Morecambe Offshore Windfarm: Generation Assets

Environmental Statement

Volume 5

Chapter 19 Human Health (Tracked)

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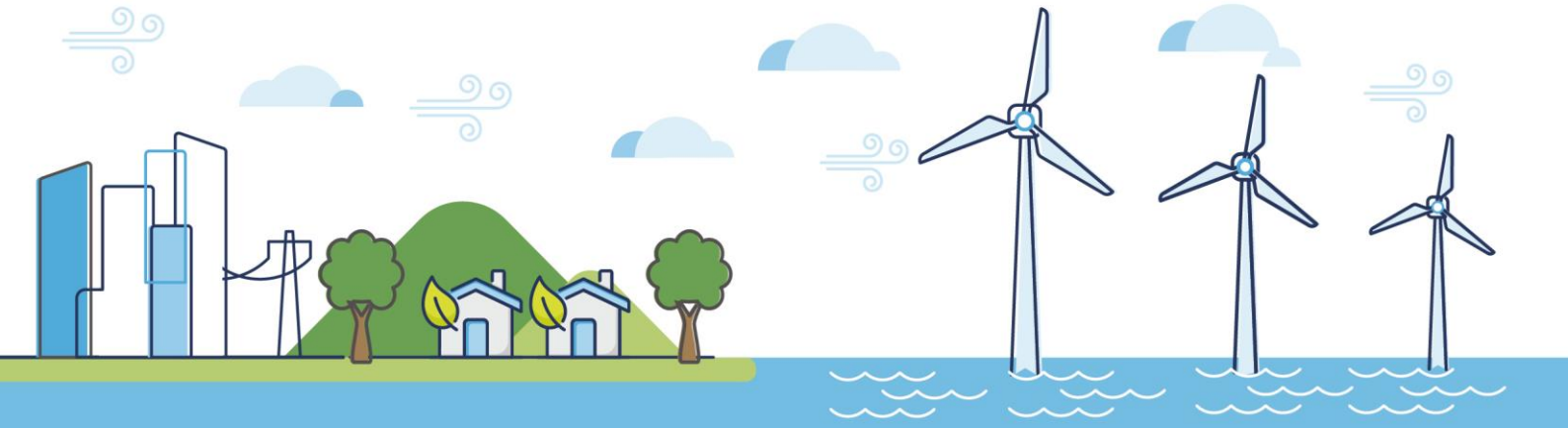

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Glossary of Acronyms

CEA	Cumulative Effects Assessment
CI	Confidence Interval
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
EIA	Environmental Impact Assessment
EMF	Health Radiation
EPP	Evidence Plan Process
ES	Environmental Statement
EUPHA	European Public Health Association
HIA	Health Impact Assessment
HM	His Majesty's
IAIA	International Association for Impact Assessment
IEMA	Institute of Environmental Management and Assessment
IPH	Institute of Public Health
IPMP	In-Principle Monitoring Plan
JSNA	Joint Strategic Needs Assessment
LSE	Likely Significant Effects
LSOA	Lower Layer Super Output Area
MARPOL	International Convention for the Prevention of Pollution from Ships
MHCLG	Ministry for Housing, Communities and Local Government
NHS	National Health Service
NOMIS	Official Labour Market Statistics
NPPF	National Planning Policy Framework
NPPG	The National Planning Practice Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OEP	The Office for Environmental Protection
OHID	Office for Health Improvement and Disparities
ONS	Office for National Statistics
OR	Odds Ratio
OSP	Offshore substation platform
OSEP	Outline Skills and Employment Plan
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report

PINS	Planning Inspectorate
SAR	Standardised Admission Ratio
SMR	Standardised Mortality Ratio
UKHSA	The UK Health Security Agency
UK	United Kingdom
WFD	Water Framework Directive
WHO	World Health Organisation
WTG	Wind turbine generator
ZoI	Zones of Influence

Glossary of Unit Terms

km	kilometre
km^2	~~kilometre~~ square kilometre~~d~~
kV	kilovolt
m	metre
MW	Megawatt

Glossary of Terminology

Applicant	Morecambe Offshore Windfarm Ltd
Generation Assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OPS(s)) and possible platform link cables to connect OSP(s).
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The transmission assets for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. This includes the OSP(s)[1], interconnector cables, Morgan offshore booster station, offshore export cables, landfall site, onshore export cables, onshore substations, 400kV cables and associated grid connection infrastructure such as circuit breaker infrastructure. Also referred to in this chapter as the Transmission Assets, for ease of reading.
Offshore substation platform(s) (OSP(s))	A fixed structure located within the windfarm site, containing electrical equipment to aggregate the power from the WTGs and convert it into a more suitable form for export to shore.
Platform link cable	An electrical cable which links one or more OSP(s).
Study area	This is an area which is defined for each Environmental Impact Assessment (EIA) topic which includes the windfarm site as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each EIA topic is intended to cover the area within which an effect can be reasonably expected. The study area for human health considers the area of effects from impacts such as the extent of visual effects.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables will be present.
Health	State of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.
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.
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.

[1] At the time of writing the Environmental Statement (ES), a decision had been taken that the OSP(s) would remain solely within the Generation Assets application and would not be included within the Development Consent Order (DCO) application for the Transmission Assets. This decision post-dated the Preliminary Environmental Information Report (PEIR) that was prepared for the Transmission Assets. The OSP(s) are still included in the description of the Transmission Assets for the purposes of this ES as the Cumulative Effects Assessment (CEA) carried out in respect of the Generation/Transmission Assets is based on the information available from the Transmission Assets PEIR.

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.

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19 Human Health

19.1 Introduction

19.1 This chapter of the Environmental Statement (ES) considers the potential effects of the proposed Morecambe Offshore Windfarm Generation Assets (the Project) on human health. This chapter provides an overview of the existing environment, followed by an assessment of the potential effects and associated mitigation for the construction, operation and maintenance, and decommissioning phases.

19.2 The Project includes the Generation Assets to be located within the windfarm site (wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s)). The Environmental Impact Assessment (EIA) of the Transmission Assets, including offshore export cables to landfall and onshore infrastructure, is part of a separate Development Consent Order (DCO) application as outlined in **Chapter 1 Introduction** (Document Reference 5.1.1).

19.3 In general, for an offshore windfarm project the benefits to public health tend to accrue from the operation of the offshore generation assets, whilst the main risks to public health are associated with nearshore and onshore transmission asset construction works close to communities.

19.4 This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary source are the National Policy Statements (NPS). Details of these and the methodology used for the EIA and Cumulative Effects Assessment (CEA) are presented in **Chapter 6 EIA Methodology** (Document Reference 5.1.6) and **Section 19.4** of this chapter.

19.5 This assessment should be read in conjunction with the following linked ES chapters as impacts in these chapters are used to assess overall impacts to human health:

- **Chapter 8 Marine Sediment and Water Quality** (Document Reference 5.1.8)
- **Chapter 13 Commercial Fisheries** (Document Reference 5.1.13)
- **Chapter 14 Shipping and Navigation** (Document Reference 5.1.14)
- **Chapter 17 Infrastructure and Other Users** (Document Reference 5.1.17)
- **Chapter 18 Seascape, Landscape and Visual Impact Assessment (SLVIA)** (Document Reference 5.1.18)

- **Chapter 20 Socio-economics, Tourism and Recreation** (Document Reference 5.1.20)
- **Chapter 21 Climate Change** (Document Reference 5.1.21)

19.6 Inter-relationships with these chapters are further described in **Section 19.9**.

19.2 Consultation

19.7 Consultation regarding human health has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements to date have included scoping (Scoping Opinion from the Planning Inspectorate (PINS) received on the 2nd August 2022), comments received on the Preliminary Environmental Information Report (PEIR) which was published in April 2023 for statutory consultation, and targeted consultation with key stakeholders including the human environment and consultation with the following:

- The Public Health team at Blackpool Council
- Office for Health Improvement and Disparities (OHID) and the UK Health Security Agency (UKHSA)

19.8 Consultation with Public Health at Lancashire County Council, (including Wyre and Fylde) and Public Health at Sefton Metropolitan Borough has also been offered by the Project. Given the offshore nature of the Project, these organisations have engaged as appropriate with consultation on the Transmission Assets.

19.9 The feedback received throughout the consultation process for the Project have been considered in preparing this ES. The key comments pertinent to this chapter are shown in **Table 19.1**~~**Table 19.1**~~, alongside details of how the Project team has had regard to the comment and how these have been addressed within this chapter.

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19.10 The consultation process is described further in **Chapter 6 EIA Methodology**. Full details of the consultation undertaken throughout the EIA process is presented in the Consultation Report (Document Reference 4.1) submitted as part of the DCO application.

Table 19.1 Consultation responses received in relation to human health and how these have been addressed in the ES

Consultee	Date	Comment	Project response/where addressed in the ES
Scoping Opinion responses			
UKHSA and OHID (Letter in Scoping Opinion Appendix 2, pdf page 133)	2nd August 2022	Having considered the submitted scoping report we understand this EIA Scoping Notification and Consultation relates to its offshore renewable windfarm energy generation assets and activities only. As such, we do not have any comments to make relating to onshore public health impacts.	Noted that the statutory consultees for public health do not request any additions or clarifications with regards to the scope of the Project health assessment or the methods proposed for the assessment.
PINS (ref. 3.15.1)	2nd August 2022	The Inspectorate agrees that bespoke surveys are not required for the ES. However, this is on the basis that the ES will include information about the baseline condition from relevant public data sources, for example any joint strategic needs assessment, to inform the assessment of Likely Significant Effects (LSE).	The assessment includes a health baseline based on public data sources, references for which are given. This is set out in **Section 19.5**.
PINS (ref. 3.15.2 and ref. 3.15.8)	2nd August 2022	The Scoping Report does not provide information about: 1. the predicted number of workers (ref 3.15.2) 2. the proportion of workers that are expected to already live in the local area (ref 3.15.8) 3. the baseline conditions for local housing supply (ref 3.15.2) 4. the baseline condition/capacity of services including GPs, dentists and schools (ref 3.15.8) As such the Inspectorate does not consider that the Scoping Report contains sufficient information to allow 'housing' and 'health and social care services' to be scoped out of further assessment. The ES should include an assessment of these matters or evidence demonstrating agreement with the relevant stakeholders and the absence of likely significant effects.	Information on the predicted number of workers and locality is provided in this chapter, **Table 19.2~~Table 19.2~~**. The baseline conditions for local housing supply are covered in **Chapter 20 Socio-economics, Tourism and Recreation**. The baseline condition/capacity of services including (e.g. General Practitioners and schools) and effects of increased employment on community assets are covered in **Chapter 20 Socio-economics, Tourism and Recreation**.

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Consultee	Date	Comment	Project response/where addressed in the ES
			Impacts related to housing and associated health and social care are limited to effects from workers in connection to the port(s) (construction and operation and maintenance phases) that will service the Project. Workers going to and from the port(s) are not assessed in detail at this stage given the location of the port(s), and thus local area, is unknown at this time. It is likely, and assumed at this point, that the Projects port(s) activities would fall under the port(s) existing licenced activities, however the need for a standalone Health Impact Assessment (HIA) would be kept under review and, with the need being considered once a port(s) location is confirmed (post-consent). This would include taking account of any relevant further legislation, e.g., the Environment (Wales) Act 2016 and the Wellbeing of Future Generations (Wales) Act 2015 if the port was located in Wales. The assumption is that for construction the Project would use existing established commercial port(s) in the UK. Such ports are supported by good existing infrastructure, including transport

Consultee	Date	Comment	Project response/where addressed in the ES
			networks that connect to large surrounding housing catchments, hotel accommodation and associated health and social care services. In this context the Project workforce would be a small proportion of overall demand for housing and local services. The Project is not expected to be associated with a large influx of new workers into a rural or small community, where the influx could put significant pressure on local services, requiring mitigation. During operation, the numbers of workers expected are considerably lower than during construction and likely to be within a commutable distance of the port(s). Consequently, no likely significant effect is anticipated in relation to housing and health and social care services.
PINS (ref. 3.15.3, 3.15.5, 3.15.6 and 3.15.12)	2nd August 2022	It is stated that a Port Traffic Management Plan (PTMP) would be produced to manage impacts. The Inspectorate cannot exclude the possibility of effects to human health arising from: 1. increased traffic on the local road network (ID 3.15.3 and ID 3.15.6) 2. localised increases in air quality emissions (ID 3.15.5) 3. localised increases in noise emissions (ID 3.15.6)	It has been discussed with the Public Health team at Blackpool Council, OHID, the UKHSA (as well as National Highways and Lancaster County Council Highways - see 'Stakeholder Meetings' consultee row below and **Chapter 22 Traffic and Transport** (Document Reference 5.1.22)) that a meaningful assessment on the road network and

Consultee	Date	Comment	Project response/where addressed in the ES
		4. potential transboundary effects (ID 3.15.12) The Inspectorate notes that even where a port is operating within its consented levels of activity, significant environmental effects may arise (ID 3.15.12). The ES should include an assessment of these matters or evidence demonstrating agreement with the relevant stakeholders and the absence of likely significant effects.	associated noise and air quality cannot be made while port location is unknown. As described above, the need for a standalone health assessment, including assessment associated with road traffic, air quality and noise, will be reviewed upon selection of the port(s) post-consent but at this time is it assumed that onshore activities are licenced under the selected port(s) permitted activities. It is assumed working within the port(s) permitted activity would avoid the potential for significant effects in the context of EIA. This commitment is captured within the DCO requirement (Schedule 2, Part 1(5)) to produce a Port Access and Transport Plan as outlined in **Chapter 22 Traffic and Transport**. Impacts on onshore receptors from transmission infrastructure are assessed in relation to onshore works as part of the separate Transmission Assets ES/DCO, and potential combined effects between the Project and Transmission Assets have been considered in this ES chapter, see **Section 19.7**. Transboundary effects are considered in **Section 19.8**.

Consultee	Date	Comment	Project response/where addressed in the ES
PINS (ref. 3.15.9)	2nd August 2022	The Scoping Report does not provide a justification for excluding likely significant effects from effects on climate change during the construction and decommissioning phases. In the absence of this information, the Inspectorate is not in a position to agree to scope this matter from the assessment.	This chapter focuses on the public health implications from the renewable energy generation during the operational phase, see **Section 19.6.4.5**. The construction and decommissioning phases, whilst including matters of embodied carbon, are not considered to be giving rise to climate change related effects on a scale with the potential for significant population health effects, see **Sections 19.6.2.5** and **19.6.4.5**. To keep the assessment scope proportionate, the construction and decommissioning phases have been scoped out of the health assessment. Greenhouse gas emissions during construction and decommissioning are considered and calculated in **Chapter 21 Climate Change**. The receptor to greenhouse gases is the global climate and considering these phases as well as the operation phase an overall positive impact is identified for climate change (**Sections 19.6.2.5, 19.6.3.4** and **19.6.4.5**). Resilience of the Project to climate change has been considered in this ES (see in **Chapter 21 Climate Change**).

Consultee	Date	Comment	Project response/where addressed in the ES
PINS (ref. 3.15.4)	2nd August 2022	The Inspectorate agrees that the determinant of health 'Safe and cohesive communities: community safety' can be scoped out of the ES.	Noted, no further action required.
PINS (ref. 3.15.7)	2nd August 2022	The Inspectorate agrees that the determinant of health 'radiation (EMF) risks' can be scoped out of the ES.	Noted, no further action required.
PINS (ref. 3.15.10)	2nd August 2022	The Inspectorate agrees that the determinant of health 'marine water quality effects' can be scoped out of the ES during operation and maintenance.	Noted, no further action required.
PINS (ref. 3.15.11)	2nd August 2022	The Inspectorate agrees that the determinant of health 'wider societal benefits' can be scoped out of the ES during construction and decommissioning.	Noted, no further action required.
PINS (ref. 3.15.13)	2nd August 2022	The Scoping Report states that a study area will be established based on the project limits and zones of influence and receptors impacted by other aspects with inter-relationships with human health, for example including marine water quality, commercial fisheries, etc. Study areas will also be used from other aspects to broadly define representative population groups instead of setting boundaries. The Inspectorate agrees that potential human health effects may not be limited to strictly defined geographical boundaries, but the ES must clearly describe the study area(s) and explain why it is sufficient in extent to support the identification of LSE. The Applicant should seek to agree the study area and receptors with relevant consultation bodies. The ES should include figures to identify the final study area and location of any static receptors considered in the assessment.	The study area is defined and justified in **Section 19.3.1**.
PINS	2nd August 2022	If a decision has not been made on the port that will be used during construction and operation of the Proposed	The only onshore works relating to the Project are related to the

Consultee	Date	Comment	Project response/where addressed in the ES
(ref. 3.15.14)		Development, the ES should include an assessment of effects to human health arising from port activities using a worst case scenario, consistent with the approach described in paragraph 125 of the Scoping Report, where significant effects are likely to occur.	construction and operation and maintenance activities at the associated port(s). As the port(s) locations are not known at this time, and would be confirmed post-consent, there is limited value in assessing the impacts to human health at this stage, given the local receptors cannot be identified. As part of the Evidence Plan Process (EPP) it was discussed with the Public Health team at Blackpool Council, OHID, the UKHSA, National Highways and Lancaster County Council Highways (see 'Evidence Plan Process' row below) that a meaningful assessment on the road network, noise, housing and air quality cannot be made while port location is unknown. As such the need for any separate assessment would also be reviewed upon selection of the port(s), although it is likely that the activities fall within permitted port activities, which is the assumption made in this chapter at this stage. This applies to the following topics: ▪ Safe and cohesive communities: Housing ▪ Safe and cohesive communities: Transport
PINS (ref. 3.15.15)	2nd August 2022	The Inspectorate notes the proposal to scope in a number of matters on a precautionary basis at this stage, which will be kept under review as further information becomes available. If the potential for a LSE can be excluded, it is proposed that such matters would be scoped out but that an explanation would be provided in the ES. The Inspectorate recommends that the Applicant seeks agreement with relevant consultation bodies on matters subsequently scoped out and provides evidence of any such agreement in the ES.	

Consultee	Date	Comment	Project response/where addressed in the ES
			▪ Environmental conditions: Air quality ▪ Environmental conditions: Noise ▪ Health and social care services
PINS (ref 3.15.16)	2nd August 2022	Whilst the Inspectorate acknowledges the potential for beneficial effects to human health receptors from the operation of the Proposed Development as described in relation to reduction in the severity of climate change, increased energy security (described as wider societal benefits) and upskilling of the workforce, the ES should also identify and assess any adverse effects, where significant effects are likely to occur.	Adverse effects have been assessed with **Section 19.6**.
PINS (ref 3.15.17)	2nd August 2022	The Scoping Report describes that the human health assessment will draw on the conclusions of other chapters in the ES. The Inspectorate notes that there is some discrepancy in the Scoping Report (between paragraph 873 and Table 9.1) about the inter-relationships that would be of relevance. For the avoidance of doubt, the Inspectorate agrees that all of the inter-relationships described in paragraph 873 would be relevant to human health.	Inter-relationships are highlighted in **Section 19.9**.
Stakeholder meetings			
Blackpool Council public health team	24th October 2022	Blackpool Council public health team had conferred with public health colleagues from surrounding local authority areas, including Lancashire County Council and Cumbria County Council. It was discussed that 'housing' and 'health and social care services' do not need to be assessed as part of the EIA health chapter.	The meeting confirmed with relevant public health stakeholders that the scope and methods of the health assessment adopted in this ES chapter were appropriate and proportionate. This included responding to clarifications on the

Consultee	Date	Comment	Project response/where addressed in the ES
		It was discussed that traffic, air quality and noise effects associated with transport activities at UK or international ports do not need to be assessed as part of the EIA health chapter. It was discussed that construction and decommissioning climate change effects associated with the project do not need to be assessed as part of the EIA health chapter.	scope of the assessment raised by PINS in their Scoping Opinion.
OHID and UKHSA	24th October 2022	A meeting was held with the OHID, who later conferred with UKHSA. It was discussed that it would not be proportionate for 'housing' and 'health and social care services' to be assessed as part of the EIA health chapter. It was discussed that it would not be proportionate for traffic, air quality and noise effects associated with transport activities at UK or international ports to be assessed as part of the EIA health chapter. It was discussed that it would not be proportionate for construction and decommissioning climate change effects associated with the project to be assessed as part of the EIA health chapter.	The meeting confirmed with relevant public health stakeholders that, subject to appropriate information and assumptions being provided in the ES health chapter, the scope and methods of the health assessment adopted are appropriate and proportionate.
National Highways and Lancashire County Council Highways Department	16th March 2023	A meeting was held with the National Highways and Lancashire County Council Highways Department to discuss Morecambe and Morgan Offshore Wind Farms: Transmission Assets and the approach to the traffic and transport assessment of the Project (Generation Assets).	The proposed approach to scoping out the onshore traffic and transport impacts of offshore (Generation Assets) construction, operation and maintenance and decommissioning was discussed and agreed. See response to PINS comment above (ref 3.15.3, 3.15.5, 3.15.6 and 3.15.12).

Consultee	Date	Comment	Project response/where addressed in the ES
Statutory consultation feedback on the PEIR			
UKHSA	1st June 2023	"The health of an individual or a population is the result of a complex interaction of a wide range of different determinants of health, from an individual's genetic make-up to lifestyles and behaviours, and the communities, local economy, built and natural environments to global ecosystem trends. All developments will have some effect on the determinants of health, which in turn will influence the health and wellbeing of the general population, vulnerable groups and individual people. Although assessing impacts on health beyond direct effects from, for example emissions to air or road traffic incidents is complex, there is a need to ensure a proportionate assessment focused on an application's significant effects. We note that the project relates to windfarm energy generating assets and activities, with few onshore activities. **We have considered the submitted documentation and can confirm that we are satisfied with the approach taken in preparing the Environmental Impact Assessment (EIA) and the conclusions drawn.** We wish to make no further comment at this time."	Noted that the statutory consultees (OHID and UKHSA) for public health do not request any additions or clarifications with regards to the scope of the Project health assessment or the methods proposed for the assessment. The statutory consultees for public health are satisfied with the conclusions that were drawn in the PEIR health assessment. The same conclusions are reached in this ES health assessment.
Cumbria Local Enterprise Partnership	2nd June 2023	"we are supportive of the Mona, Morgan and **Morecambe** developments as significant contributions to clean energy generation capacity and for economic development in Cumbria and the north-west region"	Noted. The wider societal benefits of the Morecambe offshore wind farm are noted and assessed further in **Section 19.6.3.6** of this chapter of the ES.

Consultee	Date	Comment	Project response/where addressed in the ES
Lancaster City Council	2nd June 2023	"… the City Council is supportive of the Morecambe Offshore Wind Farm proposals. We consider that the project will deliver significant benefits in the country's ambitions to reduce greenhouse gas emissions to reach Net Zero. It would make use of an area of coastline that already accommodates offshore wind turbines and would thus be unlikely to be harmful to public amenity. **We agree that the impacts described in the supporting literature are capable of being managed appropriately".**	Noted. Adverse effects have been assessed in **Section 19.6** and the wider societal benefits of the Morecambe offshore wind farm are noted and assessed further in **Section 19.6.3.6** of this chapter of the ES. Mitigation relevant to the human health assessment, which has been incorporated into the design of the Project is outlined in other chapters of the ES including **Chapter 8 Marine Sediment and Water Quality**; **Chapter 13 Commercial Fisheries**; **Chapter 14 Shipping and Navigation**; **Chapter 17 Infrastructure and Other Users** and **Chapter 18 SLVIA**.
Westmorland and Furness Council	1st June 2023	"The Council are particularly keen to begin discussions about how development can help address specific local challenges associated with pockets of deprivation, potentially as part of a comprehensive community benefits package".	This chapter of the ES has considered vulnerable groups including those in pockets of deprivation throughout assessment in **Section 19.6**.
Isle of Anglesey Public Protection department	25th May 2023	"The Isle of Anglesey Public Protection department acknowledges receipt of the Morecambe Offshore Windfarm Generation Assets consultation notification. However, upon reviewing the documentation via the portal, it would appear that the project's landfall would mainly be around the Morecambe area. Therefore, the Public Protection department would have no comments	Noted, no further action required.

Consultee	Date	Comment	Project response/where addressed in the ES
		or observations to make that would be relative to this proposal."	
Stena Line	June 2023	Stena Line notes that there is "insufficient information in respect of the cumulative impact of the Mona, Morecambe and Morgan Offshore Wind Farms on Human Health deriving from navigational risks or otherwise, to be able to make a cumulative effects assessment ("CEA") (see Mona PEIR Chapter 30 at section 30.11.1.10, Morecambe PEIR Chapter 19 at section 19.190). Although, it is queried why Morgan Offshore Wind Project Generation Assets has not included a similar reservation (see Morgan PEIR Chapter 19 at section 19.10)".	This Human Health chapter has had regard for cumulative effects associated with the Project, including effects associated with Mona Offshore Wind Project and Morgan Offshore Wind Project. A cumulative assessment of the public health implications is presented in **Section 19.7**, which takes into consideration the cumulative effects discussed in the other technical chapters of the ES, including detailed information on cumulative effects presented within **Chapter 14 Shipping and Navigation** of the ES. It is noted that revisions to the Round 4 projects site boundaries since PEIR has reduced navigational safety risks.
		"It is understood that the CEA for the Wind Farms will be contained within the Environmental Statement health chapter submitted in support of the application for Development Consent (see Mona PEIR Chapter 30, section 30.11.1.10, Morecambe PEIR Chapter 19 section 19.193)".	
		"There is the potential for adverse effects associated with shipping's access to human health, when Mona, Morecambe and Morgan are considered together. The Morecambe PEIR Chapter 19, section19.193 states: 'Discussions between the projects developers is ongoing to develop measures to avoid navigational impacts that could constitute a likely significant effect for public health' (emphasis added)".	

Consultee	Date	Comment	Project response/where addressed in the ES
		"As stated above, Stena Line's concerns are that the shipping risks are not going to be properly mitigated effectively. To emphasise, Stena Line provides a lifeline ferry service to several communities. In particular, Stena Line's concerns in respect of overcrowded shipping lanes and the associated increased collision and allision risks, which will in turn affect human health, are restated".	
		"Stena Line requires further details to be provided as to the mitigation steps being taken to reduce the impact of human health, particularly where there is an increased risk of fatalities and injuries during navigation, to make an informed opinion and position.	
Stena Line	2nd June 2023	Stena Line notes that there is insufficient information in respect of the cumulative impact of the Mona, Morecambe and Morgan Offshore Wind Farms on Human Health deriving from navigational risks or otherwise, to be able to make a cumulative effects assessment ("CEA") (see Mona PEIR Chapter 30 at paragraph 30.11.1.10, Morecambe PEIR Chapter 19 at paragraph 19.190). Although, it is queried why Morgan Offshore Wind Project Generation Assets has not included a similar reservation (see Morgan PEIR Chapter 19 at paragraph 19.10).	A CEA has been undertaken and is detailed in **Section 19.7**.
Stena Line	2nd June 2023	The Mona PEIR Submissions also suggest that there may be adverse cumulative impact to essential recognised sea lanes and access to ports and harbours (see Mona PEIR Chapter 30 at paragraph 10.11.2.1), which is not reflected in the corresponding PEIR Submissions made in respect of the Mona and Morecambe Wind Farms.	

19.3 Scope

19.3.1 Study area

19.11 The windfarm site (encompassing all Project infrastructure) is located in the Eastern Irish Sea and encompasses a seabed area of 87km^2. The nearest point from the windfarm site to shore (coast of northwest England) is approximately 30km. The Project is therefore remote from nearby human receptors, however effects for local, regional, national and international populations are relevant. The local population is comprised of the local authority areas of:

- Wyre, Fylde and West Lancashire Councils (within Lancashire County Council)
- Blackpool Council
- Sefton Metropolitan Borough

19.12 This local study area reflects representative areas onshore with the predominately affected views. These are also the areas with the closest community populations for other determinants of health, such as leisure activities.

19.13 As a study area does not necessarily define the boundaries of potential health effects, particularly mental health effects, the health chapter uses study area to broadly define representative population groups, including in relation to sensitivity, rather than to set boundaries on the extent of potential effects. These broader areas also are designed to encompass all effects, including fishing communities outside of the local study area.

19.14 The following study area has been used in the assessment to indicate the relevant population and the expected maximum extent of any likely significant effects:

- The ‘local’ population is defined using the local authority areas of Wyre, Fylde, West Lancashire, Blackpool and Sefton
- The ‘regional’ population is defined using the area of the North West England
- The ‘national’ population is defined with reference to England, and the wider UK as relevant
- The ‘international’ population is defined with reference to global effects relevant to international and transboundary effects e.g. climate change.

19.15 The health assessment also has regard to the Zones of Influence (ZoI) of the Project defined by other EIA chapters (as listed in **Paragraph 19.5**). Those

ZoI are relevant and inform the health chapter's consideration of impact magnitude.

19.16 As identified in **Chapter 1 Introduction**, the Transmission Assets (connecting the Project to the national grid) are subject to a separate DCO. As such, the only onshore works relating to the Project are related to the construction and operation and maintenance activities (and ultimately decommissioning) at the associated port(s). As the port(s) locations for the construction and the operation and maintenance phases are not known at this time, and will be confirmed post-consent, there is limited value in assessing the impacts to human health at this stage, given the local receptors cannot be identified. The need for any separate HIA would be reviewed upon selection of the port(s), although it is likely that the Project's activities will fall within permitted port(s) activities (i.e. in relation to traffic volumes and emissions), which is the assumption made in this chapter. The potential need for a separate health assessment for the port(s) applies to the following topics:

- Safe and cohesive communities: Housing
- Safe and cohesive communities: Transport
- Environmental conditions: Air quality
- Environmental conditions: Noise
- Health and social care services

19.17 This approach is mirrored in **Chapter 22 Traffic and Transport** as it is proposed that onshore traffic and transport impacts would be managed via a Port Traffic Management Plan, as required, and not assessed as part of the EIA for the Project.

19.3.2 Realistic worst-case scenario

19.18 The final design of the Project will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. To provide a precautionary, but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined. The realistic worst-case scenario (having the most impact) for each individual impact is derived from the Project Design Envelope (PDE) to ensure that all other design scenarios will have less or the same impact. Further details are provided in **Chapter 6 EIA Methodology**. This approach is common practice for developments of this nature, as set out in PINS Advice Note Nine: Rochdale Envelope (PINS, 2018).

19.19 The realistic worst-case scenarios for the human health assessment are set out in the chapters that inform the health assessment including:

- **Chapter 8 Marine Sediment and Water Quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**
- **Chapter 17 Infrastructure and Other Users**
- **Chapter 18 Seascape, Landscape and Visual Impact Assessment**
- **Chapter 20 Socio-economics, Tourism and Recreation**
- **Chapter 21 Climate Change**

19.20 These are based on the project parameters described in **Chapter 5 Project Description** (Document Reference 5.1.5), which provides further details regarding specific activities and their durations.

19.21 In addition, **Table 19.2**~~**Table 19.2**~~ highlights the assumptions for workforces used for the assessment.

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19.22 The design envelope presented has been refined as much as possible between PEIR and ES, presenting a project description with design flexibility only where it is needed.

Table 19.2 Realistic worst-case scenarios for human health

Issue	Construction (and decommissioning)	Operation and maintenance
Size of workforce in full-time employment.	Estimates of direct, indirect and induced employment as defined in **Chapter 20 Socio-economics, Tourism and Recreation**	
Where the offshore workforce is based	It is assumed that a multinational workforce will be used as vessel personnel and technical specialists may not all be UK based citizens or residents, particularly during construction. These personnel will likely return to their homes on a rotational basis. It is usual for travelling personnel to require hotel accommodation at one, or both, ends of their offshore trips depending on travel availability.	It is assumed that most personnel will be UK residents with a proportion of multinational contracts.
Where the port workforce and onshore transport workforce is based	It is assumed that most personnel will be UK residents and be home based in commutable distance from the selected port. A small minority would be non-UK resident.	It is assumed that most personnel will be UK residents and be home based in commutable distance from the selected port. A small minority would be non-UK resident.
Whether there would be additional healthcare service demand from the workforce being away from their usual place of primary care registration.	All persons entitled to National Health Service (NHS) treatment through nationality or residence will receive NHS care as required. All other personnel will be covered by health insurance provided by their employer. For all offshore personnel, first aid and initial triage will be carried out by offshore medical personnel. Where illness or injury require more advanced medical care then the patient(s) will be transported to an onshore healthcare facility by appropriate means. Onshore personnel would have first aid administered by first aiders, more serious illness or injury would be treated by the emergency services with the patient(s) transferred to a healthcare facility by ambulance or similar. Following any serious injury or illness to anyone, regardless of residency or citizenship, transport to their home would require medical certification of fitness to travel before departure and potential en-route care.	

19.3.3 Summary of mitigation embedded in the design

19.23 Embedded mitigation relevant to the human health assessment, which has been incorporated into the design of the Project is outlined in other chapters, including:

- **Chapter 8 Marine Sediment and Water Quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**
- **Chapter 17 Infrastructure and Other Users**
- **Chapter 18 SLVIA**
- **Chapter 21 Climate Change**

19.24 The health assessment has had regard to embedded mitigation as outlined in other chapters for each health determinant in **Section 19.6.**

19.4 Impact assessment methodology

19.4.1 Policy, legislation and guidance

19.4.1.1 National Policy Statements

19.25 The assessment of potential effects on human health has been made with specific reference to the relevant NPS. These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the Project are:

- Overarching NPS for Energy (EN-1) (Department for Energy Security and Net Zero (DESNZ), 2023a)
- NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2023b)
- NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2023c)

19.26 The specific assessment requirements for human health, as detailed in the NPSs, are summarised in **Table 19.3~~Table 19.3~~**, together with an indication of the section of the ES chapter where each is addressed.

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19.27 EN-3 (DESNZ, 2023b) has been reviewed and it was not considered that there are relevant policy positions in relation to human health that need to be taken into account for the Project. Relevant provisions on the scope and methods of assessments that input to the health assessment, such as seascape and marine sediment and water quality, are set out in those respective ES chapters (see **Section 19.1**) and are not repeated here.

19.28 In relation to EN-5 (DESNZ, 2023c), whilst there are relevant provisions in relation to health and electro-magnetic fields (EN-5 paragraphs 2.10.2 to 2.10.6 and 2.10.16), as stated in **Table 19.1**~~**Table 19.1**~~ (ref. 3.15.7), PINS agreed that EMF can be scoped out of the health assessment.

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Table 19.3 NPS assessment requirements

NPS requirement	NPS reference	ES reference
NPS for Energy (EN-1)		
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. 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. 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.	Paragraphs 4.3.1 – 4.3.3	This chapter provides the human health assessment in **Section** 19.6~~19.6~~, the methodology for which is provided in **Section** 19.4~~19.4~~. The assessment covers the direct and indirect, positive and negative, cumulative, transboundary, short and long term, permanent and temporary effects of the Project.
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** [emphasis added]	Paragraph 4.3.4	Employment is considered within this human health chapter, informed by **Chapter 20 Socio-economics, Tourism and Recreation**. Wellbeing is an integral consideration throughout this human health chapter, reflecting that the World Health Organisation (WHO) define health in terms of states of wellbeing. The potential for employment and upskilling is covered in **Sections 19.6.2.2**, **19.6.2.3**, **19.6.3.2**, **19.6.3.3**, **19.6.4.2** and **19.6.4.3**.

NPS requirement	NPS reference	ES reference
		The potential for effects relating to healthy lifestyles and safe and cohesive communities are covered in **Sections 19.6.2.1**, **19.6.2.6**, **19.6.3.1**, **19.6.3.6**, **19.6.4.1** and **19.6.4.6**. Effects on wellbeing and equality are inherent to all the assessments in **Section 19.6**.
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. …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 [emphasis added] 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. [emphasis added]	Paragraphs 4.4.1, 4.4.4 and 4.4.5	The effects to population health are considered in **Section 19.6**. For example, benefits of access to energy are covered in **Section 19.6.3.4** and **19.6.3.6**. The potential for adverse effects is covered in **Sections 19.6.2.1**, **19.6.2.4**, **19.6.2.6**, **19.6.3.1**, **19.6.3.5**, **19.6.4.1** and **19.6.4.4.** Cumulative effects to population health are considered in **Section 19.7**.
The direct impacts on health may include increased traffic, air or **water pollution**, dust, odour, hazardous waste and **substances**, b, exposure to radiation	Paragraph 4.4.2	Given that the Project is remote to human health receptors, the main pathway is water pollution, which is considered within this human health chapter (**Section 19.6**) and informed by **Chapter 8 Marine Sediment and Water Quality**. As explained in **Section 19.3**, the scope of this

NPS requirement	NPS reference	ES reference
		statement does not include onshore effects related to port activities given the port(s) to be used by the Project, and thus receptors, have not been identified. The assumption is that activities will be within existing permits held by the selected port(s) (e.g. discharge consents).
New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for **recreation** and physical activity. 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. 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.	Paragraph 4.4.3, 4.4.7 and 4.4.8	Given the Project is remote to human health receptors the main pathway is marine recreation, which is considered within this human health chapter (**Section 19.6**), informed by **Chapter 17 Infrastructure and Other Users** and **Chapter 20 Socio-economics, Tourism and Recreation.** The potential for effects relating to healthy lifestyles are covered in **Sections 19.6.2.1, 19.6.3.1** and **19.6.4.1.**
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.	Paragraph 5.16.2	Potential health effects are considered in **Section 19.6** and informed by **Chapter 8 Marine Sediment and Water Quality**. The potential for effects relating to water are covered in **Sections 19.6.2.4** and **19.6.4.4.**
Opportunities should be taken to mitigate indirect impacts, by promoting local improvements to **encourage health and wellbeing**, this includes potential impacts on **vulnerable**	Paragraph 4.4.6	This chapter considers opportunities to promote health and wellbeing where proportionate and appropriate.

NPS requirement	NPS reference	ES reference
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. emphasis added		This chapter considers the potential for differential effects to vulnerable groups. See **Section 19.6** conclusions which list relevant vulnerable groups for each determinant of health discussed.

19.4.1.2 Additional relevant policy and guidance

19.29 The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023) is relevant to the Project. This sets the national policy context for planning in general, including expectations for how development and planning decisions should take health into account. The following are key points.

19.30 The NPPF states:

- "Planning policies and decisions should aim to achieve **healthy, inclusive and safe places** which… **promote social interaction**… are safe and accessible… and enable and **support healthy lifestyles**, especially where this would address identified **local health and wellbeing needs**…." [paragraph 92, emphasis added]
- "Planning policies and decisions should also ensure that new development is appropriate for its location **taking into account the likely effects (including cumulative effects) of pollution on health**, living conditions and the natural environment…." [paragraph 185, emphasis added]
- "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants…". [paragraph 186]

19.31 The National Planning Practice Guidance (NPPG) (Department for Levelling Up, Housing and Communities, 2022) supports the NPPF and provides guidance across a range of topic areas. As stated in the NPPG for Healthy and Safe Communities:

- "The first point of contact on **population health and wellbeing** issues, including health inequalities, is the Director of Public Health for the local authority…"
- "A healthy place is one which supports and promotes healthy behaviours and environments and a reduction in health inequalities for people of all ages. It will provide the community with opportunities to improve their physical and mental health, and support community engagement and wellbeing"
- "It is helpful if the Director of Public Health is consulted on any planning applications (including at the pre-application stage) that are **likely to have a significant impact on the health and wellbeing of the local population or particular groups within it**. This would allow them to work together on any necessary mitigation measures. **A HIA is a useful tool** to use where there are expected to be significant impacts"

19.32 Table 19.4~~Table 19.4~~ outlines legislation relevant to the assessment of the effects on human health.

Table 19.4 Legislation used in this chapter

Legislation	Relevance
The Environment Act 2021 (His Majesty's (HM) Government, 2021)	The Act established The Office for Environmental Protection (OEP) as a public body in England and Northern Ireland. The OEP sets targets and takes enforcement action to prevent, or mitigate, serious damage to the natural environment or to human health. This includes reducing adverse impacts on public health. The OEP objective (OEP, 2022) is for environmental law (including EIA legalisation) and its implementation to be well designed and delivered, so that positive outcomes for the environment and people's health and wellbeing are achieved.
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (HM Government, 2017)	The EIA Regulations 2017 state that 'population and human health' was to be included in the list of topics to be considered in an EIA: *"The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the Project on the following factors – population and human health*".
The Public Health (Control of Disease) Act 1984 (HM Government, 1984)	The Act relates to disease control and establishing of 'port health' authorities. Port health authorities carry out a range of health controls at the UK borders. These include checks on imported food, inspecting aircraft for food safety and infectious disease control, as well as general public and environmental health checks (HM Government, 2012).
Health and Safety at Work Act 1974 (HM Government, 1974)	The Act sets a duty on employers to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all their employees. Similarly, employers must also ensure, so far as is reasonably practicable, that persons not in their employment are not exposed to risks to their health or safety as a result of activities being undertaken.
International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 and the Protocol of 1978 relating to MARPOL 1973 (together MARPOL 73/78)	The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. This was brought into effect and modified by the Protocol of 1978, which absorbed the MARPOL 1973 Convention. The combined instrument is commonly referred to as MARPOL 73/78.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and Water Framework Directive 2000/60/EC (WFD)	The WFD sets out a commitment to protecting water bodies, including bodies of water designated as recreational waters. However, it is noted that as the Project is around 30km from shore no effects on WFD water bodies waters are identified, as highlighted in **Chapter 8 Marine Sediment and Water Quality**.

19.33 This human health assessment has been conducted to meet any applicable requirements of HIA and health in EIA. Regard has therefore been had to both EIA and HIA guidance and requirements.

19.34 Planning Practice Guidance on health and wellbeing (Department for Levelling Up, Housing and Communities, 2022) applies and has been taken into account. Planning Practice Guidance on Environmental Impact Assessment (Ministry of Housing, Communities & Local Government, 2014) explains requirements of the EIA Regulations. However, the guidance does not provide additional information in relation to defining, scoping, or assessing 'human health'. Regard has therefore been given to the guidance set out in **Table 19.5**~~**Table 19.5**~~.

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Table 19.5 Health guidance used in this chapter

Guidance	Relevance
Institute of Environmental Management and Assessment (IEMA) 2022 guidance on health in EIA series, effective scoping and determining significance (Pyper *et al*., 2022a; Pyper *et al.*, 2022b)	Practitioner guidance on the coverage of human health in EIA for England, Wales, Scotland, Northern Ireland and the Republic of Ireland. This includes methods for determining population health sensitivity, magnitude and significance. This is the key methods citation.
Institute of Public Health (IPH), Guidance, Standalone Health Impact Assessment and health in environmental assessment, 2021 (Pyper *et al*., 2021)	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.
International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA). A reference paper on addressing Human Health in EIA (Cave *et al*., 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.
International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles, 2021 (Winkler *et al*., 2021).	Confirms the relationship between HIA and EIA. Confirms the application of HIA principles when undertaking health in EIA.
Public Health England, Health Impact Assessment in spatial planning 2020 (Public Health England, 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)

Guidance	Relevance
European Commission. EIA Guidance, 2017 (European Commission *et al*., 2017).	Defines 'significance' in the context of EIA. This definition informs the definition of EIA health significance.

19.4.2 Data and information sources

19.35 Study areas, receptors, project activities, mitigations and residual effect conclusions from the following chapters have informed the health assessment:

- **Chapter 8 Marine Sediment and Water Quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**
- **Chapter 17 Infrastructure and Other Users**
- **Chapter 18 SLVIA**
- **Chapter 20 Socio-economics, Tourism and Recreation**
- **Chapter 21 Climate Change**

19.36 No specific surveys are undertaken for human health, but the data sources outlined in **Table 19.6~~Table 19.6~~** have been used to inform this chapter.

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19.37 Given the interconnected nature of the Project and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, the environmental information for the Transmission Assets PEIR has also been used to inform this chapter (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Ltd, 2023)

Table 19.6 Existing data sources used in this chapter

Data source	Date	Data contents
OHID	2011-2023	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)	2019	Lower layer super output area (LSOA) resolution data on community deprivation)
Office of National Statistics (ONS) and official labour market statistics (NOMIS) statistics.	2011-2021	Census data (2021 used where released at time of baseline work).
Lancashire Health and Wellbeing Strategy (Lancashire County Council, undated)	2016-2020	Local public health priorities.
Lancashire Insights (Lancashire County Council, undated)	2018-2022	Local public health data.
Lancashire Joint Strategic Needs Assessment (JSNA) (Lancashire County Council, 2020)	2017-2023	Local vulnerable groups and local health challenges.
Blackpool Joint Health and Wellbeing Strategy (Blackpool Council, 2015)	2024-2028	Local public health priorities.
Blackpool JSNA (JNSA Blackpool, undated)	2011-2023	Local vulnerable groups and local health challenges.

19.4.3 Impact assessment methodology

19.4.3.1 General approach

19.38 **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied to the Project. The following sections outline the methodology used to assess the potential impacts on human health.

19.39 The health assessment methodology uses best practice, as published by IEMA 2022 guidance on health in EIA series, effective scoping (Pyper *et al*., 2022a) and determining significance (Pyper *et al*., 2022b). This guidance references out to further information in:

- IPH Health Impact Assessment Guidance, Standalone HIA and health in environmental assessment (Pyper *et al*., 2021)
- IAIA and EUPHA ‘Human Health: Ensuring a high level of protection’, a reference paper on addressing Human Health in EIA (Cave *et al*., 2020)

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

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

19.42 The approach taken ensures that HIA is embedded within the EIA in line with good practice (Department for Transport, 2017; Newham London, 2018; Public Health England, 2020).

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

19.4.3.2 Determinants of health, risk factors and health outcomes

19.44 This 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*" (World Health Organization, 1948).

19.45 This 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).

19.46 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.

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

19.48 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 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.

19.49 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.

19.4.3.3 Definitions of sensitivity and magnitude

19.50 For health in EIA, population groups are the sensitive receptors, the health outcomes of which are considered (Pyper *et al*., 2022a).

19.51 EIA commonly uses a significance framework that seeks to assign sensitivity to receptors, to assign a magnitude of change to derive the level of effect, and then to state if the effect is significant. For health, this requires the identification of relevant populations and their sensitivity, the level of change in determinants of health (magnitude), and a description of the likely significant effects to population health outcomes (Pyper *et al*., 2022b).

19.52 For each determinant of health, the assessment identifies levels of sensitivity for the general population and for relevant vulnerable sub-populations. A single level of significance is then reached that reflects the overall public health conclusion, including whether there are likely to be significant changes in health inequalities due to the project (Pyper *et al*., 2022b).

19.53 Table 19.7~~Table 19.7~~, Table 19.8~~Table 19.8~~ and Table 19.10~~Table 19.10~~ summarise the assessment criteria used for the Project human health assessment. The approach uses professional judgement, drawing on consistent and transparent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for human health in public health terms. This is as set out in IEMA guidance for health in EIA (Pyper *et al*., 2022b).

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Table 19.7 Definitions of sensitivity

Sensitivity	**Definition** *Indicative criteria (judgment based on most relevant criteria across categories)* *The narrative explains that the population or sub-population's sensitivity is driven by:*
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 anxious or **concerned**; 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 **uncertain** 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 **ambivalent** 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 **supported** 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 19.8 Definition of magnitude for population health

Magnitude	Definition *Indicative criteria (judgment based on most relevant criteria across categories)* *The narrative explains that the project change has:*
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.

19.4.3.4 Scoring significance

19.54 This human health chapter conclusions are presented in EIA categories of significance, such as major, moderate, minor or negligible. A narrative explaining this 'score' with reference to evidence, local context and any inequalities is also presented. The approach follows that set out in the guidance (see **Table 19.5**~~**Table 19.5**~~).

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19.55 The assessment of significance is based on the indicative matrix set out in **Table 19.9**~~**Table 19.9**~~. This is as set out in IEMA guidance for health in EIA (Pyper *et al.*, 2022b).

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19.56 Following initial assessment, if the effect does not require additional mitigation (or none is possible), the residual effect would remain the same. If, however, additional mitigation is proposed, an assessment of the post-mitigation residual effect is provided.

Table 19.9 Indicative significance assessment matrix (for beneficial and adverse effects)

Magnitude of Impact	Sensitivity			
	High	Medium	Low	Very low
High	Major	Moderate or major	Moderate or minor	Minor or negligible
Medium	Moderate or major	Moderate	Minor	Minor or negligible
Low	Moderate or minor	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or negligible	Negligible	Negligible

19.57 Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.

19.58 Effects of moderate and above are considered significant in terms of the EIA Regulations.

19.4.3.5 Effect significance

19.59 Definitions of each level of significance are provided in **Table 19.10**~~**Table 19.10**~~. Impacts and effects may be deemed as being either positive (beneficial) or negative (adverse).

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Table 19.10 Definition of effect significance

Significance score	Definition *Indicative criteria (judgment based on most relevant criteria across categories)*
Major (significant)	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. Change, due to the project, could result in a regulatory threshold or statutory standard being **crossed** (if applicable). 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. 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.

Significance score	Definition *Indicative criteria (judgment based on most relevant criteria across categories)*
Moderate (significant)	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**. Change, due to the Project, could result in a regulatory threshold or statutory standard being **approached** (if applicable). 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. 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)	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. 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). 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. 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)	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. Change, due to the project, would **not affect** a regulatory threshold, statutory standard or guideline (if applicable). 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. In addition, health priorities for the relevant study area are **not** relevant to the determinant of health or population group affected by the project.

19.60 The temporal scope of the health chapter assessment 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 (up to 48 months duration)
- 'Long term' relates to effects measured in decades (e.g., the long-term effects on health from increased flights or long-term employment)

19.61 The following terminology is also used to consistently classify effects:

- Beneficial – effects that have a positive influence on population health
- Adverse – effects that have a negative influence on population health
- Temporary – effects that persist for a limited period only (due for example, to particular activities taking place for a short period of time)
- Permanent – effects that result from an irreversible change to the baseline or which persist for the lifetime of the project and the foreseeable future
- Direct – effects that arise from the impact of activities that form an integral part of the Project (e.g., direct employment and income generation)
- Indirect – effects that arise from the impact of activities that do not explicitly form part of the Project (e.g., off-site infrastructure upgrades to accommodate the project)
- Secondary – effects that arise as a consequence of an initial effect of the project (e.g., induced employment elsewhere)

19.4.4 Cumulative effects assessment methodology

19.62 The CEA considers other plans, projects and activities that may impact cumulatively with the Project (see **Section 19.7.3**). As part of this process, the assessment considered which of the residual impacts assessed for the Project on its own have the potential to contribute to a cumulative effect (see **Section 19.7.3**). **Chapter 6 EIA Methodology provides** further details of the general framework and approach to the CEA.

19.63 As described in **Chapter 1 Introduction**, the Transmission Assets associated with the Project are undergoing a separate consent process as part of the Transmission Assets project. To enable impacts from the Project and the

Transmission Assets to be considered together, a 'combined' assessment is made within the cumulative assessment to identify any key interactions and additive effects (**Section 19.7.3.1**).

19.4.5 Transboundary impact assessment methodology

19.64 **Chapter 6 EIA Methodology** provides details of the general framework and approach to the assessment of transboundary effects.

19.65 For human health, the potential for transboundary effects (assessed in **Section 19.8**) are informed by the assessments made in the following chapters:

- **Chapter 8 Marine Sediment and Water Quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**
- **Chapter 17 Infrastructure and other marine users**
- **Chapter 18 SLVIA**
- **Chapter 20 Socio-economics, Tourism and Recreation**
- **Chapter 21 Climate Change**

19.4.6 Assumptions and limitations

19.66 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 assessment.

19.67 The health and wellbeing assessment partially draws from and builds upon, the technical outputs from inter-related technical disciplines, namely:

- **Chapter 8 Marine Sediment and Water Quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**
- **Chapter 17 Infrastructure and other marine users**
- **Chapter 18 SLVIA**
- **Chapter 20 Socio-economics, Tourism and Recreation**
- **Chapter 21 Climate Change**

19.68 As a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter. However, it is considered that the information available provides a suitable basis for assessment.

19.69 The following steps have been taken to reduce uncertainty, allowing 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
- Monitoring and adaptive management is set out as a condition, where relevant, as part of ongoing compliance
- The health assessment has been transparent in its analysis and follows good practice

19.70 It is also noted that a number of assumptions have been made on the required workforce of the Project which are detailed in **Table 19.2**~~**Table 19.2**~~.

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19.5 Existing environment

19.71 Different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstances. This section sets out relevant health baseline information. **Chapter 20 Socio-economics, Tourism and Recreation** also provides data on labour market indicators and deprivation.

19.72 The aim of the following information is primarily to put into context the local health circumstances of the communities surrounding the Project, forming the basis to the assessment and any associated mitigation. Statistics have been analysed for the Wyre, Fylde, West Lancashire, Blackpool and Sefton Local Authorities (comprising the local study area), using regional (North West) and national (England) averages as relevant comparators. Where Local Authority level data is not available, data for the Lancashire, Blackpool and Sefton Unitary Authorities has been collected as representative alternative geographies.

19.73 It should be noted that the description of the whole population, and the populations within the local and wider study areas, does not exclude the probability that there will be some individuals or groups of people who do not conform to the overall profile.

19.5.1 Demography, socio-economic circumstance and deprivation

19.74 The population structure of the local study area (Plate 19.1~~Plate 19.1~~) indicates an aging population, with a larger proportion of people aged 50 and above compared to other age groups, and also compared to the England average.

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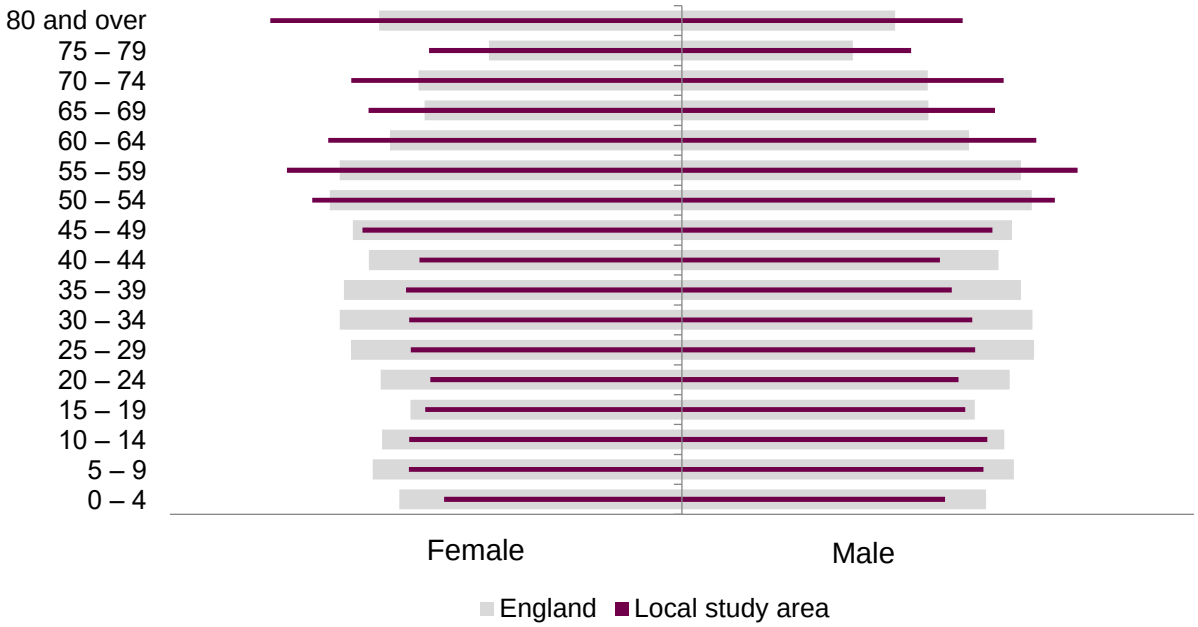

Plate 19.1 Population structure for the local study area compared to England (ONS, 2021)

19.5.2 Life expectancy and physical health

19.75 As shown in Table 19.11~~Table 19.11~~ using data from the OHID public health Fingertips data tool (OHID, 2023b)[2], life expectancy and healthy life expectancy (i.e., the number of years spent in good health) within the local study area perform largely worse than or similar to the national average.

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19.76 Hospital admissions statistics show a more mixed picture, with some local authorities such as Wyre and Fylde performing significantly better than the national average on several indicators, while others such as Blackpool and West Lancashire perform significantly worse on several indicators.

19.77 Mortality statistics across the study area perform significantly worse or similar to the national average. Data for life expectancy and physical health indicators shows a particularly poor burden of health in Blackpool, where all indicators perform significantly worse than the national average.

[2] The year (2023) on the citation reflects the date of the website. Health data are collected at different times therefore we have listed the year of the dataset for each indicator. All data in the report is the most current publicly available data at the time of the assessment.

Table 19.11 Life expectancy and physical health baseline statistics (OHID, 2023b)

Indicator	Year	Wyre	Fylde	Blackpool	West Lancashire	Sefton	North West	England
Life expectancy								
Life expectancy at birth for males[3] (years)	2018-20	77.8	79.9	74.1	78.6	78.0	77.9	79.4
Life expectancy at birth for females (years)	2018-20	82.3	82.9	79.0	82.6	82.4	81.7	83.1
Healthy life expectancy for males[4] (years)	2018-20	61.4*[5]	61.4*	53.5	61.4*	63.6	61.5	63.1
Healthy life expectancy for females (years)	2018-20	64.0*	64.0*	54.3	64.0*	63.8	62.4	63.9
Hospital admissions								
Emergency hospital admissions for all causes (SAR)[6] (per 100)	2016/17 – 2020/21	93.6	87.5	130.5	105.4	129.5	n/a	100.0

[3] Life expectancy at birth is the average number of years that a newborn could expect to live if he or she were to pass through life exposed to the sex and age specific death rates prevailing at the time of birth.

[4] Health life expectancy is the average number of years a person can expect to live in full health, without disabling illnesses or injuries.

[5] Healthy life expectancy data (both male and female) is only available at Unitary Authority/County level and above, therefore data for Wyre, Fylde and West Lancashire presented here (*) is for Lancashire.

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

Indicator	Year	Wyre	Fylde	Blackpool	West Lancashire	Sefton	North West	England
Emergency hospital admissions for coronary heart disease (SAR)	2016/17 – 2020/21	104.4	95.4	124.7	106.6	115.6	n/a	100.0
Emergency hospital admissions for stroke (SAR)	2016/17 – 2020/21	93.2	100.2	116.7	87.0	92.8	n/a	100.0
Emergency hospital admissions for myocardial infarction (SAR)	2016/17 – 2020/21	117.2	105.9	139.4	87.6	88.2	n/a	100.0
Emergency hospital admissions for chronic obstructive pulmonary disease (SAR)	2016/17 – 2020/21	95.0	74.2	200.0	104.1	125.1	n/a	100.0
Mortality								
Deaths from all causes (SMR)[7]	2016-20	105.4	102.9	136.2	106.8	104.3	n/a	100.0
Deaths from cancer (SMR)	2016-20	100.8	97.3	121.3	98.3	106.7	n/a	100.0
Deaths from circulatory disease (SMR)	2016-20	105.4	99.8	131.2	109.7	96.4	n/a	100.0

[7] The Standardised Mortality Ratio (SMR) is a summary estimate of mortality rates relative to the national average and takes into account differences in a population's age, sex and socioeconomic deprivation.

Indicator	Year	Wyre	Fylde	Blackpool	West Lancashire	Sefton	North West	England
Deaths from coronary heart disease (SMR)	2016-20	114.0	101.4	143.8	112.5	96.0	n/a	100.0
Deaths from stroke (SMR)	2016-20	100.8	110.8	121.0	114.6	100.8	n/a	100.0
Deaths from respiratory diseases (SMR)	2016-20	111.6	104.0	167.8	106.6	100.6	n/a	100.0
Deaths from causes considered preventable, under 75 years (SMR)	2016-20	110.2	95.3	180.0	107.7	116.8	n/a	100.0

Key (terms as defined and applied by the Fingertips public health data (OHID, 2023a)	
	Significantly better than the England average
	Better than the England average (but not significantly so)
	Worse than the England average (but not significantly so)
	Significantly worse than the England average
	No interpretation of significance provided

19.5.3 Mental health, lifestyle and behavioural risk factors

19.78 As shown in Table 19.12~~Table 19.12~~ (OHID, 2023b), mental health indicators within the study area local authorities show a slightly mixed picture. Hospitals stays for self-harm are better in Wyre, Fylde and West Lancashire and worse in Blackpool and Sefton compared to the national average. Both suicide rate and high anxiety score perform worse in Wyre, Fylde, Blackpool and West Lancashire with Sefton showing a slightly better performance (albeit not significantly so) than the national average.

19.79 Lifestyle and behavioural risk factors perform similarly to or significantly better than the national average in several local authorities, however data for Blackpool is significantly worse than the national average. To note also are the hospital admission episodes for alcohol-related conditions which are significantly higher in several local authorities with only West Lancashire showing significantly better performance than the national average. Sefton also performs worse in adults classified as overweight and obesity compared to both the North West region and England.

19.5.4 Climate change and future trends

19.80 Population health data presents a snapshot at a particular time. It is well recognised that population health is subject to continuing influences, both at the individual and community level. Influences may be environmental, such as seasonal variation in wellbeing and communicable diseases, they may also respond to socio-economic factors, such as migration and the availability of jobs.

19.81 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 COVID-19 pandemic. The implications of COVID-19 for public health will take years to be reflected within statistical data releases, but it is expected that the pandemic will have exacerbated public health challenges. The pandemic disproportionately affected vulnerable groups, including due to age and ill-health.

19.82 For assessment purposes, the current health baseline is considered a suitable proxy 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 relevant for 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 health assessment sensitivity score for each vulnerable group 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.

19.83 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 predication 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 (HM Government, 2021) and has been taken into account by the health assessment.

19.84 In the do-nothing scenario there is the potential for the future baseline of UK energy security to be met by non-renewable sources, or not met at all. The former is likely to increase climate change related pressures on public health, including extreme weather events, exacerbating inequalities and mental health outcomes. The latter is also likely to increase pressure on public health due to interrupted energy supplies affecting availability of goods and services, including healthcare, employment and food safety.

Table 19.12 Mental health, lifestyle and behavioural risk factor baseline statistics (OHID, 2023b)

Indicator	Year	Wyre	Fylde	Blackpool	West Lancashire	Sefton	North West	England
Mental health								
Hospital stays for self-harm (SAR)	2021/22	131.4	126.8	274.7	164.5	237.7	190.3	163.9
Suicide rate	2019-21	13.5	10.7	18.7	12.4	10.0	11.4	10.4
Self-reported wellbeing – people with high anxiety score (%)[8]	2021/22	24.4*	24.4*	23.7	24.4*	22.6	25.7	22.6
Lifestyle and behavioural risk factors								
Percentage of overweight children (including obesity) (Year 6)	2021/22	36.4	31.7	43.0	37.9	38.4	39.0	37.8
Smoking prevalence in adults (%)	2022	11.8	6.4	18.8	11.5	7.9	13.4	12.7
Hospital admission episodes for alcohol-related conditions	2020/21	561	549	751	415	598	511	494
Percentage of adults classified as overweight or obese	2021/22	66.7	62.5	72.3	68.6	71.2	66.7	63.8
Percentage of physically active adults	2021/22	68.8	68.9	59.1	69.3	65.9	65.2	67.3
Key (terms as defined and applied by the Fingertips public health data (OHID, 2023a))								
	Significantly better than the England average							

[8] Data for "self-reported wellbeing – people with a high anxiety score" is only available at Unitary Authority/County level and above, therefore data for Wyre, Fylde and West Lancashire presented here (*) is for Lancashire.

Indicator	Year	Wyre	Fylde	Blackpool	West Lancashire	Sefton	North West	England
	Better than the England average (but not significantly so)							
	Worse than the England average (but not significantly so)							
	Significantly worse than the England average							
	Similar to England							

19.6 Assessment of effects

19.6.1 Impact receptors

19.85 The principal receptors with respect to human health are population groups who may be affected by the Project.

19.86 The specific features of the receptors are listed in Table 19.13~~Table 19.13~~.

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Table 19.13 Human health receptors relevant to the Project

Receptor group	Receptor	Relevant features	Closest distance from the windfarm site (km)
Human population	General population	▪ Residents ▪ Visitors ▪ Workforce ▪ Energy consumers	30
	Vulnerable group population	▪ Age ▪ Income status ▪ Health status ▪ Social disadvantage ▪ Access/geographical	

19.87 In line with Table 19.5~~Table 19.5~~ guidance a population health approach has been taken, informed by discussion of receptors within the other technical chapters of the ES.

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19.88 For each determinant of health, the human health chapter identifies relevant inequalities through consideration of the differential effect to the 'general population' of the relevant study area, and effects to the 'vulnerable population group' of that study area. The vulnerable population group is comprised of relevant sensitivities for that determinant of health. The following population groups have been considered:

- The 'general population' including residents, visitors, workers, service providers, and service users
- The 'vulnerable group population'

19.89 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.

19.90 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.

19.91 The methods draw on the list of vulnerable population groups set out in the guidance. The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the 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; 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
- 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

19.92 The following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring receptor sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for construction, operation and maintenance and decommissioning phases.

- 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.

19.93 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.

19.94 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." (Pyper *et al*., 2022b).

19.6.2 Potential impacts during construction

19.6.2.1 Healthy lifestyles: Physical activity and leisure

19.95 This section considers the population health implications of construction activities affecting marine and nearshore recreational and leisure activities, e.g., blue water or live aboard sailing, fishing, diving, boat trips or water sports.

19.96 The health benefits of recreation and leisure include physical activity, as well as general wellbeing benefits. Peoples' 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 & Chroni, 2014). Improvements in health behaviour influence health outcomes like mortality, chronic diseases, mental and obesity disorders (Salgado *et al*., 2020).

19.97 Physical activity can improve cognitive and mental health, particularly improvements in physical self-perceptions, which accompany enhanced self-esteem (Lubans *et al*., 2016). Given the offshore context, effects are most likely in relation to changes in vessel movements and any disruption to leisure related sea transport.

19.98 This section has been informed by **Chapter 14 Shipping and Navigation** and **Chapter 17 Infrastructure and Other Users**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

19.99 A potential population health effect is considered likely because there is a plausible source-pathway-receptor relationship:

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

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

19.101 The population groups relevant to this assessment are:

- The ‘local’ coastal population of Lancashire County Council, Blackpool Council and Sefton Metropolitan Borough (noting users are also expected from the regional and national study area, but not in numbers to have the potential to affect population health at such geographic scales). This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to low-income vulnerability (people living in deprivation, including those on low incomes, for whom alternative opportunities may be limited)

19.102 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 19.6.1.**

19.103 The sensitivity of the general population is **low**. This reflects that most people in the local area would only make occasional use of the affected marine recreational and leisure opportunities. It also includes those with access to many alternatives that are not affected. 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.

19.104 The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to have 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.

19.105 **Chapter 14 Shipping and Navigation** assesses recreation vessels as part of the assessment and concludes effects are not significant. In addition, as identified in **Chapter 17 Infrastructure and Other Users**, effects to marine recreational activity are not significant given the relatively low level of activity in the area around the windfarm site and that activities can occur in nearby marine areas.

19.106 The magnitude of change due to the Project is **negligible**. This reflects that there is a *small* scale of change over the *medium term* in shipping movements that could affect marine and nearshore recreational and leisure activities. Any such effects are likely to be *occasional*, with *rapid* reversal of any effect once construction shipping effects are concluded. The change is likely to be a *minor* change in *quality of life* for a *very few* people within the affected population. *No* effect on healthcare services would be expected.

19.107 The effect is characterised as being *adverse* in direction, *temporary* and *indirect*. The significance of the population health effect is **negligible adverse** (not significant in EIA terms). The scale of change does not have the potential for a likely significant population health effect. Although the scientific literature supports a *clear* association between recreational and leisure activities and health outcomes, there is likely to be *very limited* change in the population health baseline. There is expected to be *no effect* on health policy delivery and no change in population health inequalities.

19.6.2.2 Education: Workforce upskilling

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

19.109 Increased educational attainment is associated with better health outcomes and delayed mortality. Education is associated with life expectancy, morbidity, health behaviours and educational attainment plays an important role in health by shaping opportunities, employment and income (The Lancet Public Health, 2020). Yu-Tzu Wu and colleagues show in their study that, differences in

educational attainment and wealth are strongly associated with disparities in healthy ageing across a large population of older people (Wu *et al.*, 2020). Education is therefore an important indicator of socioeconomic status that plays an important role in reducing inequalities and in improving income, employment, social networks, and behaviours (Byhoff *et al*., 2017).

19.110 The assessment has informed, and is informed by, the Morecambe OWF Outline Skills and Employment Plan (OSEP) (Document Reference 6.11), which acknowledges issues of deprivation and the benefits of targeting opportunities to vulnerable groups, including to address health inequalities. For example, the OSEP notes:

- The plan will consider how (subject to standards and security checks) access to training and employment opportunities can be targeted to vulnerable groups to reduce local inequalities. For example, supporting young adults not in education, employment or training to access apprenticeship or job interviews.
- The plan will adopt inclusive and equitable recruitment practices to ensure that opportunities within the wind farm are accessible to everyone including tailoring access for local vulnerable groups.
- Prelimianary activities include development and implementation of a local recruitment strategy and plan by project phase, prioritising local hires and opportunities to benefit vulnerable groups.
- The plan will set out the processs for allocating community funds to local skills and development initiatives, particularly in areas of higher deprivation.
- Through monitoring the plan will evaluate improvements in diversity, inclusion, and representation of underrepresented and vulnerable groups.

19.111 This section has been informed by **Chapter 20 Socio-economics, Tourism and Recreation**, which sets out relevant assessment findings that have been taken into account.

19.112 A potential population health effect is considered likely because there is a plausible source-pathway-receptor relationship:

- The source is educational opportunities and support
- The pathway is good quality education supporting socio-economic status and other outcomes, which are influential for health
- Receptors are the local population, particularly young adults commencing employment

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

19.114 The population groups relevant to this assessment are:

- The 'regional' population of the North West. This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as dependants)
  - Old age vulnerability (older people as dependants)
  - Low-income vulnerability (people for whom better quality employment may be particularly beneficial, including those who are living in deprivation, on low incomes, unemployed, in insecure jobs or shift workers)
  - Poor health vulnerability (people with existing poor physical or mental health, including as dependants)

19.115 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 19.6.1**.

19.116 The sensitivity of the general population is **low**. This reflects that most people in the local area would make use of alternative educational or training opportunities or have existing educational attainment appropriate to their vocation and career progression.

19.117 The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is linked to young adults, in relation to apprenticeship opportunities, and children or young people, in relation to educational support initiatives. For both 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 employment.

19.118 **Chapter 20 Socio-economics, Tourism and Recreation** assesses the economic impact on employment and increases of employment as negligible beneficial for the Local Economic Area and the UK and this is considered as not significant in EIA terms.

19.119 The magnitude of change due to the Project is **low**. This reflects that whilst the scale of new training opportunities is not yet confirmed, the OSEP contains specific statements with regard to offering opportunities to underrepresented and vulnerable groups. 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. The population extent is currently uncertain

until the scale of the training opportunity is confirmed, but likely relates to a small minority of the population.

19.120 The effect is characterised as being *beneficial* in direction, *permanent* in supporting ongoing future career progression and *indirect*. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms). This conclusion reflects the scientific literature supports a *clear* association between educational outcomes and health outcomes, with the potential for, based on the current information, a *slight* change in the population health baseline, albeit with potential for lasting effects over the life-course due to improved employment opportunities following upskilling. The current level of change is likely to have a supportive but marginal influence on delivering health policy, including narrowing inequalities where vulnerable groups are targeted by and take-up the training opportunities, as set out in the OSEP.

19.6.2.3 Socioeconomic status: Employment and investment

19.121 This section considers the population health implications of increased employment and economic impacts during construction.

19.122 Employment is an important determinant of health and wellbeing 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.

19.123 There is strong evidence for a protective effect of employment on depression and general mental health. Statistics showed favourable effects on depression (Odds Ratio (OR)[9]=0.52; 95% Confidence Interval (CI)[10] 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).

19.124 This section has been informed by **Chapter 20 Socio-economics, Tourism and Recreation** (potential beneficial effects) and **Chapter 13 Commercial**

[9] Odds Ratio (OR) is a statistical measure which quantifies the strength of association between two events.

[10] Confidence Interval (CI) is a range of values that is likely to contain the parameter (population value) being estimated.

Fisheries (potential adverse effects), which sets out relevant assessment findings and mitigation measures that have been taken into account. This section has also informed, and been informed by, the OSEP statements on vulnerable groups as discussed in **Paragraph 19.110**.

19.125 A potential population health effect is considered likely because there is a plausible 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
- Receptors are people of working age (and their dependants)

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

19.127 The population groups relevant to this assessment are:

- The 'regional' population of the North West. This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as dependants)
  - Old age vulnerability (older people as dependants)
  - Low-income vulnerability (people particularly sensitive to changes in employment including those who are living in deprivation, on low incomes, unemployed, in insecure jobs or shift workers)
  - Poor health vulnerability (people with existing poor physical or mental health, including as dependants)

19.128 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 19.6.1**

19.129 The sensitivity of the general population is **low**. 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).

19.130 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.

19.131 **Chapter 20 Socio-economics, Tourism and Recreation** assesses the economic impact of gross added value and employment increases as

negligible beneficial and not significant, both within the Local Economic Area and UK context.

19.132 For the health assessment, the magnitude of beneficial change due to the Project is **low**. This reflects that there would be a localised effect, albeit the location of the localised effect within the UK has yet to be determined. There would be a relatively *small* scale of change in construction employment in the context of this local labour market. These opportunities would be of *medium-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 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.

19.133 There is also the potential for adverse effects associated with reduced commercial fishery related productivity during the construction phase. This has been assessed in **Chapter 13 Commercial Fisheries**. Following mitigation identified in **Chapter 13 Commercial Fisheries** there is expected to be at most a minor Project-alone adverse impacts on commercial fishing including UK and Isle of Man potting and netting; UK, Isle of Man and Irish dredge, demersal otter trawl and beam trawl, with lesser effects reported to other parts of the commercial fishing industry such as pelagic fishery. For population health, the effects are judged to relate to a *very small* scale of change over the *medium-term*. A *frequent* or *continuous* effect may occur to a *very small minority* of the population. This is likely to relate to *minor* changes in physical and mental health morbidity associated with income and job insecurity. At most there may be *slight* healthcare service implications. The magnitude of the adverse change is also rated as **low**.

19.134 The effect during construction is characterised as being beneficial and adverse in direction, *temporary* and *indirect*. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms) in relation to employment opportunities and **minor adverse** (not significant in EIA terms) in relation to potential job or income insecurity in parts of the commercial fishing industry (UK potting). This conclusion reflects that employment has a *clear* association with better health outcomes in the scientific literature and the Project is likely to have *slight* positive and negative contributions to the local health baseline. Such an effect is likely to have a *marginal* effect on delivering health policy and on health inequalities where job opportunities and job insecurity support is targeted to and taken up by vulnerable groups.

19.6.2.4 Environmental conditions: Water

19.135 This section considers the population health implications of increases in suspended sediments and potential marine pollution releases during construction.

19.136 The key health outcomes relevant to this determinant of health arise from exposure to contaminated bathing water.

19.137 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).

19.138 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). Contaminated bathing water may therefore increase the risk of gastrointestinal and dermatological diseases including also respiratory, ear and eye related diseases (Eregno *et al*., 2016). Drinking water supplies from both surface water and groundwater sources may also be contaminated during flooding events (Andrade *et al*., 2018).

19.139 This section has been informed by **Chapter 8 Marine Sediment and Water Quality**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

19.140 A potential population health effect is considered likely because there is a plausible source-pathway-receptor relationship:

- The source is mobilisation of contaminants or sediment or new leaks or spills of pollutants
- The pathway is transmission through sea waters, including diffusion, tides and currents. Exposure includes ingestion and dermal contact
- Receptors are coastal populations of residents and visitors

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

19.142 The population groups relevant to this assessment are:

- The ‘local’ coastal population of Wyre, Fylde, West Lancashire, Blackpool and Sefton. This represents the general population as defined in **Section 19.6.1**.

- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as more sensitive to contaminants)
  - Old age vulnerability (older people as more sensitive to contaminants)
  - Poor health vulnerability (people with existing poor physical or mental health, as more sensitive to contaminants)

19.143 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 19.6.1.**

19.144 The sensitivity of the general population is **low**. This reflects many people would make limited use of coastal waters for bathing or related recreation. The general population also includes those who are in good health and less likely to be adversely affected by contaminants.

19.145 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 increases 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).

19.146 **Chapter 8 Marine Sediment and Water Quality** identified all of the potential impacts considered will result in either negligible or, at worse, minor adverse effects to water quality.

19.147 The magnitude of change due to the Project is **negligible**. This reflects the distance of the windfarm site offshore and use of standard good practice measures to avoid and contain any spills that are directly harmful or could have secondary effects such as a reduction in water quality. Sediment contaminants are very low across the windfarm site and considering suspended sediments, there is no pathway of sediment transport to bathing waters (see **Chapter 8 Marine Sediment and Water Quality)**. Given the pathway is limited to vessels and accidental spill, the level of exposure in bathing waters would likely be *very low*, *very short-term* and associated with *one-off* events and managed via spill response procedures. The severity of health outcomes, if any, would likely relate to a *minor* change in *morbidity* related risk factors associated with very low toxin exposures for a *very few* people. At most there may be *slight* healthcare service implications.

19.148 The effect is characterised as being *adverse* in direction, *temporary* and *direct*. The significance of the population health effect for this determinant of health is up to **negligible adverse** (not significant in EIA terms). This conclusion reflects the pathways are limited to Project vessels. The risk of this effect is

mitigated through standard protective measures and there is therefore potential risk for only a *very limited* effect on the population health baseline. Water quality is expected to be *well within* standards for bathing water and the changes are not expected to affect delivery of health policy or influence inequalities.

19.6.2.5 Environmental conditions: Climate change

19.149 The Project would be a part of a wider positive energy sector transition that reduces the severity of climate change. During construction there would be carbon emissions associated with shipping and assembly of generating infrastructure and use of materials with embodied carbon. Such emissions are discussed in **Chapter 21 Climate Change**. The level of effect is not expected to be of a scale that could give rise to likely significant population health effects. Further small emissions from manufacturing and constructing are outweighed by the emissions saved by the operational period. The receptor to greenhouse gasses is the global climate and considering the construction and decommissioning phases alongside the operation phase an overall positive impact is identified for climate change. As such climate change is considered overall in the operational phase.

19.6.2.6 Safe and cohesive communities: Community identity

19.150 Visual change can affect mental health and wellbeing with psychological and physiological responses. The nearest point from the windfarm site to shore is approximately 30km. During construction there would be views of shipping and assembly of the generating infrastructure that is above sea level. Such effects are discussed in **Chapter 18 SLVIA**. The level of activity during construction is not expected to be of a scale that could give rise to likely significant population health effects. In line with proportionate assessment, construction community identity effects are scoped out for construction and decommissioning and assessed in operation and maintenance only.

19.6.3 Potential impacts during operation and maintenance

19.6.3.1 Healthy lifestyles: Physical activity and leisure

19.151 This section considers the population health implications of changes in operational and maintenance activities of the Project affecting marine and nearshore recreational and leisure activities, e.g., blue water or live aboard sailing, fishing, diving, boat trips or water sports.

19.152 The health benefits of recreation and leisure are as set out in **Section 19.6.2.1**.

19.153 This section has been informed by **Chapter 14 Shipping and Navigation and Chapter 17 Infrastructure and Other Users**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

19.154 A potential population health effect is considered likely following the same source-pathway-receptor model as set out in **Section 19.6.2.1**.

19.155 The population groups relevant to this assessment are the same as set out in **Section 19.6.2.1.**

19.156 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 19.6.2.1**.

19.157 **Chapter 14 Shipping and Navigation** assesses potential effects to recreational vessels as part of the assessment including impact on risk of allision and collision within the windfarm site due to presence of WTGs and concludes effects are not significant. In addition, as identified in **Chapter 17 Infrastructure and Other Users**, effects to marine recreational are not significant given the low level of activity in the area around the windfarm site and that activities can occur in nearby marine areas.

19.158 The magnitude of change due to the Project is **negligible**. This reflects that there is a *small* scale of change over the *long-term* in shipping movements that could affect marine and nearshore recreational and leisure activities. Any such effects are likely to be *occasional*. The change is likely to be a *very minor* change in *quality of life* for a *very few* people within the affected population. *No* effect on healthcare services would be expected.

19.159 The effect is characterised as being *adverse* in direction, permanent and *indirect*. The significance of the population health effect is **negligible adverse** (not significant in EIA terms). The rationale for this conclusion is as set out in **Section 19.6.2.1**

19.6.3.2 Education: Workforce upskilling

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

19.161 Increased educational attainment is associated with better health outcomes as set out in **Section 19.6.2.2**.

19.162 The assessment has informed, and been informed by, the OSEP statements on targeting opportunities to vulnerable groups, including to address health inequalities, as discussed in **Paragraph 19.110**.

19.163 This section has been informed by **Chapter 20 Socio-economics, Tourism and Recreation**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

19.164 A potential population health effect is considered likely following the same source-pathway-receptor model as set out in **Section 19.6.2.2**

19.165 The population groups relevant to this assessment are the same as set out in **Section 19.6.2.2**

19.166 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 19.6.2.2**.

19.167 **Chapter 20 Socio-economics, Tourism and Recreation** assesses the economic impact on employment and increases of employment during operation and maintenance phase as negligible beneficial for the Local Economic Area and the UK which is not significant in EIA terms.

19.168 The magnitude of change due to the Project is **low**. This reflects that whilst the scale of new training opportunities is not yet confirmed, the OSEP contains specific statements, covering operation as well as construction, with regard to offering opportunities to underrepresented and vulnerable groups. 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. The population extent is currently uncertain until the scale of the training opportunity is confirmed, but likely relates to a small minority of the population.

19.169 The effect is characterised as being *beneficial* in direction, *permanent* in supporting ongoing future career progression and *indirect*. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms). The rationale for this conclusion is as set out in **Section 19.6.2.2**.

19.6.3.3 Socioeconomic status: Employment and investment

19.170 This section considers the population health implications of increased employment and economic impacts during operation and maintenance.

19.171 Employment is an important determinant of health and wellbeing as set out in **Section 19.6.2.3**.

19.172 This section has been informed by **Chapter 20 Socio-economics, Tourism and Recreation** (potential beneficial effects) and **Chapter 13 Commercial Fisheries** (potential adverse effects), which sets out relevant assessment findings and mitigation measures that have been taken into account. This

section has also informed, and been informed by, the OSEP statements on vulnerable groups as discussed in **Paragraph 19.110**.

19.173 A potential population health effect is considered likely following the same source-pathway-receptor model as set out in **Section 19.6.2.3**.

19.174 The population groups relevant to this assessment are the same as set out in **Section 19.6.2.3**.

19.175 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 19.6.2.3**.

19.176 **Chapter 20 Socio-economics, Tourism and Recreation** concludes the operations and maintenance of the Project will result in an increase in the turnover of businesses supporting operational activities and the changes in turnover will support jobs required to fulfil those contracts. The operational effects of the Project are concluded to be negligible beneficial in the Local Economic Area and the UK.

19.177 The magnitude of beneficial change due to the Project is **low**. This reflects a relatively *small* scale of change in operational employment in the context of the local labour market and the UK. As reported in **Chapter 20 Socio-economics, Tourism and Recreation,** the level of employment supported by the Project is less than 0.1% of total employment in the Local Economic Area and the UK. 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 *minor* changes in *morbidity* and *quality of life* for a *small minority* of the population due to improved socio-economic status and increased spending on health supporting resources and activities.

19.178 There is also the potential for adverse effects associated with reduced commercial fishery productivity. This has been assessed in **Chapter 13 Commercial Fisheries**, where operational effects are concluded to be minor adverse or lower. For population health the effects are judged to relate to a *very small* scale of change over the *long-term*. A frequent or continuous effect may occur to a *very small* minority of the population. This is likely to relate to *minor* changes in physical and mental health morbidity associated with income and job insecurity. At most there may be *slight* healthcare service implications. The magnitude of the adverse change is also rated as **low**.

19.179 The effect is characterised as being *beneficial* and *adverse* in direction, *permanent* and *indirect*. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms) in relation to employment opportunities and **minor adverse** (not significant in EIA terms) in relation to potential job or income insecurity in parts of the

commercial fishing industry. The rationale for this conclusion is as set out in **Section 19.6.2.3**.

19.6.3.4 Environmental conditions: Climate change

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

19.181 Renewable energy generation supports avoiding adverse health effects associated with climate change. These include extreme temperature effects, extreme weather patterns such as storms and flooding, infectious disease 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.

19.182 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 (Smith *et al*., 2014).

19.183 Key health outcomes (globally) relate to heat-related disorders (e.g., heat stress and lower work capacity), respiratory disorders (e.g., worsened asthma), infectious diseases, population displacement, food insecurity (e.g., lower crop yields) and mental stress associated with natural disasters.

19.184 A potential population health effect is considered likely because there is a plausible source-pathway-receptor relationship:

- Source: renewable energy created during the operation of the windfarm
- Pathway: reduction in climate-altering pollutants that contribute to climate change, which is associated with global changes in temperature, crop yields, productivity, and disease prevalence
- Receptor: international global population, particularly deprived populations in low- and middle-income countries

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

19.186 The population groups relevant to this assessment are:

- The 'national' population of England
- The 'international' population globally. This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to less capacity to adapt to climate change:
  - Young age vulnerability (children and young people)
  - Old age vulnerability (older people)
  - Low-income vulnerability (people living in deprivation, including those on low incomes)
  - Poor health vulnerability (people with existing poor physical and mental health)
  - Social disadvantage (people who experience low social status or social isolation)
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on amenities that may be affected by climate change).

19.187 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 19.6.1.**

19.188 The sensitivity of the general population is **low**. Nationally, this reflects that England 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. The effects on international populations vary depending upon the level of development and climate change resilience of each country. Overall, the general international population is considered to have capacity to adapt and is therefore considered to be low sensitivity.

19.189 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 (including various international populations). Disproportionate effects on the most disadvantaged in society are likely to widen health inequalities. Although people in England 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).

19.190 As reported in **Chapter 21 Climate Change**, the Project will contribute to the supply of renewable energy to decarbonise the power sector and support emission reductions in other economic sectors.

19.191 The magnitude of change due to the Project is **low**. This reflects that 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.

19.192 The effect is characterised as being beneficial in direction, permanent and due to a range of direct and indirect health pathways. The significance of the population health effect is **minor beneficial** (not significant in EIA terms). 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 supports 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.

19.6.3.5 Safe and cohesive communities: Community identity

19.193 This section considers the effect on community identity for coastal residents due the visual impact of the operational windfarm., c.30km offshore.

19.194 Health effects may be associated with mental health conditions (e.g., stress, anxiety, or depression) due to underlying social determinants influencing community cohesion and wellbeing.

19.195 The Project influences community identity through visual cues, i.e., the visibility of the windfarm, which includes beneficial effects reminding people that the green economy supports employment opportunities and renewable electricity generation; as well as potential adverse effects where people feel the coastal setting is adversely affected.

19.196 This section has been informed principally by **Chapter 18 Seascape, Landscape and Visual Impact Assessment** and **Chapter 20 Socio-economics, Tourism and Recreation**.

19.197 A potential population health effect is considered likely because there is a plausible source-pathway-receptor relationship:

- The source is: visual change associated with the operational windfarm; socio-economic change due to increased employment and investment opportunity

- The pathway is factors that contribute to behaviour and a sense of identity, including changes in visual environmental cues; and economic and prosperity cues that influence social status
- Receptors are residents in the local coastal communities

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

19.199 The population groups relevant to this assessment are:

- The 'local' coastal population of Wyre, Fylde, West Lancashire, Blackpool and Sefton, noting these areas are those that have the most visibility to the Project with views outside this area limited. This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to:
  - Old age vulnerability (older people as long-term residents whose sense of community identity may be more sensitive to changes in visual and auditory cues)
  - Low-income vulnerability (people living in deprivation, including those on low incomes for who employment opportunity is a strong driver of community identity)
  - Social disadvantage (people who experience low social status or social isolation that are sensitive to changes in community identity)

19.200 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 19.6.1**.

19.201 The sensitivity of the general population is **low**. This reflects that for most people in the local area (Wyre, Fylde, West Lancashire, Blackpool and Sefton) the Project would not be a strong driver of community identity given many other influences on the local social, economic and environmental landscape. For most people there would be no regular views of the windfarm.

19.202 The sensitivity of the vulnerable group population is 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 the Project.

19.203 **Chapter 18 SLVIA** identifies significant visual effects of the Project are contained within the areas of the Fylde and Sefton coasts. Although there are localised major to moderate effects on views at some locations along the coast, these visual effects do not translate into significant effects on the perceived landscape character, which is extensively urbanised, and its fundamental urban/settled character will not be changed as a result of the

Project. **Chapter 20 Socio-economics, Tourism and Recreation** identifies no significant impacts to tourism.

19.204 The magnitude of change due to the Project is **low**. This reflects that, although **Chapter 18 SLVIA** identifies that localised effects may range in magnitude from negligible to medium, for health, the population's distant views of the windfarm 30km offshore is most appropriately characterised as a *small* scale of visual change. The change would be *long-term,* with the role of such views in influencing wellbeing and mental health outcomes ranging from *occasional* to *frequent* depending on people's location, activities and weather conditions. The context of other existing windfarm development in the Irish sea, including but not limited to West of Duddon Sands and Burbo Bank offshore windfarms along the coastline, is relevant to the level of change in community identity. The change is likely to have a *very minor* influence on quality of life and morbidity risk factors linked to wellbeing for a *small minority* of the population.

19.205 The effect is characterised as being both beneficial and adverse in direction, permanent and indirect. The significance of the population health effect is up to a **minor beneficial** (not significant in EIA terms) in relation to improved community identity associated with the green economy. However, there may also be up to a **minor adverse** (not significant in EIA terms) effect due to the adverse visual cues affecting the wellbeing of some residents. The level of change in sense of place and community cohesion is unlikely to influence health policy delivery or inequalities. Any change to the local population health baseline would be slight and comprised of both beneficial and adverse influences.

19.6.3.6 Wider societal benefits

19.206 The Project supports UK energy security, which is important for maintaining continuity and affordability of electricity supplies. Public health has a high reliance on electricity supplies. 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 networking. Sustained interruption of supply or rapid increases in costs would both be expected to result in reductions in health and wellbeing outcomes.

19.207 The potential health effect is considered likely because there is a plausible source-pathway-receptor relationship:

- Source: renewable electricity generation
- Pathway: energy security whilst avoiding climate altering emissions
- Receptor: population connected to the national grid

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

19.209 The population groups relevant to this assessment are:

- The 'national' population of England, and the wider UK. This represents the general population as defined in **Section 19.6.1**.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people)
  - Old age vulnerability (older people)
  - Low-income vulnerability (people living in deprivation, including those on low incomes)
  - Poor health vulnerability (people with existing poor physical and mental health)
  - Social disadvantage (people who experience low social status or social isolation)
  - Access and geographical vulnerability (people who rely on services or amenities that are dependent on continuity of electricity supply)

19.210 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 19.6.1**.

19.211 The sensitivity of the general population is **low**. 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.

19.212 The sensitivity of the vulnerable group population is **high**. This reflects the sub-population on low incomes or with fewer resources for whom energy security, costs of energy, and interruption of energy supplies, 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.

19.213 The magnitude of change due to the Project's anticipated nominal 480MW capacity of renewable electricity, powering over of 500,000 homes, is **medium**. This is driven by the long-term and continuous public health benefits to energy security, despite the scale of the Project's 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 grid to a large

minority of the national population. Such effects may bring small benefits to healthcare service quality by reducing capacity burdens.

19.214 The significance of the population health effect for this determinant of health is **moderate beneficial** (significant in EIA terms). The professional judgment is that the Project provides a protective effect on the health baseline and that this would be important for public health. This conclusion reflects that the scientific literature 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.

19.6.4 Potential impacts during decommissioning

19.6.4.1 Healthy lifestyles: Physical activity and leisure

19.215 Effects are likely to be very similar to those described for construction. To avoid duplication such effects are not restated. The significance of the population health effect is **negligible** (not significant in EIA terms).

19.6.4.2 Education: Workforce upskilling

19.216 Effects are likely to be very similar to those described for construction. To avoid duplication such effects are not restated. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms).

19.6.4.3 Socioeconomic status: Employment and investment

19.217 Effects are likely to be very similar to those described for construction. To avoid duplication such effects are not restated. The significance of the population health effect for this determinant of health is **minor beneficial** (not significant in EIA terms) in relation to employment opportunities, and **minor adverse** (not significant in EIA terms) in relation to potential job or income insecurity in parts of the commercial fishing industry.

19.6.4.4 Environmental conditions: Water

19.218 Effects are likely to be very similar to those described for construction. To avoid duplication such effects are not restated. The significance of the population health effect for this determinant of health is **negligible** (not significant in EIA terms).

19.6.4.5 Environmental conditions: Climate change

19.219 The Project would be a part of a wider positive energy sector transition that reduces the severity of climate change. During decommissioning there would

be carbon emissions associated with shipping and disassembly of generating infrastructure and recycling or disposal of materials with embodied carbon. Such effects are discussed in **Chapter 21 Climate Change**. The level of effect is not expected to be of a scale that could give rise to likely significant population health effects. The receptor to greenhouse gasses is the global climate and considering the construction and decommissioning phases alongside the operation phase an overall positive impact is identified for climate change. As such climate change has been considered overall in the operational phase. In line with proportionate assessment, decommissioning climate change effects are scoped out of the health chapter.

19.6.4.6 Safe and cohesive communities: Community identity

19.220 Visual change can affect mental health and wellbeing with psychological and physiological responses. The nearest point from the windfarm site to shore is approximately 30km. During decommissioning there would be views of shipping and disassembly of the generating infrastructure that is above sea level. Such effects are discussed in **Chapter 18 SLVIA**. The level of effect is not expected to be of a scale that could give rise to likely significant population health effects. In line with proportionate assessment, decommissioning community identity effects are scoped out of the health chapter.

19.7 Cumulative effects

19.221 In order to undertake the CEA, and as per the PINS advice note (PINS, 2019), the potential for cumulative effects has been established considering each Project-alone effect (and the ZoI of each impact) alongside the list of plans, projects and activities that could potentially interact. These stages are detailed below.

19.7.1 Identification of potential cumulative effects

19.222 Part of the cumulative assessment process is the identification of which individual impacts assessed for the Project have the potential for a cumulative effect on receptors (impact screening). This information is set out in **Table 19.14**~~**Table 19.14**~~. Screening considers the ZoI of the impacts, and the plans, projects and activities identified in **Table 19.15**~~**Table 19.15**~~.

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19.223 Impacts for which the significance of effect is assessed in the Project-alone assessment as ‘negligible’, or above, are considered in the CEA screening (i.e. only those assessed as ‘no change’ are not taken forward as there is no potential for them to contribute to a cumulative effect).

Table 19.14 Summary of potential cumulative effects (impact screening)

Impact	'Project-alone' residual effect significance	Potential for cumulative effect	Rationale
Construction phase			
Impact 1: Healthy lifestyles: Physical activity and leisure	Negligible adverse	Yes	Potential pathway of effects to the same populations from other large-scale developments of a similar scale and nature
Impact 2: Education: Workforce upskilling	Minor beneficial	Yes	
Impact 3: Socioeconomic status: Employment and investment	Minor adverse to Minor beneficial	Yes	
Impact 4: Environmental conditions: Water	Negligible adverse	Yes	
Impact 5: Environmental conditions: Climate change	Not assessed for construction phase	No	The level of effect during construction is not expected to be of a scale that could give rise to likely significant population health effects. Climate change effects are considered for the operational phase in **Section 19.6.3.4**.
Impact 6: Safe and cohesive communities: Community identity	Not assessed for construction phase	No	The level of activity during construction is not expected to be of a scale that could give rise to likely significant population health effects. Community identity effects are assessed for the operational phase in **Section 19.6.3.5**.

Impact	'Project-alone' residual effect significance	Potential for cumulative effect	Rationale
Operation and maintenance phase			
Impact 1: Healthy lifestyles: Physical activity and leisure	Negligible adverse	Yes	Potential pathway of effects to the same populations from other large-scale developments of a similar scale and nature.
Impact 2: Education: Workforce upskilling	Minor beneficial	Yes	
Impact 3: Socioeconomic status: Employment and investment	Minor adverse to Minor beneficial	Yes	
Impact 4: Environmental conditions: Climate change	Minor beneficial	Yes	
Impact 5: Safe and cohesive communities: Community identity	Minor adverse to Minor beneficial	Yes	
Impact 6: Wider societal benefits	Moderate beneficial	Yes	
Decommissioning phase			
Impact 1: Healthy lifestyles: Physical activity and leisure	Negligible adverse	Yes	Potential pathway of effects to the same populations from other large-scale developments of a similar scale and nature
Impact 2: Education: Workforce upskilling	Minor beneficial	Yes	
Impact 3: Socioeconomic status: Employment and investment	Minor adverse to Minor beneficial	Yes	
Impact 4: Environmental conditions: Water	Negligible adverse	Yes	

Impact	'Project-alone' residual effect significance	Potential for cumulative effect	Rationale
Impact 5: Environmental conditions: Climate change	Not assessed for decommissioning phase	No	The level of effect during decommissioning is not expected to be of a scale that could give rise to likely significant population health effects. Climate change effects are considered for the operational phase in **Section 19.6.3.4**.
Impact 6: Safe and cohesive communities: Community identity	Not assessed for decommissioning phase	No	The level of activity during decommissioning is not expected to be of a scale that could give rise to likely significant population health effects. Community identity effects are assessed for the operational phase in **Section 19.6.3.5**.

19.7.2 Identification of other plans, projects and activities

19.224 The identification and review of other plans, projects and activities that may result in cumulative effects (described as 'project screening') has been undertaken alongside an understanding of Project-alone effects. For human health, the potential cumulative activities include those plans or projects that could affect the same populations within the geographic areas where effects have been identified for the Project. The potential for overlap in the populations affected is however likely to vary by determinant.

19.225 As illustrated in Table 19.15~~Table 19.15~~ and **Figure 19.1**, projects could collectedly contribute to changes in all the health determinants discussed in this chapter. Projects that are of a similar scale, location and type are considered to have the greatest potential for cumulative effects. This chapter is informed by cumulative assessment conclusions set out in other chapters, which consider a wider list of cumulative plans and projects.

19.226 All projects considered for CEA across all topics have been identified within **Appendix 6.1 CEA Project Long List** of **EIA Methodology** (Document Reference 5.2.6.1) which forms an exhaustive list of plans, projects and activities relevant to the Project.

Table 19.15 Summary of projects considered for the CEA in relation to human health

Project	Status (at the time of writing)	Construction Period	Closest distance from the Project (km)	Screened into the CEA (Y/N)	Rationale
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Pre-application stage. PEIR published in October 2023	2026 – 2029	0 (adjacent)	Y	There is potential for some receptors to be impacted for both the Project and the Transmission Assets. Both projects consider the potential for effects on water quality and recreation, affecting physical activity and mental health outcomes, and socio-economic opportunities for jobs and training.
Mona Offshore Wind Project	Pre-application stage. PEIR submitted in April 2023.	2026 - 2029	10.0	Y	Construction, operational and maintenance and decommissioning pathways of impacts to local receptors e.g., visual or restrictions to recreational activity, as well as potential employment and wider societal benefits from renewable electricity generation.
Morgan Offshore Wind Project Generation Assets	Pre-application stage. PEIR submitted in April 2023.	2026 - 2029	16.7	Y	Construction, operational and maintenance and decommissioning pathways of impacts to local receptors e.g., visual or restrictions to recreational activity, as well as potential employment and wider societal benefits from renewable electricity generation.

Project	Status (at the time of writing)	Construction Period	Closest distance from the Project (km)	Screened into the CEA (Y/N)	Rationale
Awel y Môr Offshore Windfarm[11]	Consent granted 2023.	2027 – 2030	28.9	Y	Assessments made to public health are relative to local onshore populations in Wales. Project effects to receptors in Wales have not been identified in this chapter at a level where significant cumulative effects could arise. It is noted that cumulative effects associated with shipping and navigation are considered within the assessment as identified in **Chapter 14 Shipping and Navigation**.
Mooir Vannin Offshore Windfarm[11]	Pre-application stage. Scoping Report submitted in 2023.	2030 - 2032	43.7	Y	Project effects to receptors in Isle of Man have not been identified in this chapter at a level where significant cumulative effects could arise. It is noted that cumulative effects associated with shipping and navigation are considered within the assessment as identified in **Chapter 14 Shipping and Navigation**.

[11] However, is considered within chapters that inform this assessment.

19.7.3 Assessment of cumulative effects

19.227 Having established the residual effects from the Project with the potential for a cumulative effect, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of cumulative effect that may arise. These are detailed below in themes to cover impacts where the potential for cumulative effects has been identified (in line with **Table 19.14~~Table 19.14~~**). Given the cumulative assessment findings within the Shipping and Navigation assessment, the impacts to transport nodes have also been included in the CEA.

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19.228 Given the interconnected nature of the Project and the Transmission Assets, a separate 'combined' assessment of these is provided within the CEA (**Section 19.7.3.1**). Thereafter, the cumulative assessment considers all plans, projects and activities screened into the CEA (**Section 19.7.3.2**).

19.7.3.1 Cumulative assessment – the Project and Transmission Assets (combined assessment)

19.229 While the Transmission Assets[12] are being considered in a separate ES as part of a separate DCO application (combined with the Morgan Offshore Wind transmission assets), given the functional link, a 'combined' assessment has been made considering both the Project and Transmission Assets for the purposes of cumulative assessment. This provides an assessment including impact interactions and additive effects and thus any change in the significance of effects as assessed separately.

19.230 The PEIR of the Transmission Assets includes Volume 1, Annex 5.1: Human health (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Ltd, 2023). That assessment scopes out offshore effects as not having the potential for likely significant effects on population health. The onshore activity scope of that annex considers how onshore populations are affected in relation to changes in: transport modes, access and connections; open space, leisure and play; socio-economic factors; air quality; water quality; land quality; noise and vibration; and understanding of electro-magnetic field risk. The annex concludes that there would be no significant effects to population health.

19.231 Whilst there is some overlap in the determinants of health assessed between the Project and the Transmission Assets, there is very limited overlap in the

[12] As the Transmission Assets includes infrastructure associated with both the Project and the Morgan Offshore Wind Project Generation Assets, it should be noted that the combined assessment considers the transmission infrastructure for both the Project and the Morgan Offshore Wind Project Generation Assets (and includes all infrastructure as described in the Transmission Assets PEIR).

populations that would experience the respective effects. The situation is of separate 'sources' of impact, having geographically distinct 'pathways', to different 'receptor' populations.

19.232 For adverse effects, both projects consider the potential for effects on water quality and recreation, affecting physical activity and mental health outcomes. For all project phases, both projects find each of these effects to be not significant. The combination between the projects is characterised as there being very limited overlap in the individuals who may experience effects, and each effect having very limited potential to affect population health. Cumulatively the projects are considered unlikely to give rise to greater effects, i.e. they would not result in significant adverse effects for public health.

19.233 Similarly for beneficial effects, whilst both projects consider the socio-economic opportunities for jobs and training, the combined effects (whilst more beneficial), is not considered so great as to give rise to a significant population health effect. The combined effect therefore remains not significant.

19.234 Due to the differing nature of the two projects, there are a range of determinants of health that are assessed by one, but not both, projects, e.g. the wider societal benefits of the renewable energy generation for public health is assessed only in the Project and not also in the Transmission Assets. This avoids double counting. Such instances where the same determinants of health are not assessed by both projects are not considered likely to give rise to cumulative effects.

19.7.3.2 Cumulative assessment - all plans and projects

19.235 Based on both the impacts (Table 19.14~~Table 19.14~~) and other plans and projects (Table 19.15~~Table 19.15~~) identified, where required, a detailed cumulative assessment was undertaken considering all relevant information from the Project and other plans and projects (including the Transmission Assets).

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19.236 Cumulative health assessment extends the analysis of each determinant of health. This means for each determinant of health the relevant reasonably foreseeable cumulative projects are listed and a professional judgement is made as to the combined level of effect and its implications for public health.

19.237 As set out in IEMA 2022 guidance for human health, a combined public health effect is most likely where a population is affected by multiple determinants of health and a large proportion of the same individuals within that population experience the combination of effects.

19.238 A high degree of spatial proximity is required for there to be the potential for cumulative effects for localised changes in determinants of health, e.g., dust

from a construction site. In contrast, where there are more far-reaching effects in a determinant of health, e.g., job creation or noise along shared transport corridors, there is greater opportunity for cumulative interactions between projects.

19.239 The Project, Morgan Offshore Wind Project Generation Assets, the Mona Offshore Wind Project and the Morgan and Morecambe Offshore Wind Farms Transmission Assets are geographically separate such that they would affect different populations. As there is not a large overlap in the populations affected or the effect experience would be different there are not new or materially different magnitude or significance conclusions identified as detailed below.

19.240 A PEIR for the Transmission Assets, as well as PEIRs for the Mona Offshore Wind Project and Morgan Generation Assets projects have been published and, at the time of writing, the projects were preparing respective ES's.

Healthy lifestyles, education and the water environmental conditions

19.241 As construction phase effects of the Project on healthy lifestyles and the water environment are considered to be negligible for population health, and given the assessments made for other projects, no potential for significant effects (relevant to the Project) when considered cumulatively with other projects are identified. This is due to mitigations in place for all projects.

19.242 For construction, operation and maintenance and decommissioning phases, collective beneficial training and jobs effects between projects are noted and are likely to be greater than the effects of the Project in isolation. However, given the geographically different populations affected and in the context of the overall UK, effects in EIA terms would remain as identified for Project-alone.

Socioeconomic status: Employment and investment

19.243 The identified significant cumulative adverse effects in association with commercial fisheries during construction presents, regionally, more frequent disruptions and greater combined risks. Effects, and residual risks, would be mitigated, including by the Project as detailed in **Chapters 13 Commercial Fisheries**. As such, while significant effects have been identified on specific fish fleets, there is no anticipated significant effect on human health, with the cumulative effects on human health receptors considered as minor adverse. Cumulative employment benefits are noted but are not expected to be on a scale within regional employment markets to give rise to a significant population health effect. The beneficial effect therefore remains as for the individual level effect.

Safe and cohesive communities: Community identity

19.244 The potential for the Project to have a cumulative adverse effect on community identity with other projects during the operation and maintenance phase has been considered. Whilst there is some reduction in the extent of open sea views during particularly clear weather, when the Mona and Morgan Offshore Wind Projects may also be visible from parts of the Sefton and Fylde coast, the cumulative visual impact of all the projects (beyond Project-alone effects) as identified in **Chapter 18 SLVIA**, does not assign a cumulative effect significance greater than Project-alone effects, which are discussed in **Section 19.6.3.5**. As such no significant effect on population health outcomes is anticipated.

Wider societal benefits and climate change

19.245 Operational benefits for population health associated with wider societal benefits of renewable energy production are likely to be cumulatively greater when taking into account other large-scale renewables projects, such as Morgan and Mona Offshore Wind Projects. Considering the effects identified for these other projects a cumulative effect, of moderate beneficial is considered. For climate change, whilst there may similarly be cumulative benefits for vulnerable population groups, the combined effect is not expected to be greater than minor beneficial. This reflects the context of needing to account for all development affecting the global atmosphere as a receptor.

Transport Modes

19.246 There are no Project-alone human health effects identified as a result of shipping and navigation impacts (impacts to transport modes). While cumulative effects on shipping and navigation receptors are identified, mitigation, as detailed in **Chapter 14 Shipping and Navigation**, has been identified and as such there are no anticipated significant effects on shipping and navigation receptors or on human health receptors. The Project does not contribute to significant navigation safety risks that have been identified in the region between the Morgan and Mooir Vannin projects as detailed in **Chapter 14 Shipping and Navigation**.

19.247 It is noted that the location of the Mona Offshore Wind Project and Morgan Offshore Wind Project Generation Assets, together with the Project have cumulative shipping and navigation effects, including ferry routes to the Isle of Man and Belfast. These effects arise from modest but appreciable delays on some routes. The Project is however not a key contributor to cumulative shipping and navigation effects, particularly in relation to the Isle of Man routes. Significant delays or cancellations would only arise if there has been an earlier sailing on that day. It remains the case that the first sailing of the day to or from the Isle of Man would allow medical and other health related deliveries and trips to occur. As medical supplies to the Isle of Man are

routinely scheduled on the Wednesday early morning sailing (02:15) from Heysham to Douglas (a route that is not directly impacted by the Project), these supplies arrive on the Isle of Man, even if slightly delayed. The margins of delay, even if a few hours, are not considered to compromise the refrigeration or shelf-life of medical drugs or other products. It is noted that there are a range of other existing transport options that contribute to resilience in access to Isle of Man. These include the MV Arrow freight relief vessel and transport via Isle of Man Airport. Use of the first sailing of the day for medical and health related deliveries and trips, continues to be appropriate to mitigate against adverse weather delays, with or without the Project. For food transport there is not considered to be a risk of food shortages, although there may remain times (likely limited to a few days duration on an occasional basis) when fresh foods are low in stock due to adverse weather (noting the Project does not directly impact the adverse weather routes to the IoM). The scheduling of fresh foods, including fruit and vegetables, to early sailings on a given day is likely to continue to minimise any temporary reduction in healthy food choices. Any minor delays on a crossing are not considered to present a risk to public health. As such there is no likely significant effect for public health identified.

Summary

19.248 In conclusion and as demonstrated in **Table 19.16**~~**Table 19.16**~~, no significant adverse effects on population health are expected due to cumulative effects with other projects. Beneficial effects for population health would remain and may be extended.

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Table 19.16 Summary of CEA assessment

Potential impact	Receptor	Sensitivity	Magnitude	Cumulative effect
Construction/decommissioning phase				
Transport modes	General population	Low	Low	Not Significant (Minor adverse)
	Vulnerable group population	High		
Healthy lifestyles: Physical activity and leisure	General population	Low	Negligible	Not Significant (Negligible adverse)
	Vulnerable group population	High		
	General population	Low	Low	Not Significant (Minor beneficial)

Potential impact	Receptor	Sensitivity	Magnitude	Cumulative effect
Education: Workforce upskilling	Vulnerable group population	High		
Socioeconomic status: Employment and investment	General population	Low	Low	Not significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High		
Environmental conditions: Water	General population	Low	Negligible	Not Significant (Negligible adverse)
	Vulnerable group population	High		
Operation and maintenance phase				
Transport modes	General population	Low	Low	Not Significant (Minor adverse)
	Vulnerable group population	High		
Healthy lifestyles: Physical activity and leisure	General population	Low	Negligible	Not Significant (Negligible)
	Vulnerable group population	High		
Education: Workforce upskilling	General population	Low	Low	Not Significant (Minor beneficial)
	Vulnerable group population	High		
Socioeconomic status: Employment and investment	General population	Low	Low	Not significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High		

Potential impact	Receptor	Sensitivity	Magnitude	Cumulative effect
Environmental conditions: Climate change	General population	Low	Low	Not Significant (Minor beneficial)
	Vulnerable group population	High		
Safe and cohesive communities: Community identity	General population	Low	Low	Not Significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High		
Wider societal benefits	General population	Low	Medium	Significant (Moderate beneficial)
	Vulnerable group population	High		

19.8 Transboundary effects

19.249 Based on the residual effect findings of **Chapter 14 Shipping and Navigation, Chapter 13 Commercial Fisheries** and **Chapter 20 Socio-economics, Recreation and Tourism** it is not considered that the Project in isolation has the potential for likely significant transboundary population health effects and has a small contribution to cumulative effects.

19.250 In relation to direct and indirect employment through the Project supply chain, the Project proponent operates appropriate policies in accordance with current regulation and good practice, including in relation to general employment and avoiding issues of discrimination. Appropriate policies and standards are expected for contractors, including in transboundary contexts. On this basis there are unlikely to be likely significant population health effects.

19.9 Inter-relationships

19.251 There are clear inter-relationships between the human health topic and several other topics that have been considered within this ES (in that they have informed this chapter). These are as follows:

- **Chapter 8 Marine Sediment and Water quality**
- **Chapter 13 Commercial Fisheries**
- **Chapter 14 Shipping and Navigation**

- **Chapter 17 Infrastructure and Other Users**
- **Chapter 18 SLVIA**
- **Chapter 20 Socio-economics, Tourism and Recreation**
- **Chapter 21 Climate Change**

19.252 These linkages have been identified and assessed throughout this chapter with impacts assessed in these chapters used in defining the magnitude of impacts on human health as well as identifying the ZoI of impacts and as such the receptor pathways.

19.10 Interactions

19.253 The impacts identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between impacts are presented in Table 19.17~~Table 19.17~~ and Table 19.18~~Table 19.18~~. This provides a screening tool for which impacts have the potential to interact. The impacts have been assessed relative to each development phase (i.e., construction, operation and maintenance, or decommissioning) to see if (for example) multiple construction impacts affecting the same population could increase the level of impact upon that population.

19.254 Following this, a lifetime assessment is undertaken, which considers the impact interactions identified as well as effects on receptors relevant across all development phases (Table 19.19~~Table 19.19~~).

19.255 In Table 19.17~~Table 19.17~~ and Table 19.18~~Table 19.18~~ the term 'No' indicates that there is unlikely to be an interaction because there is limited potential for the same individuals to be affected. Phase and lifetime assessments (Table 19.19~~Table 19.19~~) take into account that beneficial and adverse impacts do not necessarily affect the same people, so do not necessarily cancel each other out and are not necessarily additive or synergistic.

Table 19.17 Interaction between impacts - screening (construction and decommissioning phase)

	Potential interaction between construction phase impacts			
	Impact 1: Healthy lifestyles: Physical activity and leisure	**Impact 2: Education: Workforce upskilling**	**Impact 3: Socioeconomic status: Employment and investment**	**Impact 4: Environmental conditions: Water**
Impact 1: Healthy lifestyles: Physical activity and leisure		No	No	Yes
Impact 2: Education: Workforce upskilling	No		Yes	No
Impact 3: Socioeconomic status: Employment and investment	No	Yes		No
Impact 4: Environmental conditions: Water	Yes	No	No	
	Potential interaction between decommissioning phase impacts			
	The magnitudes of impact would be comparable to those identified for the construction phase. Accordingly, given that no significant effects were assessed on receptors during the construction phase, it is anticipated that the same would be valid for the decommissioning phase.			

Table 19.18 Interaction between impacts - screening (operation and maintenance phase)

	Potential interaction between impacts					
	Impact 1: Healthy lifestyles: Physical activity and leisure	**Impact 2: Education: Workforce upskilling**	**Impact 3: Socioeconomic status: Employment and investment**	**Impact 4: Environmental conditions: Climate change**	**Impact 5: Safe and cohesive communities: Community identity**	**Impact 6: Wider societal benefits**
Impact 1: Healthy lifestyles: Physical activity and leisure		No	No	Yes	Yes	Yes
Impact 2: Education: Workforce upskilling	No		Yes	Yes	No	Yes
Impact 3: Socioeconomic status: Employment and investment	No	Yes		Yes	No	Yes
Impact 4: Environmental conditions: Climate change	Yes	Yes	Yes		Yes	Yes
Impact 5: Safe and cohesive communities: Community identity	Yes	No	No	Yes		Yes
Impact 6: Wider societal benefits	Yes	Yes	Yes	Yes	Yes	

Table 19.19 Interaction between impacts – phase and lifetime assessment

	Highest significance of effect level				
Receptor	**Construction**	**Operation**	**Decommissioning**	**Phase assessment**	**Lifetime assessment**
Local population	Physical activity and leisure [negligible] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial] Water quality [negligible]	Physical activity and leisure [negligible adverse] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial] Community identity [minor beneficial and minor adverse]	Physical activity and leisure [negligible adverse] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial]	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from both training and employment opportunities within a given phase, this is assessed as no greater than the individually assessed impact.	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people across all project phases, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from training and employment opportunities across the Project phases, this is assessed as no greater than the individually assessed impact.
Regional population	Workforce upskilling [minor beneficial]	Workforce upskilling [minor beneficial]	Workforce upskilling [minor beneficial]	No greater than individually assessed impact.	No greater than individually assessed impact.

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
	Employment and investment [minor beneficial]	Employment and investment [minor beneficial]	Employment and investment [minor beneficial]	Beneficial impacts do not necessarily affect the same people within each project phase and are not necessarily additive or synergistic. Whilst some people may benefit from both training and employment opportunities within a given phase, this is assessed as no greater than the individually assessed impact.	Beneficial impacts do not necessarily affect the same people across all project phases and are not necessarily additive or synergistic. Whilst some people may benefit from training and employment opportunities across the Project phases, this is assessed as no greater than the individually assessed impact.
National population		Climate change [minor beneficial] Wider societal benefits [moderate beneficial]		No greater than individually assessed impact. Beneficial impacts do not necessarily affect the same people within each project phase and are not necessarily additive or synergistic.	No greater than individually assessed impact. Beneficial impacts do not necessarily affect the same people across all project phases and are not necessarily additive or synergistic.

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
International population		Environmental conditions: Climate change [minor beneficial]		Multiple effects are not identified for the international population, therefore no greater than individually assessed impact.	Multiple effects are not identified for the international population, therefore no greater than individually assessed impact.
Population vulnerable due to age	Workforce upskilling [minor beneficial] Employment and investment [minor beneficial] Water quality [negligible adverse]	Workforce upskilling [minor beneficial] Employment and investment [minor beneficial] Climate change [minor beneficial] Community identity [minor beneficial and minor adverse] Wider societal benefits [moderate beneficial]	Workforce upskilling [minor beneficial] Employment and investment [minor beneficial]	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from both training and employment opportunities within a given phase, with indirect benefit extended to	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people across all project phases, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from training and employment opportunities across the Project phases, with indirect benefit extended to dependants young

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
				dependants young and old, this is assessed as no greater than the individually assessed impact.	and old, this is assessed as no greater than the individually assessed impact.

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
Population vulnerable due to income status	Physical activity and leisure [negligible adverse] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial/ minor adverse]	Physical activity and leisure [negligible adverse] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial/ minor adverse] Climate change [minor beneficial] Community identity [minor beneficial and minor adverse] Wider societal benefits [moderate beneficial]	Physical activity and leisure [negligible adverse] Workforce upskilling [minor beneficial] Employment and investment [minor beneficial/ minor adverse]	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people on low incomes may particularly benefit from both training and employment opportunities within a given phase, this is assessed as no greater than the individually assessed impact.	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people on low incomes may particularly benefit from training and employment opportunities across the Project phases, this is assessed as no greater than the individually assessed impact.
Population vulnerable due to health status	Workforce upskilling [minor beneficial]	Workforce upskilling [minor beneficial]	Workforce upskilling [minor beneficial]	No greater than individually assessed impact. Beneficial and adverse impacts do	No greater than individually assessed impact. Beneficial and adverse impacts do

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
	Employment and investment [minor beneficial/ minor adverse] Water quality [negligible adverse]	Employment and investment [minor beneficial/ minor adverse] Climate change [minor beneficial] Wider societal benefits [moderate beneficial]	Employment and investment [minor beneficial/minor adverse]	not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from both training and employment opportunities within a given phase, including where either they or their dependants have existing poor health, this is assessed as no greater than the individually assessed impact.	not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic. Whilst some people may benefit from training and employment opportunities across the Project phases, including where either they or their dependants have existing poor health, this is assessed as no greater than the individually assessed impact.

Receptor	Highest significance of effect level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
Population vulnerable due to social disadvantage	N/A	Climate change [minor beneficial] Community identity [minor beneficial and minor adverse] Wider societal benefits [moderate beneficial]	N/A	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic.	No greater than individually assessed impact. Beneficial and adverse impacts do not necessarily affect the same people within each project phase, so do not necessarily cancel each other out and are not necessarily additive or synergistic.
Population vulnerable due to access/ geographical factors	N/A	Climate change [minor beneficial] Wider societal benefits [moderate beneficial]	N/A	No greater than individually assessed impact.	No greater than individually assessed impact.

19.11 Potential monitoring requirements

19.256 There is no specific monitoring for human health identified, but there is monitoring proposed for the chapters that inform this assessment. Monitoring requirements for relevant chapters are described in the In-Principle Monitoring Plan (IPMP) (Document Reference 6.4) submitted alongside the DCO application and will be further developed and agreed with stakeholders prior to construction based on the IPMP and taking account of the final detailed design of the Project.

19.12 Assessment summary

19.257 This human health chapter assessment considers potential impacts on population health from changes due to the Project.

19.258 Population health varies given factors such as personal choice, location, mobility and exposure. These factors that influence health are called determinants of health and they span environmental, social, behavioural, economic and institutional aspects. The Project has the potential to change determinants of health, with beneficial and adverse effects, either directly, indirectly or cumulatively.

19.259 The methodology for assessing human health follows guidance and good practice as set out in the 2022 publications on health in EIA by IEMA. The assessment identifies any likely significant effects on population health. Consideration is given to physical health, mental health and health inequalities, across a broad range of determinants of health.

19.260 The health assessment is informed by the findings of other ES chapters, including: **Chapter 8 Marine Sediment and Water Quality**; **Chapter 13 Commercial Fisheries**; **Chapter 14 Shipping and Navigation**; **Chapter 17 Infrastructure and Other Users**; **Chapter 18 SLVIA**; **Chapter 20 Socio-economics, Tourism and Recreation** and **Chapter 21 Climate Change**. The health assessment has also been informed by a review of relevant public health evidence sources, including scientific literature, baseline data, health policy, local health priorities and health protection standards.

19.261 The health assessment looks at the potential effects for both the general population and for vulnerable groups. Vulnerability relates to experiencing effects differently due to age, income level, health status, degree of social disadvantage or ability to access services or resources. The health assessment considers localised effects for Wyre, Fylde, West Lancashire, Blackpool and Sefton, as well as effects to the wider regional population of the North West of England. The assessment also considers national and international effects.

19.262 A discussion on the Projects selection of port(s) and of workforce assumptions is provided in this human health chapter to support proportionate scoping and assessment on these issues (see **Table 19.1**~~**Table 19.1**~~ and **Table 19.2**~~**Table 19.2**~~).

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19.263 The human health chapter covers the following health determinants. In all cases specific regard is given to vulnerable groups.

19.264 Physical activity and leisure: The assessment considers the potential for physical and mental health effects due to Project infrastructure, vessels and activities causing disruption to marine and nearshore recreational and leisure activity opportunity. During construction, operation and maintenance and decommissioning the effects are considered negligible adverse (not significant).

19.265 Workforce upskilling: The potential benefits due to additional training and educational support, which can support health throughout life, are considered. The effect is minor beneficial (not significant) during construction, operation and maintenance and decommissioning.

19.266 Employment and investment: The potential benefits due to socio-economic factors (income and employment), which are strongly correlated with better health outcomes including for dependents, are considered. During construction, operation and maintenance and decommissioning the effects are considered minor beneficial (not significant) and minor adverse (not significant).

19.267 Water quality: Consideration is given to the population health implications of increases in suspended sediment and potential marine pollution releases. The distance of the windfarm site offshore and use of standard good practice measures to avoid and contain any spills means the effect would be negligible adverse (not significant) during construction, operation and maintenance and decommissioning.

19.268 Climate change: The contribution of the Project to avoiding health inequalities associated with climate change, including due to population displacement, food insecurity, shifts in communicable illness ranges and exposure to extreme weather conditions is considered. The significance of the population health effect for this determinant of health would be minor beneficial (not significant) during operation and maintenance. The effects would be negligible during construction and decommissioning so are not assessed in detail.

19.269 Community identity: The assessment considers the potential for Project changes, particularly visual changes to the seascape, to affect how coastal populations feel about their community. Community identity can affect mental health and wellbeing. As community identity is highly subjective there would be a range of responses to visual change. The assessment concludes that

during operation there would be both minor beneficial (not significant) and minor adverse (not significant) effects to population health, reflecting that some people would respond positively to distant windfarm views and others negatively. Effects during construction and decommissioning would be negligible and are not assessed in detail.

19.270 Wider societal benefits: Access to electricity supplies is important for many daily activities that support good health and facilitate healthcare services. The Project provides energy security equivalent to over half a million homes. This operational effect would have a **moderate beneficial** (**significant**) protective effect on public health nationally.

19.271 Cumulative effects, transboundary effects, as well as inter-relationships and interactions between health determinants have been considered. These are not expected to give rise to any additional likely significant effects for public health.

19.272 The OSEP discusses the benefits of vulnerable groups accessing training and employment opportunities, including in reducing health inequalities, and provides a basis whereby such benefits may be further extended in the future.

19.273 This chapter has provided a characterisation of the existing environment for human health based on both existing data source, which has established that the effects on human health during the construction, operation and decommissioning phases of the Project range from minor adverse, through negligible to moderate beneficial. A summary of the assessment is presented in **Table 19.20~~Table 19.20~~**.

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Table 19.20 Summary of potential impacts on human health

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation effect	Mitigation measures proposed	Residual effect	Cumulative effect
Construction phase							
Healthy lifestyles: Physical activity and leisure	General population	Low	Negligible	Not Significant (Negligible adverse)	None	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)
	Vulnerable group population	High					
Education: Workforce upskilling	General population	Low	Low	Not Significant (Minor beneficial)	None	Not Significant (Minor beneficial)	Not Significant (Minor beneficial)
	Vulnerable group population	High					
Socioeconomic status: Employment and investment	General population	Low	Low	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	None	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	Not Significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High					
Environmental conditions: Water	General population	Low	Negligible	Not Significant (Negligible adverse)	None	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)
	Vulnerable group population	High					

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation effect	Mitigation measures proposed	Residual effect	Cumulative effect
Operation and maintenance phase							
Healthy lifestyles: Physical activity and leisure	General population	Low	Negligible	Not Significant (Negligible adverse)	None	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)
	Vulnerable group population	High					
Education: Workforce upskilling	General population	Low	Low	Not Significant (Minor beneficial)	None	Not Significant (Minor beneficial)	Not Significant (Minor beneficial)
	Vulnerable group population	High					
Socioeconomic status: Employment and investment	General population	Low	Low	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	None	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	Not Significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High					
Environmental conditions: Climate change	General population	Low	Low	Not Significant (Minor beneficial)	None	Not Significant (Minor beneficial)	Not Significant (Minor beneficial)
	Vulnerable group population	High					

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation effect	Mitigation measures proposed	Residual effect	Cumulative effect
Safe and cohesive communities: Community identity	General population	Low	Low	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	None	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	Not Significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High					
Wider societal benefits	General population	Low	Medium	Significant (Moderate beneficial)	None	Significant (Moderate beneficial)	Significant (Moderate beneficial)
	Vulnerable group population	High					
Decommissioning phase							
Healthy lifestyles: Physical activity and leisure	General population	Low	Negligible	Not Significant (Negligible adverse)	None	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)
	Vulnerable group population	High					
Education: Workforce upskilling	General population	Low	Low	Minor beneficial (not significant)	None	Not Significant (Minor beneficial)	Not Significant (Minor beneficial)
	Vulnerable group population	High					

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation effect	Mitigation measures proposed	Residual effect	Cumulative effect
Socioeconomic status: Employment and investment	General population	Low	Low	Minor beneficial (not significant) and Minor adverse (not significant)	None	Not Significant (Minor beneficial) and Not Significant (Minor adverse)	Not Significant (Minor beneficial) and Not Significant (Minor adverse)
	Vulnerable group population	High					
Environmental conditions: Water	General population	Low	Negligible	Negligible adverse (not significant)	None	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)

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