balancing and storage services enabled by the ESBI;
- Pathway: reduction in climate-altering pollutants contribute to climate change, which is associated with global changes in temperature, crop yields, productivity and disease prevalence; and
- Receptor: international global population, particularly deprived populations in low- and middle-income countries.

324. Furthermore, the theoretical effect is considered applicable in the context of this Project.

325. The population groups relevant to this assessment are:

- The ‘national’ population of England, and the wider UK;
- The ‘international’ population globally; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

#### 29.7.2.4.1 Receptor Sensitivity

326. The sensitivity of the general population is **low.** Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. The UK is a developed economy and has comparatively high resilience and capacity to adapt, so in general the national population can be considered to be of low sensitivity.

327. The sensitivity of the vulnerable group population is **high**. This reflects that the adverse effects would fall most heavily on the poorest and most vulnerable members and regions of society (globally). Disproportionate effect on the most disadvantaged in society are likely to widen health inequalities. Although people in the UK are generally less vulnerable, as they are able to get support to cope with the effects of climate change, some may still be at greater risk (e.g. low incomes or age making it harder to cope with heatwaves or flooding).

#### 29.7.2.4.2 Impact Magnitude

328. **Chapter 31 Climate Change** concludes that given that the Project will supply the UK electricity transmission network with renewable energy and provide other potential carbon benefits enabled by the ESBI, the overall effect significance of the Project is considered to be beneficial, when considering both the Project's avoided emissions and its whole lifecycle emissions (GHG-WL-01). The Project will ultimately contribute positively to the UK's emission reduction targets and its ability to achieve and maintain its net-zero status in the long-term.

329. In terms of population health, the scale of change would be *small* within the national energy sector emissions context, albeit *continuous* and *long-term*. The health effect likely represents a *very minor* change in the risk of mortality and morbidity linked to a range of health determinants influenced by a changing climate for a large minority of the global population and a *small minority* of the national population. Relevant effects include population displacement, food insecurity, shifts in communicable illness ranges and exposure to extreme meteorological conditions. Overall, the magnitude of change for population health due to the Project is **low**.

#### 29.7.2.4.3 Effect Significance

330. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor beneficial** significance for population health, which is **not significant** in EIA terms.

331. The effect is characterised as being beneficial in *direction, permanent* and due to a range of direct and indirect health pathways. This reflects a very limited effect on the global or national health baseline with long-term inter-generational effects. The scientific literature supports a causal relationship between climate altering pollutants and climate change, and the Project support a marginal narrowing of inequalities nationally and globally. The conclusion reflects that climate change is a general public health priority issue, with consensus from stakeholders as to its importance for public health.

### 29.7.2.5 Bio-Physical Environment: Noise and Vibration (HH-O-19) (Onshore)

332. This section discusses the operational changes in noise exposure from the Project that may be detrimental to population health. The OCS and ESBI include fixed plant such as transformers, which can cause community annoyance due to noise, including distinctive tonal characteristics. Noise effects from other O&M activities are unlikely to have the potential to affect population health.

333. Scientific literature identifies the relevant associations on the impact of noise on population health. These are set out in **Section 29.7.1.7**.

334. This section has been informed by **Chapter 25 Noise and Vibration**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

335. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is noise generated by operation of the OCS and ESBI;
- The pathway is pressure waves through the air; and
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

336. Furthermore, the theoretical effect is considered applicable in the context of this Project.

337. The population groups relevant to this assessment are:

- The site-specific population, as listed in **Section 29.4.1**; and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people who live in proximity to the OCS and ESBI).

#### 29.7.2.5.1 Receptor Sensitivity

338. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. Most people in the Study Area live, work or travel at a distance from either of the OCS zones which remain under consideration where operational noise effects would be imperceptible.

339. The sensitivity of the vulnerable group population is **high**. Vulnerability relates to those living close to an OCS zone, including those spending more time in affected dwellings e.g. due to low economic activity, shift work or poor health. The sub-population more sensitive to noise includes *children, elderly* and those receiving care due to *poor health*. This sub-population may experience *existing widening* inequalities due to living in areas with increased noise and elevated deprivation, with *limited capacity* to adapt to changes. People who are concerned or have high degrees of uncertainty about noise and its effect on their wellbeing may be more sensitive to changes in noise.

#### 29.7.2.5.2 Impact Magnitude

340. **Chapter 25 Noise and Vibration**, states:

- Noise emissions from operation of the OCS and ESBI will comply with maximum allowable limits at identified noise sensitive receptors, which will be specified in a DCO requirement at ES stage. An operational noise investigation protocol will ensure that operational noise emissions from the OCS and ESBI do not exceed the identified limits. This would ensure that the operational noise effects from the OCS and ESBI are of no worse than minor adverse significance (NV-O-01) (Commitment ID CO71).
- Installations of the OCS and ESBI will be designed to achieve very low levels of ground-borne vibration. This will be achieved using industry standard mitigation measures applied to items of plant with the potential to generate significant levels of vibration, such as vibration isolation pads / mounts for transformers. Additionally, the OCS and ESBI will not contain any large items of rotating plant that may give rise to significant vibration. In terms of the potential for impacts at receptors, the very low levels of vibration within the installations will be greatly attenuated due to propagation with distance. No likely significant effects due to operational vibration were identified (NV-O-02).

341. For population health, the magnitude of change due to the operation of the OCS and ESBI is expected to be no greater than **low**. In terms of population health, the expectation is that there would be a *small scale* of change in noise levels and, if this is the case, it would predominantly relate to a *minor change* in quality of life and / or cardiovascular and mental health morbidity for a very few people. That level of change at the individual level, whilst appropriate to mitigate, would be unlikely to constitute a population health effect. The change is expected to be long-term duration and continuous, potentially affecting daytime and night-time periods. Overall, the magnitude of change for population health due to the Project is **low** (this does not differ between OCS Zone 4 and OCS Zone 8).

#### 29.7.2.5.3 Effect Significance

342. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

343. This conclusion reflects that noise and vibration impacts from the operation of the OCS and ESBI will be minimal and kept below health-protective thresholds through careful design. Although the scientific literature indicates a clear association between elevated and sustained noise and vibration disturbance and reduced health outcomes, the changes would at most result in a very limited effect in the health baseline of the population, which takes into account subjective response to noise. The distribution of effects is not expected to affect health inequalities. The level of effect is not expected to affect the ability to deliver local or national health policy.

### 29.7.2.6 Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks (HH-O-21) (Onshore)

344. This section considers the perception of the potential operational population health effect due to EMF exposure associated with the Project.

345. All electrical systems generate EMF. EMF effects diminish rapidly with distance, often requiring only a few metres, or less, to reach background levels (Gajšek, 2016). In line with good practice, public understanding of risk in relation to operational EMF is assessed. This includes considering how mental health effects can be avoided or reduced through provisions of timely and non-technical information explaining how actual health risks are mitigated.

346. Consistent with the IEMA's 2022 guidance, scientific literature is used to inform the professional judgements reached. The scientific literature identifies the following general points relevant to potential effects and health outcomes. The way risks are understood has important influences on health behaviour (Ferrer and Klein, 2015). Awareness of risk can affect mental, physical and emotional wellbeing, and can be worse when it is accompanied by uncertainty (Luria, 2009). The ultimate goal of dialogue between regulators and communities is to produce an informed public (Sinisi, 2004). Trust, credibility, competence, fairness and empathy are of great importance (Sinisi, 2004) and the routine monitoring and clear communication of results can greatly increase trust, empower people and reduce fear factors (WHO, 2013b). The views that people hold can be associated with low-grade illnesses (e.g. headaches or hypertension) and can be exacerbated when there is uncertainty (Luria 2009).

347. An EMF Compliance Statement will be developed and submitted with the DCO application, which will demonstrate the Project's compliance with the relevant design guidelines of the ICNIRP and UK Government voluntary code of practice (Department for Energy Security and Net Zero, 2012; ICNIRP, 1998) and other latest relevant regulations and standards. Compliance with such guidelines are deemed sufficient for avoiding actual EMF risk. ICNIRP reference levels are defined for the general public, which is *"the entire population. It includes individuals of all ages, and of varying health status, and this will include particularly vulnerable groups or individuals such as the frail, elderly, pregnant workers, babies and young children"* (ICNIRP, 2010). The focus of this assessment section is therefore not on the actual risk itself, which is considered appropriately mitigated through standard industry practice, but on people's understanding of risk (i.e. risk perception). This relates to the potential for community concern about being close to electrical infrastructure such as the onshore export cables, the OCS and ESBI to affect mental health. This is a concern even when the levels of EMF exposure remain within the established public safety guideline limits.

348. The visibility of permanent above-ground electrical infrastructure in the OCS zone from surrounding views will be minimised through sensitive micro-siting, and landscaping and other visual screening measures will be provided to integrate the OCS and ESBI into the surrounding landscape as far as reasonably practicable (Commitment IDs CO64 and CO65).

349. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is electrical equipment introduced by the Project (including OCS and ESBI);
- The pathway is concern about EMF exposure, affecting mental health; and
- Receptors are residents in the local community, particularly those living in close proximity to new electrical infrastructure.

350. Furthermore, the theoretical effect is considered applicable in the context of this Project.

351. The population relevant to this assessment are:

- The site-specific population, as listed in **Section 29.4.1**;
- The local population of East Riding of Yorkshire (reflecting potential for wider community concern); and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

29.7.2.6.1 Receptor Sensitivity

352. The sensitivity of the general population is considered to be **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. Most people in the Study Area live, work or travel at a distance from the Project's electrical infrastructure where they would not be concerned about the potential for EMF risks. This group also includes that portion of the population who are ambivalent or not concerned about EMF as a risk factor.

353. The sensitivity of the vulnerable sub-population is **high**. The sub-population includes people who may be uncertain or concerned about EMF, and this may exacerbate existing mental health conditions or be a source of stress and anxiety in itself. This may particularly be the case for people with near views and / or who live in close proximity to the OCS and ESBI.

29.7.2.6.2 Impact Magnitude

354. The following section describes the existing international and national public health protection standards and regulations on EMF emissions which are applicable to the Project's electrical infrastructure. Compliance with the requirements described below will be detailed in the EMF Compliance Statement, which will be developed at ES stage, including compliance mechanisms to ensure that the Project's detailed design and as-built parameters remain in compliant with the identified requirements.

355. In terms of population health, buried cables do not produce an electric field at the surface. Magnetic fields vary with design but are engineered to be ICNIRP compliant. Illustratively, the National Grid publication, 'Undergrounding high voltage electricity transmission lines, The technical issues' (National Grid, 2015), notes in Section 9 that for a 400kV buried cable 0.9m underground, the typical magnetic field strengths at the surface directly above the cable is 24 μT (less than a tenth of the public exposure limit and this drops by almost an order of magnitude within 5m).

356. In addition, with respect to the OCS and ESBI, as noted in EN-5 Paragraph 2.9.51 "*For electricity substations, the EMFs close to the sites tend to be dictated by the overhead lines and cables entering the installation, not the equipment within the site"*.

357. Due consideration will be given to the specification of the Project's electrical infrastructure in the EMF Compliance Statement, as required by NPS EN-5 Paragraph 2.10.11. The Project is required to be compliant with the Electricity Safety, Quality and Continuity Regulations 2002, which imposes requirements regarding the installation and use of electrical networks and equipment owned or operated by generators, distributors, and meter operators, and the participation of suppliers in providing electricity to consumers

358. The EMF Compliance Statement will also consider guideline limits set out in the ICNIRP guidelines and the UK Government voluntary code of practice and the Department of Health and Social Care advice on Electromagnetic Field (EMF) exposures (UK Health Security Agency, 2013).

359. The Department of Health's advice on health effects of EMF exposure has not changed since the 2013 Electric and magnetic fields: health effects of exposure. However, it is noted that the UK Health Security Agency guidance Electric and magnetic fields: reducing exposure, was updated in March 2024 (UK Health Security Agency, 2024). The advice relates predominately to voluntary steps people can take within their home to reduce EMF exposures on a precautionary basis if they have concerns about EMF. The advice note opens by stating: "*The exposures in our homes are usually much lower than the guidelines levels, which provide adequate protection*." The advice note goes on to state that: "*measures to reduce fields, such as avoiding the routeing of power lines near to homes, or not building homes close to power lines, are not needed*". Even so, the Project's site selection process has embedded the principle of avoiding and minimising impacts to residential properties by implementing a buffer distance. This principle has been implemented in the site selection exercise leading up to the identification of the Onshore Development Area and will be applied during further site selection refinements at ES stage (see **Chapter 5 Site Selection and Consideration of Alternatives**).

360. The level of actual exposure is negligible, however the scale of change that may contribute to community concern about EMF is *medium, continuous* and *long-term*. The severity of health outcome relates to concern about risks of EMF, as no actual risks are anticipated. These relate predominantly to a minor change in mental health related morbidity for a very few people within the population. Such individual level effects are unlikely to have implications for health service capacity. For many people there is likely to be a rapid reversal of effects should their concerns be responded to and resolved to their satisfaction. The Applicant will engage with the local community surrounding the OCS zone providing information to confirm that the EMF generated by the Project's electrical infrastructure during operation will be in accordance with ICNIRP public exposure health protection standards. Information on the controls put in place to achieve appropriate health protection standards will be provided in a timely and non-technical format, describing how actual health risks are mitigated. Overall, the magnitude of change for population health due to the Project is **low**.

#### 29.7.2.6.3 Effect Significance

361. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

362. The professional judgement is that there could be a *slight* adverse change in the health baseline for the local population if concerns are widespread. This conclusion reflects scientific understanding of the impact of uncertainty or concern about environmental risks on mental health. It also reflects that the actual risks would be well within regulatory standards for EMF and that most members of the public would expect this to be the case. The context that electrical transmission infrastructure and associated facilities, such as the OCS and ESBI, are relatively common features would also be expected to inform population understanding of EMF risks.

### 29.7.2.7 Institutional and Built Environment: Built Environment (HH-O-25) (Onshore)

363. This section considers the implications of the ESBI during operation in relation to public safety and related health outcomes. Such effects in relation to other onshore infrastructure are scoped out as detailed in **Chapter 28 Major Accidents and Disasters**.

364. Consistent with the IEMA's 2022 guidance scientific, literature is used to inform the professional judgements reached. The scientific literature identifies the following general points relevant to potential risks and health outcomes. Hazard types associated with battery energy storage systems are categorised by fire, chemical release and electrical hazards. Fire hazards may include thermal runaway, overheating, swelling, electrolyte leakage venting, leading to explosions and fires in worst case scenarios. Thermal runaway (thermal explosions) refers to a chain reaction within a battery cell, typically lithium-ion batteries, characterised by uncontrollable heat generation, which can lead to catastrophic consequences such as fire or explosion (Jeevarajan, 2022; Wang and Shu, 2022).

365. Other issues relate to perceived risks of battery energy storage systems, which may impact mental health. In one study, risk perception was found to amplify annoyance as it introduces a suggestion of danger to environmental changes. A study by (Thomas, 2019) on the acceptability of battery energy storage technologies in the UK identified concerns over aesthetic and spatial impacts, environment and sustainability risks, toxicity, safety, electromagnetic radiation and mechanical failures of battery energy storage systems. Perceived risk was therefore identified as one of the major barriers to the acceptability of the technology in communities. (Baur, 2023) observed that participants who viewed battery energy storage systems as more positive, environmentally friendly, and innovative expressed less concerns over the technology than those who had little knowledge of it.

366. This section has been informed by **Chapter 28 Major Accidents and Disasters**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

367. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is ESBI within the OCS zone;
- The pathway is potential hazards, including thermal events or chemical leaks and public concern about the ESBI affecting mental health; and
- Receptors are residents in the local community, particularly those living in close proximity to the ESBI within the OCS zone.

368. Furthermore, the theoretical effect is considered applicable in the context of this Project.

369. The population relevant to this assessment are:

- The site-specific population, as listed in **Section 29.4.1**;
- The local population of East Riding of Yorkshire (reflecting potential for wider community concern); and
- The sub-population vulnerable due to young age, old age, low income, poor health, social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

29.7.2.7.1 Receptor Sensitivity

370. The sensitivity of the general population is considered to be **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. The sensitivity of the general population is considered **low.** Most individuals in the Study Area live, work or travel at a distance from the ESBI, where potential safety effects would be minimal and imperceptible. This group also includes that portion of the population who are ambivalent or not concerned about the ESBI as a risk factor.

371. The sensitivity of the vulnerable population group is assessed as **high**. This includes individuals living in close proximity to the ESBI, particularly those who may spend extended periods in affected dwellings due to low economic activity, shift work or poor health. Vulnerable groups such as children, the elderly and those pre-existing conditions may face heightened risks including due to reduced mobility and less capacity to respond to emergencies. This also includes individuals who express concerns or uncertainties about the safety of the ESBI and this may exacerbate existing mental health conditions or be a source of stress and anxiety in itself.

29.7.2.7.2 Impact Magnitude

372. **Chapter 28 Major Accidents and Disasters** concludes:

- In relation to the effect significance for a major accident or disaster impact arising from the ESBI (MAD-O-01), the likelihood of such an event occurring is considered very unlikely and the effect is considered to be negligible to minor adverse.

373. **Chapter 28 Major Accidents and Disasters** includes the following relevant embedded mitigation measures related to operational safety of the ESBI:

- The detailed design will ensure that the Project remain resilient to current and future climate conditions during the Project's operational lifetime. The design will be informed by relevant climate change projection data and include sufficient safety margins to withstand foreseeable extreme weather events (Commitment ID CO96).

- A Battery Safety Management Plan (BSMP) will be developed in accordance with the Outline BSMP. The BSMP will provide a health and safety risk assessment of the ESBI and detail appropriate prevention, monitoring and contingency measures for any identified hazards, including fire and chemical leak containment, to ensure compliance with latest relevant regulations and standards. The BSMP will also include measures for provision of information to the local community on ESBI risks and how these risks are appropriately mitigated and managed (Commitment ID CO79). An Outline BSMP will be developed at ES stage and submitted with the DCO application. Indicative design and operational measures to be included in the Outline BSMP are provided in **Chapter 28 Major Accidents and Disasters** and **Chapter 4 Project Description**.
- Prior to detailed design and commencement of the construction works within the OCS zone, consultation with the appropriate stakeholders such as National Grid Gas, the operator of the Central Area Transmission Systems (CATS) Pipeline, the Environment Agency and Health and Safety Executive, will be undertaken to manage interfaces and define appropriate control measures when working close to live pipelines. Safety buffer zones, agreed with relevant stakeholders, will be created and clearly delineated that prohibits work from occurring in proximity to these receptors (Commitment ID CO105).

374. Whilst the presence of the ESBI would be *long-term* duration and *continuous*, there would be a very *small* scale of change in public safety and if this is the case, it predominantly relates to a *minor* change in quality of life and / or morbidity for a very few people. This reflects that the Project is anticipated to effectively manage the risks associated with operation of the ESBI through the implementation of best practice measures, minimising any potential impact on community health.

375. Regard has also been given to the magnitude of the population effects associated with potential community concern with understating of risk. The potential effects are in the context of the ESBI operating over the *long term*. As a conservative assessment, the scale of change is considered *low*. The expected severity of health outcomes relates predominantly to a *minor change* in mental health related morbidity for a *very few people* within the population. Such individual level effects are *unlikely* to have implications for health service capacity. For many people, there is likely to be *rapid* reversal of effects should their concerns be responded to and resolved to their satisfaction. The Project will engage with the local community surrounding the OCS zone providing information on how relevant ESBI risks will be appropriately mitigated and managed (Commitment ID CO79 for the BSMP). Overall, the magnitude of change for population health due to the Project is **low** (this does not differ between OCS Zone 4 and OCS Zone 8).

#### 29.7.2.7.3 Effect Significance

376. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score), and the magnitude of impact is **low**. The effect, accounting for health inequalities, is therefore of **minor adverse** significance for population health, which is **not significant** in EIA terms.

377. This conclusion reflects the design measures and safety protocols the Project will put in place to ensure public safety, as required by regulations and standard industry practice relevant to battery energy storage systems. There could be a *slight* adverse change in the health baseline for the local population if concerns are widespread. This conclusion reflects scientific understanding of the impact of uncertainty or concern about environmental risks on mental health.

### 29.7.2.8 Institutional and Built Environment: Wider Societal Infrastructure and Resources (HH-O-26) (Offshore)

378. The electricity generated by the Project and supplied to the national electricity transmission network would enable many aspects of everyday life that either protect or promote good health.

379. UK energy security is important for maintaining continuous and affordable electricity which supports many aspects of public health. This includes power to safely cook and refrigerate food, regulate the temperature and lighting of homes and schools, operate health and social care services, maintain economic productivity and employment, and operate technologies that improve quality of life and social support. Sustained interruption of supply or rapid increases in costs would both be expected to result in reductions in health and well-being outcomes. Increases in the cost of electricity, particularly in the context of rising costs of living, can cause some people to prioritise essential costs (e.g. food, shelter) over electricity demands (e.g. heating a home).

380. Energy insecurity is a public health concern particularly for vulnerable populations (e.g. low-income, children, elderly). It is associated with hazardous exposures, heat stress, cold stress, asthma, chronic disease, poor mental health, parental fear and stigma, family disruption and residential instability (Hernández, 2016). In children, energy insecurity has been shown to affect development, hospitalisation and overall child health (Cook 2008).

381. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is renewable energy generation;
- The pathway is energy security whilst avoiding climate altering emissions; and

- Receptors are population connected to the national electricity transmission network.

382. Furthermore, the theoretical effect is considered applicable in the context of this Project.

383. The population group relevant to this assessment are:

- The 'national' populations of England and the wider UK.
- The vulnerable sub-populations including young and old people, people with low income and their dependants, people with poor health or disabilities, people experiencing social disadvantage and people with access and geographical vulnerability.

29.7.2.8.1 Receptor Sensitivity

384. The sensitivity of the general population is considered to be **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **Section 29.5.4.1.4**. The general population comprise those members of the community in good physical and mental health and with greater resources to respond to the costs of energy or to interruptions in supply.

385. The sensitivity of the vulnerable group population is considered to be **high**. The sub-population on low incomes, for whom energy security and interruption of energy supplies are more sensitive, pose a greater risk. This is particularly the case for dependants at risk during temperature extremes, including heatwaves and cold weather, as well as people in poor health, including when accessing healthcare.

29.7.2.8.2 Impact Magnitude

386. The magnitude of change due to the Project is considered to be **medium**. The impact is predicted to be of national spatial extent, with direct and indirect effects to population health. The Project's provision of renewable electricity would have *continuous* public health benefits to energy security despite the scale of contribution being relatively *small* within the national energy generation context. The effects are likely to provide a *minor* reduction in risks for population mortality (e.g. reducing excess winter deaths) and morbidity of physical and mental health outcomes related to standard of living and access to health supporting infrastructure. Such an effect may extend via the national electricity transmission network to a large minority of the national population. Such effects may bring *small* benefits to healthcare service quality by reducing capacity burdens.

29.7.2.8.3 Effect Significance

387. Overall, it is predicted that sensitivity of the population is **high** (driven by the vulnerable sub-population score) and the magnitude of impact is **medium**. The effect, accounting for health inequalities, is therefore of **moderate beneficial** significance for population health, which is **significant** in EIA terms.

388. The Project provides a protective effect on the health baseline, and this would be important for public health. This conclusion reflects the scientific literature, which establishes a clear association between energy security and health outcomes. The Project is likely to be *influential* to delivering health policy, including in *narrowing* inequalities that are at risk of widening due to reduced national energy security and rising costs of living.

## 29.7.3 Potential Effects during Decommissioning

389. No decision has been made regarding the final decommissioning strategy for the offshore and onshore infrastructure, as it is recognised that regulatory requirements and industry best practice change over time.

390. Commitment IDs CO21 and CO56 (see **Table 29–5**) requires an Offshore Decommissioning Programme and an Onshore Decommissioning Plan to be prepared and agreed with the relevant authorities prior to the commencement of offshore and onshore decommissioning works respectively. This will ensure that decommissioning impacts with respect to human health will be assessed in accordance with the applicable regulations and guidance at that time of decommissioning where relevant, with appropriate mitigation implemented as necessary to avoid significant effects.

391. The detailed activities and methodology for decommissioning will be determined later within the Project's lifetime, but would be expected to include:

- Offshore:
  - Removal of all the wind turbine components and part of the foundations (those above seabed level);
  - Removal of some or all of the inter-array and offshore export cables;
  - The inter-array and offshore export cables will likely be cut at the cable ends and left in-situ below the seabed, and scour and cable protection would likely be left in-situ other than where there is a specific condition for its removal.
- Onshore:
  - Deinstallation and removal of electrical equipment, buildings and other infrastructure for the OCS and ESBI;
  - Removal of above-ground link boxes along the onshore ECC;

- Inspection of underground infrastructure to be left in-situ along the onshore ECC and at the landfall (i.e. TJB, jointing bays, underground link boxes, onshore export cables and ducting) to ensure they are safe to remain in place. If considered unsuitable to be left in-situ at the time of decommissioning, these components will be removed; and
- Site reinstatement and landscaping.

392. Whilst a detailed assessment of decommissioning impacts cannot be undertaken at this stage, for this assessment, it is assumed that decommissioning is likely to operate within the parameters identified for construction (i.e. any activities are likely to occur within the temporary construction working areas and require no greater amount or duration of activity than assessed for construction). The decommissioning sequence will generally be the reverse of the construction sequence. It is therefore assumed that decommissioning impacts would likely be of similar nature to, and no worse than, those identified during the construction phase.

### 29.7.4 Additional Mitigation Measures

393. No additional mitigation measures have been proposed for human health.

## 29.8 Cumulative Effects

394. Cumulative effects are the result of the impacts of the Project acting in combination with the impacts of other proposed and reasonably foreseeable developments on receptors. This includes plans and projects that are not inherently considered as part of the current baseline.

395. The overarching framework used to identify and assess cumulative effects is set out in **Chapter 6 Environmental Impact Assessment Methodology**. The four-stage approach is based upon the Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2024). The fourth stage of the process is the assessment stage, which is detailed within the sections below for potential cumulative effects on human health receptors.

### 29.8.1 Screening for Potential Cumulative Effects

396. The first step of the CEA identifies which impacts associated with the Project alone, as assessed under **Section 29.7**, have the potential to interact with other plans and projects to give rise to cumulative effects. All potential cumulative effects to be taken forward in the CEA are detailed in **Table 29–22** with a rationale for screening in or out. Only impacts determined to have a residual effect of negligible or greater are included in the CEA. Those assessed as 'no change' are excluded, as there is no potential for them to contribute to a cumulative effect.

*Table 29–22 Human Health – Potential Cumulative Effects*

| Impact ID | Impact and Project Activity | Potential for Cumulative Effects | Rationale |
|---|---|---|---|
| **Construction** | | | |
| HH-C-03 | Social Environment: Impacts on open space, leisure and play (onshore) - onshore construction activities | No | Other plans and projects have limited potential to have cumulative effects on health-related behaviours due to limited expected overlap in the very localised effects where the population undertakes physical activity and leisure-based activities. |
| HH-C-05 | Social Environment: Impacts on transport modes, access and connections (onshore) - onshore construction activities and associated road vehicle movements | Yes | Other plans and projects have potential to affect transport infrastructure capacity and thus outcomes such as access, road safety and travel times. |
| HH-C-09 | Economic Environment: Impacts on education and training (offshore and onshore) - offshore and onshore construction activities | Yes | Other plans and projects have potential to contribute to new training opportunities, locally and regionally. |
| HH-C-10 | Economic Environment: Impacts on employment and income (offshore and onshore) - offshore and onshore construction activities | Yes | Other plans and projects currently have potential to contribute to new jobs opportunities and affect local supply chains locally and regionally. |
| HH-C-14 | Bio-Physical Environment: Impacts on air quality (onshore) - dust and fine particulate emissions, plant, equipment and road vehicle exhaust emissions associated with onshore construction activities | Yes | Other plans and projects have potential to contribute to changes in local air quality where their activities or transport routes coincide or are in close proximity. |

| Impact ID | Impact and Project Activity | Potential for Cumulative Effects | Rationale |
|---|---|---|---|
| HH-C-16 | Bio-Physical Environment: Impacts on water quality and availability (onshore) - accidental pollution associated with onshore construction activities | Yes | Other plans and projects have potential to contribute to changes in water quality where the same onshore catchments or aquifers are affected, or offshore works are in close proximity and sufficiently close to the shore. |
| HH-C-19 | Bio-Physical Environment: Impacts from noise and vibration (onshore) - noise and vibration associated with onshore construction activities and associated road vehicle movements | Yes | Other plans and projects have potential to contribute to mobilisation of soil contamination affecting landowners, land users and neighbouring land users where their activities are in close proximity. |
| **Operation & Maintenance** | | | |
| HH-O-08 | Social Environment: Impacts on community identity, culture, resilience and influence (onshore) - presence of onshore workforce during routine and unplanned O&M activities, presence of onshore infrastructure during operation and onshore routine and unplanned O&M activities | Yes | Other plans and projects have potential to contribute to cumulative visual impact and resulting change in community identity where the presence of above-ground infrastructure are in close proximity. |
| HH-O-09 | Economic Environment: Impacts on education and training (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | Yes | Other plans and projects have potential to contribute to new training opportunities, locally and regionally. |
| HH-O-10 | Economic Environment: Impacts on employment and income (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | Yes | Other plans and projects have potential to contribute to new jobs opportunities and affect local supply chains locally and regionally. |
| HH-O-12 | Bio-Physical Environment: Impacts on climate change and adaptation (offshore and onshore) - provision of renewable energy during operation of the wind farm and other potential carbon benefits enabled by the ESBI | Yes | Other plans and projects have potential to contribute to the overall scale of renewable energy generation, e.g. other wind farms. However, a detailed cumulative assessment is not considered appropriate as such an assessment would account for all development that affects the global atmosphere as a receptor. This is not a feasible activity for an EIA. |
| HH-O-19 | Bio-Physical Environment: Impacts from noise and vibration (onshore) - noise and vibration associated with onshore O&M activities and associated road vehicle movements | Yes | Other plans and projects have limited potential to have cumulative effects from operational noise such as those from other substations, as such effects are typically highly localised and would require very close proximity to act cumulatively. However, the potential for such effects is considered. |
| HH-O-21 | Bio-Physical Environment: Impacts from public perception of electro-magnetic field risk (onshore) - presence of onshore electrical infrastructure during operation | Yes | Other plans and projects have potential to contribute to concern about EMF, where other projects include electrical infrastructure that is visible within the same landscape and visual study area. |
| HH-O-25 | Institutional and Built Environment: Impacts on built environment (onshore) - disruption to third-party assets during onshore routine and unplanned O&M activities and presence of onshore infrastructure during operation | Yes | Other plans and projects have potential to have cumulative effects in terms of public safety. While it is anticipated that other developments similar to the ESBI would adhere to appropriate safeguarding measures, the potential for such effects is considered. |

| Impact ID | Impact and Project Activity | Potential for Cumulative Effects | Rationale |
|---|---|---|---|
| HH-O-26 | Wider Societal Infrastructure and Resources: Impact on wider societal infrastructure and resources (offshore) - provision of renewable energy during operation of the wind farm | Yes | Other plans and projects have potential to contribute to the overall scale of renewable energy generation that supports public health through energy security, regionally and nationally. |
| **Decommissioning** | | | |
| There is insufficient information available on other plans and projects which could have a spatial and temporal overlap with the Project's offshore and onshore decommissioning works. The details and scope of offshore and onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Offshore Decommissioning Programme and Onshore Decommissioning Plan respectively (see **Table 29–5**, Commitment IDs CO21 and CO56). This will include a detailed assessment of decommissioning impacts and appropriate mitigation measures to avoid significant effects, including cumulative effects.<br><br>For this assessment, it is assumed that cumulative decommissioning effects would be of similar nature to, and no worse than, those identified during the construction phase. | | | |

### 29.8.2 Screening for Other Plans / Projects

397. The second step of the CEA identifies a short-list of other plans and projects that have the potential to interact with the Project to give rise to significant cumulative effects during the construction and O&M phases. The short-list provided in **Table 29–23** has been produced specifically to assess cumulative effects on human health receptors. The exhaustive list of all offshore / onshore plans and projects considered in the development of the Project's CEA framework is provided in **Volume 2, Appendix 6.4 Cumulative Effects Screening Report – Offshore** and **Volume 2, Appendix 6.5 Cumulative Effects Screening Report – Onshore**.

398. Developments that were fully operational during baseline characterisation, including at the time of site-specific surveys, are considered as part of baseline conditions for the surrounding environment. It is assumed that any residual effects associated with these developments are captured within the baseline information. As such, these developments are not subject to further assessment within the CEA and excluded from the screening exercise presented in **Table 29–23**.

399. For developments that were not fully operational, including those in planning / pre-construction stages or under construction, during baseline characterisation and operational developments with potential for ongoing impacts, these are included in the screening exercise presented in **Table 29–23**.

400. The screening exercise has been undertaken based on available information on each plan or project up to and including 31st December 2024. Information has been obtained from the Planning Inspectorate's NSIP portal, ERYC and Hull City Council planning portals. It is noted that further information regarding the identified plans and projects may become available between PEIR publication and DCO application submission or may not be available in detail prior to construction. The assessment presented here is therefore considered to be conservative at the time of PEIR publication. The list of plans and projects will be updated at ES stage to incorporate more recent information at the time of writing. Plans and projects identified in **Table 29–23** have been assigned a tier based on their development status, the level of information available to inform the CEA and the degree of confidence. A three-tier system based on the Planning Inspectorate Advice Note Seventeen has been adopted (PINS, 2024).

401. The zone of influence (ZoI) used to identify relevant plans and projects for the human health CEA is aligned to the Human Health Study Areas set out in **Section 29.4.1**, as relevant to each health determinant. This reflects that for some determinants (such as open space, air quality, water quality, noise or visual impacts) the proximity to onshore infrastructure is the relevant consideration, whilst for other health determinants the more general presence of the projects in the wider area in relation to cumulative transport impacts or employment and training opportunity effects is relevant.

402. Each plan or project in **Table 29–23** has been considered on a case-by-case basis. Only plans and projects with potential for significant cumulative effects with the Project are taken forward to a detailed assessment, which are screened based on the following criteria:

- There is potential that a pathway exists whereby an impact could have a cumulative effect on a receptor;
- The impact on a receptor from the Project and the plan or project in consideration has a spatial overlap (i.e. occurring over the same area);
- The impact on a receptor from the Project and the plan or project in consideration has a temporal overlap (e.g. occurring at the same time);
- There is sufficient information available on the plan or project in consideration and moderate to high data confidence to undertake a meaningful assessment; and
- There is some likelihood that the residual effect (i.e. after accounting for mitigation measures) of the Project could result in significant cumulative effects with the plan or project in consideration.

403. The CEA for human health has identified a total of eight plans and projects where significant cumulative effects could arise in combination with the Project. A detailed assessment of cumulative effects is provided in the section below.

*Table 29–23 Short List of Plans / Projects for the Human Health Cumulative Effect Assessment*

| Project / Plan | Development Type | Status | Tier | Construction / Operation Period | Closest Distance to Array Area (km) | Closest Distance to Offshore ECC (km) | Closest Distance to Onshore ECC (km) | Closest Distance to OCS Zone 4 (km) | Closest Distance to OCS Zone 8 (km) | Potential for Significant Cumulative Effects | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dogger Bank A Offshore Wind Farm (EN010021) | Offshore Wind Farm | Operational | 1 | Operation: 2025+ | 43 | 0 | 0 | 0.50 | 2.66 | Yes | Potential for spatial and temporal overlap of operational impacts. |
| Dogger Bank B Offshore Wind Farm (EN010021) | Offshore Wind Farm | Under Construction | 1 | Construction: 2020 to 2025<br>Operation: 2026+ | 52 | 0 | 0 | 0.50 | 2.66 | Yes | Potential for spatial and temporal overlap of operational impacts. |
| Dogger Bank South Offshore Wind Farms (EN010125) | Offshore Wind Farm | Examination | 1 | Construction: 2026 to 2033<br>Operation: 2034+ | 71 | 0 | 0 | 0.10 | 0.30 | Yes | Potential for spatial and temporal overlap of construction and operational impacts. |
| Eastern Green Link 2 (22/01990/STPLFE) | Electricity Interconnector | Under Construction | 1 | Construction: 2024 to 2028<br>Operation: 2029+ | N/A | N/A | 4.51 | 11.74 | 10.36 | No | Limited spatial overlap to an extent that has the potential to affect population health. Site- specific effects are unlikely to overlap, and local and regional effects would be diffuse. |
| Hornsea Project Four Offshore Wind Farm (EN010098) | Offshore Wind Farm | Under Construction | 1 | Construction: 2024 to 2028<br>Operation: 2029+ | 134 | 0 | 0 | 0.11 | 0.01 | Yes | Potential for spatial and temporal overlap of operational impacts. |
| Wanlass Beck National Grid Substation (24/03819/STPLF) | Electricity Transmission Infrastructure | Pending Consideration | 1 | Construction: 2026 to 2030<br>Operation: 2031+ | N/A | N/A | 0.91 | 2.09 | 3.02 | Yes | Potential for spatial and temporal overlap of construction and operational impacts. |
| Peartree Hill Solar Farm (EN010157) | Solar Farm | Planning | 2 | Construction: 2026 to 2027<br>Operation: 2028+ | N/A | N/A | 0 | 1.05 | 2.66 | Yes | Potential for spatial and temporal overlap of operational impacts. |

| Project / Plan | Development Type | Status | Tier | Construction / Operation Period | Closest Distance to Array Area (km) | Closest Distance to Offshore ECC (km) | Closest Distance to Onshore ECC (km) | Closest Distance to OCS Zone 4 (km) | Closest Distance to OCS Zone 8 (km) | Potential for Significant Cumulative Effects | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sofia Offshore Wind Farm (EN010051) | Offshore Wind Farm | Under Construction | 2 | Construction: 2023 to 2025<br>Operation: 2026+ | 18 | 0 | N/A | N/A | N/A | No | Limited spatial overlap to an extent that has the potential to affect population health (i.e. onshore infrastructure associated with Sofia Offshore Wind Farm does not come ashore in East Riding of Yorkshire). Site-specific effects are unlikely to overlap, and local and regional effects would be diffuse. |
| Birkhill Wood National Grid Substation | Electricity Transmission Infrastructure | Planning | 3 | Construction: 2026 to 2030<br>Operation: 2031+ | N/A | N/A | 0.03 | 1.11 | 2.31 | Yes | Potential for spatial and temporal overlap of construction and operational impacts. |
| Eastern Green Link 1 | Electricity Interconnector | Under Construction | 3 | Construction: 2025 to 2029<br>Operation: 2030+ | 254 | 116 | N/A | N/A | N/A | No | Limited spatial overlap to an extent that has the potential to affect population health (i.e. onshore infrastructure associated with Eastern Green Link 1 does not come ashore in East Riding of Yorkshire). Site-specific effects are unlikely to overlap and local and regional effects would be diffuse. |
| North Humber to High Marnham Grid Upgrade (EN020034) | Electricity Transmission Infrastructure | Planning | 3 | Construction: 2028 to 2030<br>Operation: 2031+ | N/A | N/A | 0 | 0.89 | 0.41 | Yes | Potential for spatial and temporal overlap of construction and operational impacts. |

## 29.8.3 Assessment of Cumulative Effects

404. Similar to the approach noted in **Section 29.4.6**, the CEA for the OCS zone infrastructure will remain the same for both development scenarios. Only one OCS zone option will be taken forward to development, which will be confirmed in the ES. Therefore, there is no cumulative development scenario in which both OCS zones would be developed simultaneously for consideration in the CEA.

### 29.8.3.1 Cumulative Impact 1: Social Environment: Transport Modes, Access and Connections (HH-C-05) (Onshore)

405. The Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade, Birkhill Wood National Grid Substation and Wanlass Beck National Grid Substation have the potential for significant cumulative effects due to changes in road safety and access as well as other PRoW and cycle routes. This includes road works, temporary diversions and traffic volumes required due to construction of the Project's onshore infrastructure.

406. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is disruption and disturbance to roads, cycle routes and footpaths;
- The pathway is behavioural change in physical activity, transport delay, and road accidents and safety; and
- Receptors are coastal and inland residents and visitors.

407. Furthermore, the theoretical effect is considered applicable in the context of this Project.

408. Embedded mitigation measures relevant to transport modes, access and connections are discussed in **Section 29.4.3**.

#### 29.8.3.1.1 Receptor Sensitivity

409. The sensitivity of human health receptors is described in **Section 29.7.1.2.1**. The sensitivity of the general population is considered as **low**, and the sensitivity of the vulnerable population is considered as **high**.

#### 29.8.3.1.2 Cumulative Impact Magnitude

410. As reported in **Chapter 26 Traffic and Transport**, a detailed assessment of cumulative effects will be provided at ES stage based on cumulative construction traffic flows between the Project and other plans and projects screened into the traffic CEA.

411. Nevertheless, the magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.2.2**, as it is assumed that these developments will adhere to construction management plans and appropriate mitigation measures to minimise impacts. The magnitude of change for population health due to the Project is **low**.

#### 29.8.3.1.3 Cumulative Effect Significance

412. Overall, the magnitude of the impact is deemed to remain **low** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.2 Cumulative Impact 2: Economic Environment: Education and Training (HH-C-09) (Offshore and Onshore)

413. The Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade, Birkhill Wood National Grid Substation and Wanlass Beck National Grid Substation have the potential for significant cumulative effects in workforce upskilling.

414. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is potential for educational opportunities and support;
- The pathway is good quality education supporting socio-economic status and other outcomes, which are influential for health; and
- Receptors are the local population, particularly young adults commencing employment and vulnerable groups that may disproportionately benefit.

415. Furthermore, the theoretical effect is considered applicable in the context of this Project.

416. Embedded mitigation measures relevant to education and training opportunities are discussed in **Section 29.4.3**.

#### 29.8.3.2.1 Receptor Sensitivity

417. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.1.3.1** the sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high**.

29.8.3.2.2 Cumulative Impact Magnitude

418. The magnitude of change for population health due to the Project is **negligible**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.3.2**.

29.8.3.2.3 Cumulative Effect Significance

419. Overall, the magnitude of the impact is deemed to remain **negligible** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor beneficial** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.3 Cumulative Impact 3: Employment and Income (HH-C-10) (Offshore and Onshore)

420. The Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade, Birkhill Wood National Grid Substation and Wanlass Beck National Grid Substation have the potential for significant cumulative effects in employment opportunities and income.

421. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is changes in direct and indirect jobs and economic activity;
- The pathway is good quality employment providing more health supporting resources; and
- Receptors are people of working age (and their dependants), including vulnerable groups that may be disproportionately affected.

422. Furthermore, the theoretical effect is considered applicable in the context of this Project.

423. Embedded mitigation measures relevant to employment and income opportunities are discussed in **Section 29.4.3**.

29.8.3.3.1 Receptor Sensitivity

424. The sensitivity of the general population is considered as l**ow**, and the sensitivity of the vulnerable population is considered as **high**. The sensitivity of human health receptors is set out in **Section 29.7.1.4.1**.

29.8.3.3.2 Cumulative Impact Magnitude

425. **Chapter 30 Socio-Economics, Tourism and Recreation** reports there is potential for cumulative benefits on employment generated by cumulative developments as they will be a significant driver of demand for services and goods to support the offshore wind energy sector, with the potential to create demand for supporting activities in Socio-Economic Study Areas (i.e. local, regional and UK). The cumulative impact of the developments would enable the supply chain to generate beneficial impacts which are greater than those of Project alone. **Chapter 30 Socio-Economics, Tourism and Recreation** concludes that the cumulative effect significance of increase in employment is major (beneficial) at the LSESA, moderate (beneficial) at the RSA and moderate (beneficial) at the national UK level.

426. With respect to commercial fisheries, the combined effect of the cumulative projects means a larger area of fishing grounds would have reduced access, however the scale of change for affected fishing communities would remain low (see **Chapter 14 Commercial Fisheries**).

427. Whilst there is the potential for a combined effect from the cumulative projects, it is also likely that the effect would be spread across a wide regional area, rather than the projects having overlapping, localised effects on the same communities. On this basis the impact is not considered to be greater than the effect of each project individually. The magnitude of change is therefore considered to be **low**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.4**.

29.8.3.3.3 Cumulative Effect Significance

428. Overall, the magnitude of the impact is deemed to remain **low** (both beneficial and adverse) even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor beneficial** and **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.4 Cumulative Impact 4: Bio-Physical Environment: Air Quality (HH-C-14) (Onshore)

429. The Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade, Birkhill Wood National Grid Substation and Wanlass Beck National Grid Substation have the potential for significant cumulative effects on population health due to changes in air quality during construction. Construction of the cumulative projects has the potential to result in dust effects from construction activities, as well as vehicle emissions from construction traffic and plant emissions from non-road mobile machinery.

430. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is air pollutants (particularly $NO_2$, $PM_{2.5}$ and $PM_{10}$) from construction emissions;
- The pathway is diffusion through the air; and
- Receptors are residents, visitors and long-term occupiers of nearby properties and community buildings.

431. Furthermore, the theoretical effect is considered applicable in the context of this Project.

432. Embedded mitigation measures relevant to air quality are discussed in **Section 29.4.3**.

29.8.3.4.1 Receptor Sensitivity

433. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.1.5.1** the sensitivity of the general population is **low,** and the sensitivity of the vulnerable group population is **high**

29.8.3.4.2 Cumulative Impact Magnitude

434. As reported in **Chapter 20 Air Quality and Dust**, the cumulative air quality effect associated with construction dust emissions is anticipated to be not significant in EIA terms. Emissions from traffic associated with cumulative developments will be considered at ES stage based on cumulative construction traffic flows from the traffic CEA.

435. For population health, the magnitude of change due to the cumulative projects remains **negligible**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.5.2**

29.8.3.4.3 Cumulative Effect Significance

436. Overall, the magnitude of the impact is deemed to remain **negligible** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.5 Cumulative Impact 5: Bio-Physical Environment: Water Quality or Availability (HH-C-16) (Onshore)

437. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms have the potential for significant cumulative effects caused by the direct disturbance of surface water bodies.

438. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is mobilisation of contaminants or sediment or new leaks or spills of pollutants;
- The pathway is transmission through marine or onshore waters. Exposure includes ingestion and dermal contact; and
- Receptors are populations of residents and visitors, including in coastal communities.

439. Furthermore, the theoretical effect is considered applicable in the context of this Project.

440. Embedded mitigation measures relevant to the direct disturbance of water quality are discussed in **Section 29.4.3**.

29.8.3.5.1 Receptor Sensitivity

441. The sensitivity of the general population is considered as l**ow,** and the sensitivity of the vulnerable population is considered as **high**. The sensitivity of human health receptors is described in **Section 29.7.1.6.1**.

29.8.3.5.2 Cumulative Impact Magnitude

442. As reported in **Chapter 21 Water Resources and Flood Risk**, the cumulative effect for the catchments crossed by the North Humber to High Marnham Grid Upgrade project is negligible, and the cumulative effect for the catchment crossed by Dogger Bank South Offshore Wind Farms is minor adverse.

443. For population health, the magnitude of change due to the cumulative projects remains **negligible**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.6.2**.

29.8.3.5.3 Cumulative Effect Significance

444. Overall, the magnitude of the impact is deemed to remain **negligible** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.6 Cumulative Impact: Bio-Physical Environment: Noise and Vibration (HH-C-19) (Onshore)

445. The Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade, Birkhill Wood National Grid Substation and Wanlass Beck National Grid Substation have the potential for significant cumulative effects on population health due to changes in noise during construction.

446. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is noise and vibration generated by construction activities and vehicle movements;
- The pathway is pressure waves through the air and ground vibrations; and
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

447. Furthermore, the theoretical effect is considered applicable in the context of this Project.

448. Embedded mitigation measures relevant to noise are discussed in **Section 29.4.3.**

29.8.3.6.1 Receptor Sensitivity

449. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.1.7.1** the sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high.**

29.8.3.6.2 Cumulative Impact Magnitude

450. As reported in **Chapter 25 Noise and Vibration,** the cumulative noise effect of the Project with Dogger Bank South Offshore Wind Farms, North Humber to High Marnham Grid Upgrade and Birkhill Wood National Grid Substation is considered to be minor adverse.

451. For population health, the magnitude of change due to the cumulative projects remains **low**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.1.7.2** .

29.8.3.6.3 Cumulative Effect Significance

452. Overall, the magnitude of the impact is deemed to remain **low** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.7 Cumulative Impact 6: Social Environment: Community Identity, Culture, Resilience and Influence (HH-O-08) (Onshore)

453. The Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Hornsea Project Four Offshore Wind Farm, Birkhill Wood National Grid Substation, Wanlass Beck National Grid Substation, North Humber to High Marnham Grid Upgrade and Peartree Hill Solar Farm have the potential for significant cumulative effects on population health due to changes in community identity, culture, resilience and influence.

454. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is visual change associated with the operational onshore electrical infrastructure, i.e. views of other major electrical infrastructure in addition to the Project's OCS and ESBI;
- The pathway is factors that contribute to behaviour and a sense of identity, including changes in visual environmental cues; and
- Receptors are residents in the coastal communities and long-term occupiers of nearby properties and community buildings.

455. Furthermore, the theoretical effect is considered applicable in the context of this Project.

456. Embedded mitigation measures relevant to visual impacts and community identity are discussed in **Section 29.4.3**.

29.8.3.7.1 Receptor Sensitivity

457. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.2.1.1** the sensitivity of the general population is **low,** and the sensitivity of the vulnerable group population is **high**.

#### 29.8.3.7.2 Cumulative Impact Magnitude

458. For population health, cumulative effect is predicted to be similar in the majority of its characteristics to the individual level magnitude described in **Section 29.7.2.1.2**. The combined effect of the cumulative projects is noted as an influence on wider community identity. However, the scale of change is considered to remain low as each project provides landscaping and other visual screening, and the sites are not so concentrated within views from dwellings that the overall community context changes to a degree that is likely to significantly influence public health. The collective changes are likely to have a *mino*r influence on quality of life and morbidity risk factors linked to wellbeing for a small minority of the population. No healthcare services implications are anticipated. The magnitude is therefore, considered to be **low**.

#### 29.8.3.7.3 Cumulative Effect Significance

459. Overall, the magnitude of the impact is deemed to remain **low** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.8 Cumulative Impact 7: Economic Environment: Education and Training (HH-O-09) (Offshore and Onshore)

460. The Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Hornsea Project Four Offshore Wind Farm, Birkhill Wood National Grid Substation, Wanlass Beck National Grid Substation, North Humber to High Marnham Grid Upgrade and Peartree Hill Solar Farm have the potential for significant cumulative effects in workforce upskilling.

461. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is potential for educational opportunities and support;
- The pathway is good quality education supporting socio-economic status and other outcomes, which are influential for health; and
- Receptors are the local population, particularly young adults commencing employment and vulnerable groups that may disproportionately benefit.

462. Furthermore, the theoretical effect is considered applicable in the context of this Project.

463. Embedded mitigation measures relevant to education and training opportunities are discussed in **Section 29.4.3**.

#### 29.8.3.8.1 Receptor Sensitivity

464. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.2.2.1** the sensitivity of the general population is **low,** and the sensitivity of the vulnerable group population is **high**.

#### 29.8.3.8.2 Cumulative Impact Magnitude

465. The magnitude of change for population health due to the Project is **negligible**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.2.2.2**.

#### 29.8.3.8.3 Cumulative Effect Significance

466. Overall, the magnitude of the impact is deemed to remain **negligible** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **negligible beneficial** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

#### 29.8.3.8.4 Cumulative Impact: Employment and Income (HH-O-10) (Offshore and Onshore)

467. The Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Hornsea Project Four Offshore Wind Farm, Birkhill Wood National Grid Substation, Wanlass Beck National Grid Substation, North Humber to High Marnham Grid Upgrade and Peartree Hill Solar Farm have the potential for significant cumulative effects in employment opportunities and income.

468. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is changes in direct and indirect jobs and economic activity;
- The pathway is good quality employment providing more health supporting resources; and
- Receptors are people of working age (and their dependants), including vulnerable groups that may be disproportionately affected.

469. Furthermore, the theoretical effect is considered applicable in the context of this Project.

470. Embedded mitigation measures relevant to employment and income opportunities are discussed in **Section 29.4.3**.

29.8.3.8.5 Receptor Sensitivity

471. The sensitivity of the general population is considered as l**ow,** and the sensitivity of the vulnerable population is considered as **high**. The sensitivity of human health receptors is set out in **Section 29.7.1.4.1**.

29.8.3.8.6 Cumulative Impact Magnitude

472. **Chapter 30 Socio-Economics, Tourism and Recreation** reports there is potential for cumulative benefits on employment generated by the cumulative developments as they will be a significant driver of demand for services and goods to support the offshore wind energy sector, with the potential to create demand for supporting activities in the Socio-Economic Study Areas (i.e. local, regional and UK). The cumulative impact of the developments would enable the supply chain to generate beneficial impacts which are greater than those of Project alone. **Chapter 30 Socio-Economics, Tourism and Recreation** concludes that the cumulative effect significance of increase in employment is moderate (beneficial) at the RSA and moderate (beneficial) at the national UK level.

473. Whilst there is the potential for a combined effect from the cumulative projects, it is also likely that the effect would be spread across a large regional area, rather than the projects having overlapping, localised effects to the same communities. On this basis the impact is not considered to be greater than the effect of each project individually. The magnitude of change is therefore considered to be **negligible**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.2.3.**

29.8.3.8.7 Cumulative Effect Significance

474. Overall, the magnitude of the impact is deemed to remain **negligible** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **negligible beneficial** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

29.8.3.8.8 Cumulative Impact: Bio-Physical Environment: Climate Change and Adaptation (HH-O-12) (Offshore and Onshore)

475. The Project in combination with Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Peartree Hill Solar Farm and Hornsea Project Four Offshore Wind Farm will all contribute towards wider energy sector transition to renewable energy which is expected to reduce the severity of climate change. Cumulatively, these projects have a greater magnitude of effect. In the context of effects on global atmospheric conditions, rather than localised effects, the cumulative effect is arguably inclusive of all energy projects currently being consented, and likely much broader than just this one sector. Such a broad cumulative assessment is not within the scope of this project-level EIA. On this basis the cumulative effect is noted as greater, but for this subset of Tier 1 and Tier 2 projects, the effect is conservatively considered to remain **minor beneficial**.

### 29.8.3.9 Cumulative Impact 8: Bio-Physical Environment: Noise and Vibration (HH-O-19) (Onshore)

476. The Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Hornsea Project Four Offshore Wind Farm, Birkhill Wood National Grid Substation, Wanlass Beck National Grid Substation, North Humber to High Marnham Grid Upgrade and Peartree Hill Solar Farm have the potential for significant cumulative effects on population health due to changes in noise during operation.

477. A potential population health effect is considered plausible as there is a theoretical source-pathway-receptor relationship:

- The source is noise generated by operation of major onshore infrastructure in addition to the Project's OCS and ESBI;
- The pathway is pressure waves through the air; and
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

478. Furthermore, the theoretical effect is considered applicable in the context of this Project.

479. Embedded mitigation measures relevant to noise are discussed in **Section 29.4.3.**

29.8.3.9.1 Receptor Sensitivity

480. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.2.5.1** the sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high.**

29.8.3.9.2 Cumulative Impact Magnitude

481. As reported in **Chapter 25 Noise and Vibration,** no cumulative projects have been identified where significant cumulative operational effects could arise in combination with the Project.

482. As such, for population health, the magnitude of change due to the cumulative projects remains **low**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.2.5.2**.

29.8.3.9.3 Cumulative Effect Significance

483. Overall, the magnitude of the impact is deemed to remain **low** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.10 Cumulative Impact 9: Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks (HH-O-21) (Onshore)

484. Cumulative effects in terms of actual risks or public perception of risk are not expected as set out in **Section 29.7.2.6**. Effects in terms of risk perception are similarly not expected to be cumulatively greater than the individual effects of each project as effects would relate to localised visual or auditory cues.

29.8.3.10.1 Receptor Sensitivity

485. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.2.6.1** the sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high.**

29.8.3.10.2 Cumulative Impact Magnitude

486. For population health the magnitude of change due to the cumulative projects remains **low**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.2.6.2**.

29.8.3.10.3 Cumulative Effect Significance

487. Overall, the magnitude of the impact is deemed to remain **low** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The cumulative effect will, therefore, be of **minor adverse** significance, which is **not significant** in EIA terms. No new or materially different population health effect is anticipated.

### 29.8.3.11 Cumulative Impact 10: Wider Societal Infrastructure and Resources (HH-O-26) (Offshore)

488. In combination with Dogger Bank South Offshore Wind Farms, Dogger Bank A and B Offshore Wind Farms, Peartree Hill Solar Farm and Hornsea Project Four Offshore Wind Farm, the Project will provide enhanced energy security. The national context of such energy security has been considered, and the individual effects are not expected to be collectively greater.

29.8.3.11.1 Receptor Sensitivity

489. The sensitivity of the general and of the vulnerable group populations are unchanged in the cumulative assessment. As set out in **Section 29.7.2.8**, the sensitivity of the general population is **low**, and the sensitivity of the vulnerable group population is **high.**

29.8.3.11.2 Cumulative Impact Magnitude

490. The magnitude of change due to the cumulative projects remains **medium**. The magnitude of cumulative projects is not expected to be materially different to the conclusions set out in **Section 29.7.2.8**.

29.8.3.11.3 Cumulative Effect Significance

491. Overall, the magnitude of the impact is deemed to remain **medium** even accounting for cumulative impacts and the sensitivity of the vulnerable group population remains **high**. The significance of cumulative effect is considered to be **moderate beneficial** and is **significant** in EIA terms. No new or materially different significance conclusions from those listed in **Section 29.7.2.8** in relation to the built environment and population health effects are expected due to cumulative projects.

## 29.9 Transboundary Effects

492. No potential for significant transboundary effects regarding human health from the Project on receptors within the EEZ of other EEA member states or other interests of EEA member states have been identified. Therefore, a transboundary effect assessment has been scoped out for the health assessment.

493. The offshore scope of the health assessment has been considered in relation to shipping and navigation and commercial fishing transboundary effects. It is, however, considered unlikely that these topics would have degrees of change for onshore populations either in the UK or in other jurisdictions that would be on a scale to significantly affect public health. For example, the impact on shipping is unlikely to significantly affect health related journeys or delivery of medical supplies on a scale to affect population health. Similarly, the impact on international commercial fishing fleets is unlikely to result in highly localised, large-scale economic changes within coastal communities on a scale that could significantly affect population health in any jurisdiction. As there is not the potential for a likely significant population health effect, such offshore impacts are scoped out in relation to their transboundary implications for human health.

## 29.10 Inter-Relationships and Effects Interactions

### 29.10.1 Inter-Relationships

494. Inter-relationships are defined as effects arising from residual effects associated with different environmental topics acting together upon a single receptor or receptor group. Potential inter-relationships between human health and other environmental topics have been considered, where relevant, within the PEIR.

495. Since the health assessment inherently takes inter-relationships between EIA topics into account, no additional inter-related impacts associated with human health have been identified that would change the conclusions of the assessment outlined in **Section 29.7**.

### 29.10.2 Interactions

496. The impacts identified and assessed in this chapter have the potential to interact with each other. Potential interactions between impacts are identified in **Table 29–24**. Where there is potential for interaction between impacts, these are assessed in **Table 29–25** for each receptor or receptor group.

497. Interactions are assessed by development phase (“phase assessment”) to see if multiple impacts could increase the overall effect significance experienced by a single receptor or receptor group during each phase. Following from this, a lifetime assessment is undertaken which considers the potential for multiple impacts to accumulate across the construction, O&M and decommissioning phases and result in a greater effect on a single receptor or receptor group. When considering synergistic effects from interactions, it is assumed that the receptor sensitivity remains consistent, while the magnitude of different impacts is additive.

*Table 29–24 Human Health – Potential Interactions between Impacts throughout the Project's Lifetime*

**Construction, Operation and Maintenance**

| | HH-C-03 | HH-C-05 | HH-C-09 | HH-C-10 | HH-C-14 | HH-C-16 | HH-C-19 | HH-O-08 | HH-O-09 | HH-O-10 | HH-O-12 | HH-O-19 | HH-O-21 | HH-O-25 | HHO-26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Social Environment: Open space, leisure and play (HH-C-03)** | | Yes | No | No | Yes | Yes | Yes | No | No | No | No | No | No | No | No |
| **Social Environment: Transport Modes, Access and Connections ( HH-C-05)** | Yes | | No | No | Yes | No | Yes | No | No | No | No | No | No | No | No |
| **Economic Environment: Education and Training (HH-C-09)** | No | No | | Yes | No | No | Yes | No | Yes | Yes | No | No | No | No | No |
| **Economic Environment: Employment and income (HH-C-10)** | No | No | Yes | | No | No | No | No | Yes | Yes | No | No | No | No | No |
| **Bio -Physical Environment: Air Quality (HH-C-14)** | Yes | Yes | No | No | | No | No | No | No | No | No | No | No | No | No |
| **Bio-Physical Environment: Water Quality or Availability (HH-C-16)** | Yes | No | No | No | No | | No | No | No | No | No | No | No | No | No |
| **Bio-Physical Environment: Noise and Vibration (HH-C-19)** | Yes | Yes | Yes | No | No | No | | No | No | No | No | Yes | No | No | No |

**Construction, Operation and Maintenance**

| | HH-C-03 | HH-C-05 | HH-C-09 | HH-C-10 | HH-C-14 | HH-C-16 | HH-C-19 | HH-O-08 | HH-O-09 | HH-O-10 | HH-O-12 | HH-O-19 | HH-O-21 | HH-O-25 | HHO-26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Social Environment: Community identity, culture, resilience and influence (HH-O-08)** | No | No | No | No | No | No | No | | No | No | Yes | No | Yes | Yes | No |
| **Economic Environment: Education and Training (HH-O-09)** | No | No | Yes | Yes | No | No | No | No | | Yes | No | No | No | No | No |
| **Economic Environment: Employment and income (HH-O-10)** | No | No | Yes | Yes | No | No | No | No | Yes | | No | No | No | No | No |
| **Bio-Physical Environment: Climate Change and Adaptation (HH-O-12)** | No | No | No | No | No | No | No | Yes | No | No | | No | No | Yes | Yes |
| **Bio-Physical Environment: Noise and Vibration (HH-O-19)** | No | No | No | No | No | No | Yes | No | No | No | No | | Yes | Yes | No |
| **Bio-Physical Environment: Public Concern and Understanding of Electro-Magnetic Field Risks (HH-O-21)** | No | No | No | No | No | No | No | Yes | No | No | No | Yes | | No | No |
| **Institutional and Built Environment: Built Environment (HH-O-25)** | No | No | No | No | No | No | No | Yes | No | No | Yes | Yes | No | | No |

### Construction, Operation and Maintenance

| | HH-C-03 | HH-C-05 | HH-C-09 | HH-C-10 | HH-C-14 | HH-C-16 | HH-C-19 | HH-O-08 | HH-O-09 | HH-O-10 | HH-O-12 | HH-O-19 | HH-O-21 | HH-O-25 | HHO-26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Institutional and Built Environment: Wider Societal Infrastructure and Resources (HHO-26)** | No | No | No | No | No | No | No | No | No | No | Yes | No | No | No | |

### Decommissioning

The details and scope of decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Offshore Decommissioning Programme and Onshore Decommissioning Plan (see **Table 29–5,** Commitment IDs CO21 and CO56).

For this assessment, it is assumed that interactions during the decommissioning phase would be of similar nature to, and no worse than, those identified during the construction phase.

*Table 29–25 Interaction Assessment – Phase and Lifetime Effects*

| Receptor | Impact ID | Highest Significance Level | | | Phase Assessment | Lifetime Assessment |
|---|---|---|---|---|---|---|
| | | Construction | Operation and Maintenance | Decommissioning | | |
| Landfall:<br>Site-specific population | HH-C-03<br>HH-C-14<br>HH-C-16<br>HH-C-19 | Minor Adverse | Minor Adverse | TBC – Assumed no greater than construction | **Construction:** No greater than individually assessed impact.<br>**Operation and Maintenance**: No greater than individually assessed impact.<br>Changes in access to open space at the landfall may overlap with issues of active travel disruption, noise, dust and water pollution. However, construction noise, dust and any disruption of active travel routes or open space are all transitory and short-term at any given location, whilst the combined effects may be slightly greater, it is not considered they are so great as to constitute a significant population health effect.<br>**Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts. | No greater than individually assessed impact.<br>Population health effects, across the assessed determinants, are no greater when considering the combined effects to the same population groups of the construction, O&M and decommissioning phases. |
| Onshore ECC:<br>Site-specific population | HH-C-05<br>HH-C-14<br>HH-C-19 | Minor Adverse | Minor Adverse | TBC – Assumed no greater than construction | **Construction:** No greater than individually assessed impact.<br>**Operation and Maintenance**: No greater than individually assessed impact.<br>Issues of active travel disruption (e.g. along the onshore ECC) may overlap with issues of noise and dust emissions. However, construction noise, dust and any disruption of active travel routes or open space are all transitory and short-term at any given location, this limits the potential for effects, even in combination to be significant public health effects.<br>**Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts. | No greater than individually assessed impact.<br>Population health effects, across the assessed determinants, are no greater when considering the combined effects to the same population groups of the construction, O&M and decommissioning phases. |
| OCS and ESBI (OCS zone):<br>Site-specific population | HH-C-09<br>HH-C-14<br>HH-C-19<br>HH-O-08<br>HH-O-21<br>HH-O-25 | Minor Adverse | Minor Adverse | TBC – Assumed no greater than construction | **Construction:** No greater than individually assessed impact.<br>**Operation and Maintenance:** No greater than individually assessed impact.<br>A small minority of the population in the site-specific Study Area may experience views of the OCS and ESBI, which could adversely affect community identity and health outcomes. Additionally, there may be adverse impacts on health due to noise from the operational OCS and ESBI and public concerns regarding the risks associated with the operational OCS and ESBI, which could affect mental health. The combined effects may particularly impact vulnerable groups with existing poor mental health. At the population level, it is not expected that the combination of effects would interact in a way that significantly reinforces negative health outcomes. Issues of community identity related to the presence of the OCS and ESBI during operation are not expected to overlap with issues of construction noise and air pollution, as these arise during different phases of the project. No greater effect is therefore likely. | No greater than individually assessed impact.<br>Population health effects, across the assessed determinants, are no greater when considering the combined effects to the same population groups of the construction, O&M and decommissioning phases. |

| Receptor | Impact ID | Highest Significance Level | | | Phase Assessment | Lifetime Assessment |
|---|---|---|---|---|---|---|
| | | Construction | Operation and Maintenance | Decommissioning | | |
| | | | | | **Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts. | |
| Regional population | HH-C-09<br>HH-O-09<br>HH-C-10<br>HH-O-10 | Minor Beneficial | Minor Beneficial | TBC – Assumed no greater than construction | **Construction:** No greater than individually assessed impact.<br>**Operation and Maintenance:** No greater than individually assessed impact.<br>The Project's training and employment benefits may interact but would remain a minor influence on public health at the regional level.<br>**Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts. | No greater than individually assessed impact.<br>Population health effects, across the assessed determinants, are no greater when considering the combined effects to the same population groups of the construction, O&M and decommissioning phases. |
| National population | HH-O-12<br>HH-O-26 | N/A | Moderate Beneficial | TBC – Assumed no greater than construction | **Construction:** No greater than individually assessed impact.<br>**Operation and Maintenance:** No greater than individually assessed impact.<br>Nationally, the population would benefit both from a reduction in the severity of health effects associated with climate change and from the benefits to public health of energy security. Effects would be greatest for vulnerable groups, particularly those on low incomes less able to adapt or afford alternatives. As the effects associated with climate change are expected to be driven by the benefit to deprived populations globally, the combined effect in the UK of these health determinants is not expected to be greater than the individual effects.<br>**Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts. | No greater than individually assessed impact.<br>Population health effects, across the assessed determinants, are no greater when considering the combined effects to the same population groups of the construction, O&M and decommissioning phases. |

## 29.11 Monitoring Measures

498. Potential monitoring measures for human health will be developed where required through the EIA process and identified in the ES.

## 29.12 Summary

499. **Table 29–26** presents a summary of the preliminary results of the assessment of likely significant effects on human health during the construction, operation and decommissioning of the Project.

## 29.13 Next Steps

500. The next step is to review the statutory consultation responses on the Human Health PEIR chapter and refine the assessment in the Human Health ES chapter where required.

501. Following refinements of the Offshore and Onshore Development Areas and the Project Design Envelope, the Human Health ES chapter will include an updated baseline environment and impact assessment. The chapter will also incorporate any additional data which has become available following the publication of the PEIR, as well as any comments received as part of the statutory consultation.

502. Further design refinement work will be conducted to reduce the potential for significant adverse population health effects and further explore public health opportunities. For each Human Health Study Area, qualitative analysis will be progressed to review, and if appropriate, update the magnitude of impacts on public health, informed by the residual effect conclusions of other topic chapters in the ES. The evidence base will be further developed, including refreshes in relation to local public health priorities, vulnerable groups and policy considerations from the JSNA and JHWS. These will guide the final professional judgments as to the significance of population health effects. These findings will be reported in the ES.

503. Prior to publication of the ES, it is anticipated that meetings will be held with the relevant stakeholders (e.g. UK Health Security Agency and Office of Health Improvements and Disparities and the local Director of Public Health) to discuss the health assessment findings and to understand any additional local constraints or public health opportunities.

504. The Human Health ES chapter will continue to consider the potential for population health to be influenced by inter-related effects between determinants of health. The potential for cumulative effects on population health will also be assessed, including on the issue of how multiple large electrical infrastructure projects influence local mental health. In both cases, the potential effects on vulnerable groups and health inequalities will be reported in the ES.

*Table 29–26 Summary of Potential Effects Assessed for Human Health*

| Impact ID | Impact and Project Activity | Embedded Mitigation Measures | Enhancement Measures | Receptor | Receptor Sensitivity | Impact Magnitude | Effect Significance | Additional Mitigation Measures | Residual Effect | Monitoring Measures |
|---|---|---|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | | | | |
| HH-C-03 | Impacts on open space, leisure and play (onshore) - onshore construction activities | CO57 | N/A | Site-specific and local population | General Population: Low<br>Vulnerable Sub-Population: High | Low | Minor Adverse (Not Significant) | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-C-05 | Impacts on transport modes, access and connections (onshore) - onshore construction activities and associated road vehicle movements | CO39<br>CO57<br>CO73 | N/A | Site-specific, local and regional population | General Population: Low<br>Vulnerable Sub-Population: High | Low | Minor Adverse (Not Significant) | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-C-09 | Impacts on education and training (offshore and onshore) - offshore and onshore construction activities | N/A | CO67 | Site-specific, local and regional population | General Population: Low<br>Vulnerable Sub-Population: High | Negligible | Minor Beneficial (Not Significant) | N/A | Potential **Moderate Beneficial (Significant)** effect depending on the development of the Outline ESP (CO67) | N/A |
| HH-C-10 | Impacts on employment and income (offshore and onshore) - offshore and onshore construction activities | N/A | CO67 | Site-specific, local and regional population | General Population: Low<br>Vulnerable Sub-Population: High | Low | Minor Beneficial (Not Significant) and Minor Adverse (Not Significant) | N/A | Potential **Moderate Beneficial (Significant)** effect depending on the development of the Outline ESP (CO67) | N/A |
| HH-C-14 | Impacts on air quality (onshore) - dust and fine particulate emissions, plant, equipment and road vehicle exhaust emissions associated with onshore construction activities | CO39<br>CO55 | N/A | Site-specific, local and regional population | General Population: Low<br>Vulnerable Sub-Population: High | Negligible | Minor Adverse (Not Significant) | N/A | **Minor Adverse (Not Significant)** | N/A |

| Impact ID | Impact and Project Activity | Embedded Mitigation Measures | Enhancement Measures | Receptor | Receptor Sensitivity | Impact Magnitude | Effect Significance | Additional Mitigation Measures | Residual Effect | Monitoring Measures |
|---|---|---|---|---|---|---|---|---|---|---|
| HH-C-16 | Impacts on water quality and availability (onshore) - accidental pollution associated with onshore construction activities | CO38<br>CO49 | N/A | Site-specific and local population | General Population: Low<br>Vulnerable Sub-Population: High | Negligible | Minor Adverse (Not Significant) | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-C-19 | Impacts from noise and vibration (onshore) - noise and vibration associated with onshore construction activities and associated road vehicle movements | CO70 | N/A | Site-specific and local population | General Population: Low<br>Vulnerable Sub-Population: High | Low | Minor Adverse (Not Significant) | N/A | **Minor Adverse (Not Significant)** | N/A |
| **Operation and Maintenance** | | | | | | | | | | |
| HH-O-08 | Impacts on community identity, culture, resilience and influence (onshore) - presence of onshore workforce during routine and unplanned O&M activities, presence of onshore infrastructure during operation and onshore routine and unplanned O&M activities | CO65 | N/A | Site-specific and local population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Low** | **Minor Adverse (Not Significant)** | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-O-09 | Impacts on education and training (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | N/A | CO67 | Local and regional population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Negligible** | **Negligible Beneficial (Not Significant)** | N/A | Potential **Moderate Beneficial (Significant)** effect depending on the development of the Outline ESP (CO67) | N/A |
| HH-O-10 | Impacts on employment and income (offshore and onshore) - offshore and onshore routine and unplanned O&M activities | N/A | CO67 | Local and regional population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Negligible** | **Negligible Beneficial (Not Significant)** | N/A | Potential **Moderate Beneficial (Significant)** effect depending on the development of the Outline ESP (CO67) | N/A |

| Impact ID | Impact and Project Activity | Embedded Mitigation Measures | Enhancement Measures | Receptor | Receptor Sensitivity | Impact Magnitude | Effect Significance | Additional Mitigation Measures | Residual Effect | Monitoring Measures |
|---|---|---|---|---|---|---|---|---|---|---|
| HH-O-12 | Impacts on climate change and adaptation (offshore and onshore) - provision of renewable energy during operation of the wind farm and other potential carbon benefits enabled by the ESBI | N/A | N/A | National and international population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Low** | **Minor Beneficial (Not Significant)** | N/A | **Minor Beneficial (Not Significant)** | N/A |
| HH-O-19 | Impacts from noise and vibration (onshore) - noise and vibration associated with onshore O&M activities and associated road vehicle movements | CO71 | N/A | Site-specific population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Low** | **Minor Adverse (Not Significant)** | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-O-21 | Impacts from public perception of electro-magnetic field risk (onshore) - presence of onshore electrical infrastructure during operation | CO64<br>CO65 | N/A | Site-specific and local population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Low** | **Minor Adverse (Not Significant)** | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-O-25 | Impacts on built environment (onshore) - disruption to third-party assets during onshore routine and unplanned O&M activities and presence of onshore infrastructure during operation | CO79<br>CO96<br>CO105 | N/A | Site-specific and local population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Low** | **Minor Adverse (Not Significant)** | N/A | **Minor Adverse (Not Significant)** | N/A |
| HH-O-26 | Impact on wider societal infrastructure and resources (offshore) - provision of renewable energy during operation of the wind farm | N/A | N/A | National population | General Population: **Low**<br>Vulnerable Sub-Population: **High** | **Medium** | **Moderate Beneficial (Significant)** | N/A | **Moderate Beneficial (Significant)** | N/A |

| Impact ID | Impact and Project Activity | Embedded Mitigation Measures | Enhancement Measures | Receptor | Receptor Sensitivity | Impact Magnitude | Effect Significance | Additional Mitigation Measures | Residual Effect | Monitoring Measures |
|---|---|---|---|---|---|---|---|---|---|---|
| **Decommissioning** | | | | | | | | | | |
| HH-D-03 | Impacts on open space, leisure and play (onshore) - decommissioning activities not yet defined | CO21<br>CO56 | The details and scope of decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Offshore Decommissioning Programme and Onshore Decommissioning Plan (see **Table 29–5**, Commitment IDs CO21 and CO56). This will include a detailed assessment of decommissioning impacts and appropriate mitigation measures to avoid significant effects.<br>For this assessment, it is assumed that impacts during the decommissioning phase would be of similar nature to, and no worse than, those identified during the construction phase. | | | | | | | |
| HH-D-05 | Impacts on transport modes, access and connections (onshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-09 | Impacts on education and training (offshore and onshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-10 | Impacts on employment and income (offshore and onshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-14 | Impacts on air quality (onshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-15 | Impacts on water quality and availability (offshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-16 | Impacts on water quality and availability (onshore) - decommissioning activities not yet defined | | | | | | | | | |
| HH-D-19 | Impacts from noise and vibration (onshore) - decommissioning activities not yet defined | | | | | | | | | |

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# List of Acronyms

| Term | Definition |
|---|---|
| CEA | Cumulative Effect Assessment |
| COPD | Chronic Obstructive Pulmonary Disease |
| EEA | European Economic Area |
| EEZ | Exclusive Economic Zone |
| EIA | Environmental Impact Assessment |
| EMF | Electro-magnetic field |
| ES | Environmental Statement |
| ESBI | Energy Storage and Balancing Infrastructure |
| EUPHA | European Public Health Association |
| DBD | Dogger Bank D |
| HIA | Health Impact Assessment |
| HVDC | High Voltage Direct Current |
| IAIA | International Association for Impact Assessment |
| ICNIRP | International Commission on Non-ionizing Radiation Protection |
| IEMA | Institute of Environmental Management and Assessment |
| IPH | Institute of Public Health |
| JSNA | Joint Strategic Needs Assessment |
| KSI | Killed and Seriously Injured |
| LSOA | Lower **L**ayer Super Output Area |
| MHCLG | Ministry for Housing, Communities and Local Government |
| NEET | Not in education, employment or training |
| NHS | National Health Service |
| $NO_2$ | Nitrogen dioxide |
| NOMIS | National Online Manpower Information System |
| NPS | National Policy Statement |
| NSIP | Nationally Significant Infrastructure Planning |
| OEP | The Office for Environmental Protection |
| OHID | Office for Health Improvement and Disparities |
| ONS | Office for National Statistics |
| CoCP | Code of Construction Practice |
| ESP | Employment and Skills Plan |
| CTMP | Construction Traffic Management Plan |
| PEIR | Preliminary Environmental Information Report |
| PHE | Public Health England |
| PM | Particulate Matter |
| PRoW | Public Right of Way |
| SAR | Standardised Admission Ratios |
| SMR | Standardised Mortality Ratio |
| SSC | Suspended Sediment Concentrations |
| UKHSA | United Kingdom Health Security Agency |
| WFD | Water Framework Directive |
| WHO | World Health Organisation |