

**Tillbridge Solar Project
EN010142**

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Chapter 11: Human Health
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11. Human Health

11.1 Introduction

- 11.1.1 This chapter presents the findings of an assessment of the likely significant effects on human health as a result of the Tillbridge Solar Project (hereafter referred to as 'the Scheme'). For more details about the Scheme, refer to **Chapter 3: Scheme Description** of this Environmental Statement (ES) [EN010142/APP/6.1].
- 11.1.2 The chapter identifies and proposes measures to address the potential impacts and likely significant effects on human health during the construction, operation, and decommissioning phases of the Scheme. It draws on assessments set out in other chapters of this ES which assess likely significant effects on human receptors and community amenities or services which could have an impact on human health, including:
- a. **Chapter 6: Air Quality;**
 - b. **Chapter 7: Climate Change;**
 - c. **Chapter 12: Landscape and Visual Amenity;**
 - d. **Chapter 13: Noise and Vibration;**
 - e. **Chapter 14: Socio-economics and Land Use;**
 - f. **Chapter 16: Transport and Access;** and
 - g. **Chapter 17: Other Environmental Topics** [EN010142/APP/6.1].
- 11.1.3 The chapter is supported by the following appendix:
- a. **Appendix 11-1: Human Health Legislation, Policy and Guidance** [EN010142/APP/6.2].

11.2 Legislation and Planning Policy

- 11.2.1 **Appendix 11-1: Human Health Legislation, Policy and Guidance** of this ES [EN01042/APP/6.2] identifies the legislation, policy, and guidance of relevance to the assessment of likely significant human health effects of the Scheme.

11.3 Assessment Assumptions and Limitations

- 11.3.1 The assessment of the significance of human health effects has been carried out against a benchmark of current human health baseline conditions prevailing around the Scheme, as far as is possible within the limitations of human health-related data. Baseline data is subject to a time lag between collection and publication. As with any dataset, these conditions may be subject to change over time which may influence the findings of the assessment. Baseline conditions regarding human health reported in Section 11.6 are based on latest data available at the time of writing.

- 11.3.2 The assessment of likely health effects arising from the Scheme is based on professional judgement, drawing on relevant guidance as set out in **Appendix 11-1** of this ES [EN01042/APP/6.2]. It considers both the potential beneficial and adverse impacts that the Scheme is likely to have on human health.
- 11.3.3 Effects on human health during construction, operation and decommissioning phases are based on a range of related assessments, taking into consideration the results from the relevant environmental studies. These studies comprise **Chapter 6: Air Quality; Chapter 7: Climate Change; Chapter 12: Landscape and Visual Amenity, Chapter 13: Noise and Vibration; Chapter 14: Socio-economics and Land Use; Chapter 16: Transport and Access; and, Chapter 17: Other Environmental Topics** of this ES [EN010142/APP/6.1]. Relevant assumptions and limitations relating to these assessments are set out below.
- 11.3.4 For the air quality assessment (as set out in **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1]), a dust risk assessment has been undertaken on a whole-site basis, assuming that works can be undertaken at any point within the Order limits. This provides a worst-case assessment, ensuring that if works are undertaken in a different location than anticipated, the assessment has covered this potential.
- 11.3.5 **Chapter 7: Climate Change** of this ES [EN010142/APP/6.1], sets out a comprehensive section on assessment assumptions and limitations, covering: the Scheme parameters assessed; components and materials; transport for components, materials and waste; waste management; use of plant and machinery; consumption of water; worker travel; land use change; and any assumptions related to the construction, operation and decommissioning phases. Worst-case scenarios have been used to ensure a robust assessment.
- 11.3.6 In respect of the transport assessment (as set out in **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1]), the traffic flows and non-road mobile machinery during the construction period are based on a worst-case scenario of all infrastructure being built to its maximum design principles, which may slightly overestimate the number of vehicles and equipment. During the operational phase, the Scheme will be manned by a nominal amount of people across the Order limits. Therefore, due to the low level of trips likely to be generated within network peak hours, an assessment of the operational phase transport effects has been scoped out as agreed through the Environmental Impact Assessment (EIA) scoping process.
- 11.3.7 As set out in **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1], the assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors. Construction noise predictions have been undertaken using the computer modelling software SoundPLAN® (version 8.2). Noise predictions were carried out to represent a conservative scenario where construction plant is operational nearest to the identified receptors and does not take into account quieter periods when limited activities take place or at further distances. Therefore, noise predictions may

overestimate construction noise levels and be considered to be a reasonable likely worst case.

- 11.3.8 Operational noise has been predicted with all plant being in maximum operation at all times of day as a worst-case assumption.
- 11.3.9 This assessment has also considered the socio-economic assessment (**Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1]), which presents population, labour force and local economy information and is based on the latest data available at the time of writing. It should also be noted that baseline data can be subject to a time lag between collection and publication, which may influence the assessment.
- 11.3.10 As set out in **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1], the assessment considers a reasonable worst-case scenario, whereby the maximum (and, where relevant, minimum) parameters for the design elements of the Scheme have been assessed. The assessment also draws upon landscape and visual surveys, accompanied visits to residential properties and professional judgement. Further detailed information regarding assumptions and limitations can be found in **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1].
- 11.3.11 As stated in **Chapter 3: Scheme Description** of this ES [EN010142/APP/6.1], the operational life of the Scheme is 60 years from the date of final commissioning. Therefore, decommissioning is assessed as occurring after 60 years of operation, and for the purposes of this assessment is treated as taking place in 2088. It is possible that certain elements of the Scheme may be decommissioned prior to the end of the 60-year period. Should parts of the Scheme be decommissioned in advance of the main decommissioning phase, the predicted effects would be the same or less than those outlined in this chapter. Similar to the construction period, the assessment of the decommissioning period therefore represents a realistic worst case.

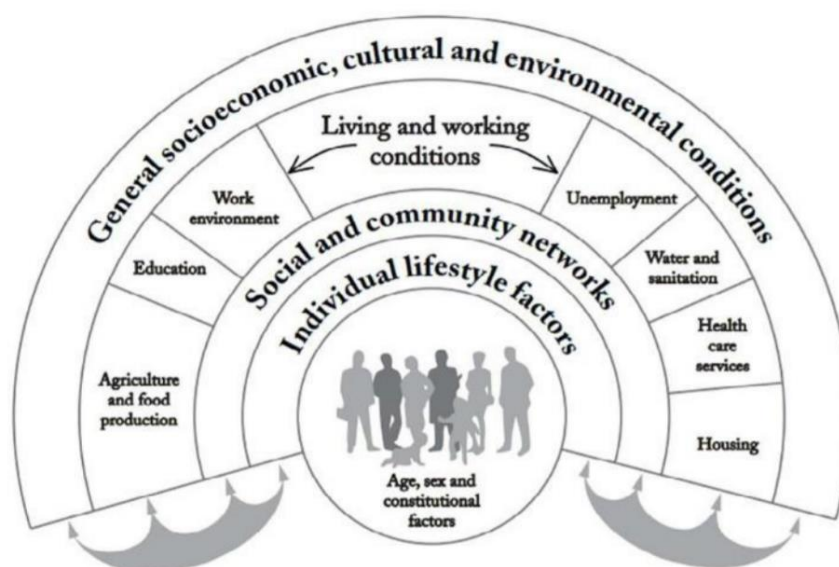
11.4 Assessment Methodology

Scope of Assessment

- 11.4.1 The Institute of Environmental Management and Assessment (IEMA) guidance "*Determining Significance For Human Health In Environmental Impact Assessment*" forms the basis of the approach adopted to assess impacts on human health in this chapter. In addition, consideration has been given to NHS England's Healthy Urban Development Unit's (HUDU) Rapid Health Impact Assessment (HIA) Toolkit 2019 (Ref. 11-3) to help with the identification of relevant health determinants and mapping of health pathways (the route through which changes to health determinants would be expected to lead to changes in health outcomes).
- 11.4.2 The World Health Organisation (WHO) Europe defines health as a "*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (Ref. 11-6). Public health therefore encompasses general wellbeing, not just the absence of illness.

- 11.4.3 The health and wellbeing of individuals is determined by a broad range of individual constitutional and behavioural factors (or “determinants”), as well as broader environmental, social, and economic factors. Some factors are direct and obvious, others are indirect.
- 11.4.4 Dahlgreen and Whitehead’s model of the main determinants of health (Ref. 11-7) illustrates the breadth of possible influences on health, as shown in **Plate 11-1**. At the centre of the illustration are factors that are largely fixed, including individual age, sex, constitutional and genetic factors. Outside of this are factors generally described as the wider or broader determinants of health. The model emphasises interactions between the layers. Moving outwards from the centre, individual lifestyle choices are embedded in social norms and community networks, and in living and working conditions, which in turn are shaped by and related to the wider socioeconomic and cultural environment.

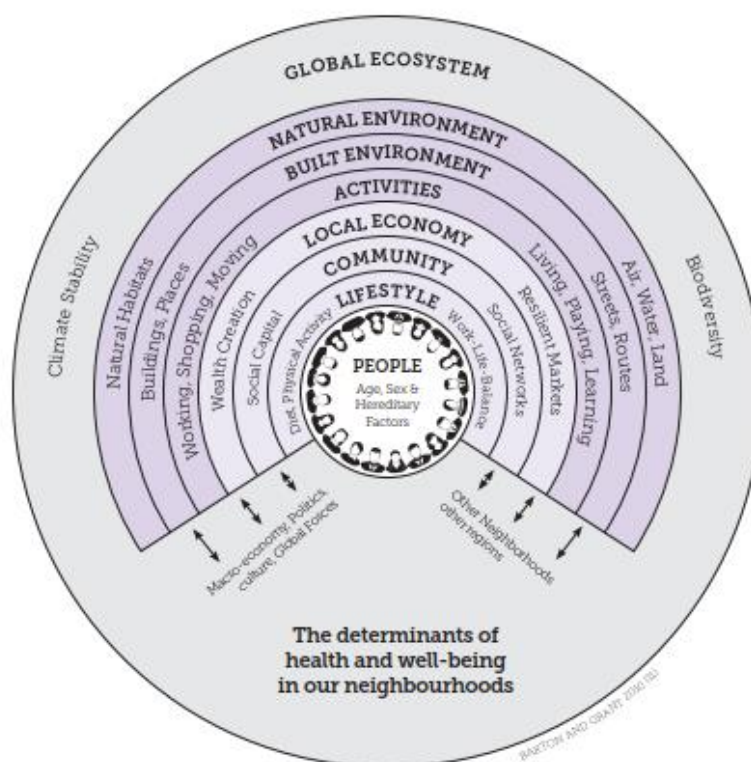
Plate 11-1: Determinants of Health



Source: Dahlgreen and Whitehead (1993)

- 11.4.5 This model has been developed to show elements of the built environment and communities that are the most significant determinants of health, as shown in **Plate 11-2** (Ref. 11-8).

Plate 11-2: Determinants of Health in Neighbourhoods



Source: Barton and Grant (2006)

- 11.4.6 Within a population there can also be health inequalities, defined by the WHO as “differences in health status or in the distribution of health determinants between different population groups. For example, differences in mobility between elderly people and younger populations or differences in mortality rates between people from different social classes” (Ref. 11-6).
- 11.4.7 Drawing on the IEMA guidance, Guide to Effective Scoping of Human Health (Ref. 11-2), this assessment considers the following human health determinants of relevance to the Scheme:
- Transport modes, access and connections, including: community connectivity such as access to services, facilities and open space; prioritisation of walking and cycling; and road and route safety;
 - Employment and income, including provision of economic opportunities and resources that protect and promote good health;
 - Air quality;
 - Noise and vibration;
 - Climate change; and
 - Landscape and visual amenity.
- 11.4.8 **Table 11-1** sets out a summary of the health determinants scoped into this assessment, and the source, pathway and receptor links relevant to each.

Table 11-1: Health determinants – Source-Pathway-Receptor Links

Source	Pathway	Receptor	Project phase
Potential changes to community connectivity, access to healthcare and wider community services (including open space), and/or access to employment arising from temporary or permanent closures, diversions or amenity impacts on public rights of way (PRoW) or impacts on the local road network	Potential adverse impacts on levels of community participation and interaction, social and family support, access to health services including use of community centres, dental, pharmacy and GP services and open spaces, and/or access to employment which could impact human health	Human receptors living within local communities	Construction, operation and decommissioning
Potential temporary or permanent closures, diversions or amenity impacts on PRoW or impacts on the local road network which impact use by cyclists or pedestrians	Potential adverse impacts on journeys made by active travel modes, which could impact human health	Human receptors who are users of local PRoW and the local road network for cycling or walking	Construction, operation and decommissioning
Potential temporary or permanent increases in traffic on the local road network	Potential adverse impacts on road safety, which could impact human health	Human receptors who are users of the local road network	Construction, operation and decommissioning
Potential temporary or permanent increase in employment and	Potential beneficial economic impacts arising from employment, training and	Human receptors who could potentially benefit from employment	Construction, operation and decommissioning

Source	Pathway	Receptor	Project phase
training opportunities, directly related to the Scheme, or within the wider supply chain	income opportunities for those working on the Scheme, or within the wider supply chain, which could impact human health	and training opportunities, directly related to the Scheme, or within the wider supply chain	
Potential temporary changes in local air quality including increased dust and particulate matter emissions arising from the construction and decommissioning of the Scheme	Potential adverse human health impacts arising from increased exposure to dust and particulate matter emissions arising from the Scheme	Human receptors likely to be at risk of possible direct and indirect air quality impacts from the Scheme	Construction and decommissioning. (Impacts during operation would be negligible).
Potential temporary or permanent changes in noise levels arising from the Scheme	Potential adverse human health impacts arising from increased exposure to noise arising from the Scheme	Human receptors likely to be at risk of possible direct and indirect noise impacts from the Scheme	Construction, operation and decommissioning
Potential temporary or permanent changes to Greenhouse Gas (GHG) emissions	Potential human health impacts arising from increased or reduced exposure to GHG emissions arising from the Scheme	Human receptors likely to be exposed to increased or reduced GHG emissions arising from the Scheme	Construction, operation and decommissioning
Potential temporary or permanent changes to views as a result of the Scheme.	Potential adverse human health impacts arising from visual amenity impacts which may contribute to peoples' mental health and enjoyment of the local landscape	Residential receptors likely to have significant visual effects as a result of the Scheme	Construction, operation and decommissioning

- 11.4.9 The impacts of the Scheme on these determinants of human health are assessed using professional judgement, best practice, and drawing on other assessments within the ES [EN010142/APP/6.1].
- 11.4.10 The potential impacts of Electric and Magnetic Fields are assessed in **Chapter 17: Other Environmental Topics** (Section 17.9 Electric and Electro-Magnetic Fields) of this ES [EN010142/APP/6.1]. Underground cables eliminate the electric field altogether as it is screened out by the sheath around the cable, but they still produce electro-magnetic fields. Therefore, as effects of electric fields do not occur, they were not included in the assessment. The assessment presented in **Chapter 17: Other Environmental Topics** (Section 17.9 Electric and Electro-Magnetic Fields) of this ES [EN010142/APP/6.1] concluded that no significant effects to residential receptors or users of PRoW are predicted. Therefore, the potential for Human Health effects associated with potential exposure to Electric and Electro-Magnetic Fields (EMF) has been scoped out of this ES. It is also noted in **Table 11-7** that the UK Health Security Agency (UKHSA) is satisfied with the justification for scoping out the potential health effects of EMFs, as per its statutory consultation response.
- 11.4.11 Whilst a standalone assessment of major accidents and disasters has been scoped out of the ES [EN010142/APP/6.1], an assessment of the likely effects of the Scheme on the risks of major accidents or disasters occurring has been carried out within **Chapter 17: Other Environmental Topics** of this ES [EN010142/APP/6.1]. Unplanned fire events do not fall within the scope of the health and wellbeing assessment, however, further details and assessment regarding fire and fire safety can be found in **Appendix 17-5: Unplanned Atmospheric Emissions from Battery Energy Storage Systems [EN010142/APP/6.2]** and the **Framework Battery Safety Management Plan** submitted alongside the DCO application [EN010142/APP/7.13].

Study Area

- 11.4.12 The Study Areas for the assessment of potential human health effects have been defined to include human populations likely to be at risk from the possible direct and indirect health impacts that might arise from the Scheme. The Study Areas for human health are therefore based both on the extent and characteristics of the Scheme, and the populations assessed to be likely to be directly and indirectly affected by it. Therefore, the Study Areas for the health assessment vary by the type of impact being assessed.
- 11.4.13 Where the Human Health assessment draws on other chapters of the ES [EN010142/APP/6.1], it reflects the Study Areas used within these other assessments. As reflected in these other chapters, the worst-case outcomes, and therefore the worst-case human health effects, have been assessed. A summary of the different components of the human health assessment and the Study Areas for each component is set out in further detail in **Table 11-2**.

Table 11-2: Summary of Potential Human Health Impacts and Study Areas

Potential Impact	Study Area	Rationale for Study Area
<p>Potential adverse impacts on community connectivity; potential adverse impacts on access to healthcare and other local services; potential adverse impacts on access to employment</p>	<p>Homes and communities within proximity of the Principal Site Order limits, including Harpswell and Glentworth approximately 500m and 1km to the east of the Principal Site respectively, and Springthorpe and Heapham approximately 500m and 1.5km to the west of the Principal Site; and, users of the following roads: A631/B1398 Middle Street Roundabout; A631/A15 Roundabout; A631; A15; B1398 Middle Street; A1500 (Till Bridge Lane); B1241 (Willingham Road); A156; Pilham Lane; School Lane; Springthorpe Road; Common Lane; Kexby Road; Willingham Road; Headstead Bank; Cow Pasture Lane; and Cottam Road/Outgang Lane.</p>	<p>Study Area includes communities and road users that could be affected by severance or access impacts, or journey delay, as set out in Chapter 14: Socio-economics and Land Use and Chapter 16: Transport and Access of this ES [EN010142/APP/6.1]. Also refer to Figure 16-1 for the Transport and Access Study Area [EN010142/APP/6.3].</p>
<p>Potential adverse impacts on travel by active modes (walking and cycling)</p>	<p>PRoW within 500m of the Order limits, and the communities of Harpswell and Glentworth approximately 500m and 1km to the east of the Order limits respectively, and Springthorpe and Heapham approximately 500m and 1.5km to the west of the Order limits; and, the following roads: A631/B1398 Middle Street Roundabout; A631/A15 Roundabout; A631; A15; B1398 Middle Street; A1500 (Till Bridge Lane); B1241 (Willingham Road); A156; Pilham Lane; School Lane; Springthorpe Road; Common Lane; Kexby Road; Willingham Road; Headstead Bank; Cow Pasture Lane; and Cottam Road/Outgang Lane.</p>	<p>Study Area includes human receptors that could be affected by impacts on PRoW or the local road network as a result of the Scheme, as set out in Chapter 14: Socio-economics and Land Use and Chapter 16: Transport and Access of this ES [EN010142/APP/6.1]. Also refer to Figure 16-1 for the Transport and Access Study Area [EN010142/APP/6.3].</p>
<p>Potential adverse impacts on road safety</p>	<p>The following roads: A631/B1398 Middle Street Roundabout; A631/A15 Roundabout; A631; A15; B1398 Middle Street; A1500</p>	<p>Study Area includes roads that could be at risk from traffic and safety impacts as a result</p>

Potential Impact	Study Area	Rationale for Study Area
	(Till Bridge Lane); B1241 (Willingham Road); A156; Pilham Lane; School Lane; Springthorpe Road; Common Lane; Kexby Road; Willingham Road; Headstead Bank; Cow Pasture Lane; and Cottam Road/Outgang Lane.	of the Scheme, as set out in Chapter 16: Transport and Access of this ES [EN010142/APP/6.1] . Also refer to Figure 16-1 for the Transport and Access Study Area [EN010142/APP/6.3] .
Potential beneficial impacts on access to employment, training and income opportunities	West Lindsey district, Bassetlaw district, and the 60-minute drive time Study Area (shown on Figure 14-1 of this ES [EN010142/APP/6.3]).	Study Area includes human receptors that could benefit from potential local economic and employment impacts, as set out in Chapter 14: Socio-economics and Land Use of this ES [EN010142/APP/6.1] .
Potential adverse impacts on exposure to dust or particulate matter, or emissions from traffic	Within 350m of the Order limits, within 50m of the roads expected to be impacted by construction and decommissioning phase traffic and within 500m of Site access points.	Study Area includes human receptors that could be impacted by construction and decommissioning phase dust or particulate matter, or emissions generated by construction or decommissioning road traffic, as set out in Chapter 6: Air Quality of this ES [EN010142/APP/6.1] .
Potential adverse impacts on exposure to increased noise	Within 300m of the Order limits during the construction and decommissioning phases; and within 500m of the Order limits during the operational phase.	Study Area includes human receptors that could be impacted by noise impacts within the Zone of Influence (ZoI) for noise effects, as set out in Chapter 13: Noise and Vibration of this ES [EN010142/APP/6.1] . Also refer to Figure 13-1 for the Noise Study Area [EN010142/APP/6.3] .

Potential Impact	Study Area	Rationale for Study Area
Potential adverse or beneficial impacts as a result of climate change	Local ward study area, West Lindsey district and Bassetlaw district.	Study Area includes human receptors that could be impacted by changes in climate resulting from GHG emissions as a result of the Scheme, as set out in Chapter 7: Climate Change of this ES [EN010142/APP/6.1].
Potential temporary or permanent changes to views as a result of the Scheme.	5km from the outer boundary of the solar panel areas of the Principal Site.	Zones of Theoretical Visibility (ZTV) are used to define the LVIA Study Area, as detailed in Chapter 12: Landscape and Visual Amenity of this ES [EN010142/APP/6.1].

Sources of Information

11.4.14 This chapter seeks to assess the likely significant human health effects of the Scheme against the current human health baseline conditions within the Study Areas set out in **Table 11-2** above.

Desktop Survey

11.4.15 In order to understand the existing human population health baseline, data illustrating the existing population health conditions has been collected through a desk-based research exercise using publicly available sources, documents, and web-based applications.

11.4.16 Sources of information consulted include:

- a. ONS Census 2021 (Ref. 11-10);
- b. English Indices of Multiple Deprivation (2019) (Ref. 11-11);
- c. Office for Health Improvement and Disparities (OHID); Health Profiles (Ref. 11-12); and
- d. Claimant Count, 2022 (Ref. 11-13).

Field Survey

11.4.17 The following field surveys have been carried out by related technical topics relevant to this assessment:

- a. **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1] sets out details of field surveys carried out to assess baseline conditions of relevance to the potential air quality impacts of the Scheme;

- b. **Chapter 12: Landscape and Visual Amenity** of this ES [EN10142/APP/6.1] sets out details of the fieldwork and photography undertaken between May 2022 and November 2023, which helped to inform the landscape character assessments;
- c. **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] sets out details of field surveys carried out to assess baseline conditions of relevance to the potential noise impacts of the Scheme; and
- d. **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] sets out details of field surveys carried out to assess baseline conditions of relevance to the potential transport and access impacts of the Scheme.

Assessment Methodology

Assessment Criteria

- 11.4.18 The Human Health assessment follows the general assessment methodology set out in **Chapter 5: EIA Methodology** of this ES [EN010142/APP/6.1]. The specific magnitude and sensitivity criteria applied for the human health assessment are set out below, and reflect the IEMA guidance, Determining Significance for Human Health in EIA, released in 2022 (Ref. 11-1).
- 11.4.19 Best practice principles for assessing impacts on human health are also provided in NHS England's Healthy Urban Development Unit's (HUDU) Rapid HIA Toolkit 2019 (Ref. 11-3), which alongside IEMA guidance, has also been drawn on to assess impacts on human health in this chapter. The approach also reflects Central Lincolnshire's HIA for Planning Applications Guidance Note (Ref. 11-17).
- 11.4.20 Significance reflects the relationship between the scale of effect (magnitude) and the sensitivity of the affected receptor. As such, the significance criteria of health and wellbeing effects has been assessed based on the expert judgment and professional experience of the author, and relies on the following considerations:
 - a. **Sensitivity of human health receptors including general populations and potentially vulnerable sub-populations:** the assessment takes account of the qualitative (rather than quantitative) sensitivity of relevant populations and sub-populations and their ability to respond to change; and
 - b. **Magnitude of impact:** this entails consideration of the scale of the exposure of the population to an impact; whether the impact is one-off or continuous; the likely nature of the human health impact; the permanence of the change; and the proportion of the relevant Study Area population that would be affected.

Sensitivity of Receptor

- 11.4.21 Sensitivity of population health is driven by a number of factors which are set out in **Table 11-3**, and are based on guidance set out by IEMA (Ref. 11-1).

Table 11-3: Human Health Sensitivity Criteria – Population Health

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

Source: Adapted from: IEMA Guide to Determining Significance for Health (Table 7.1) (Ref. 11-1).

Magnitude of Impact

11.4.22 Magnitude of impact is driven by a number of factors which are set out in **Table 11-4**, based on guidance set out by IEMA (Ref. 11-1).

Table 11-4: Human Health Magnitude of Impact Criteria

Magnitude level	Magnitude criteria
High	High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) or very severe illness/injury outcomes; majority of population affected; permanent change; substantial service quality implications

Magnitude level	Magnitude criteria
Medium	Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or moderate 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 small scale; very short-term duration; one off frequency; severity predominantly relates to minor change in quality of life; very few people affected; immediate reversal once activity complete; no service quality implications.

Source: Adapted from: IEMA Guide to Determining Significance for Health (Table 7.2) (Ref. 11-1).

Significance of Effects

- 11.4.23 Human health effects reflect the relationship between the sensitivity of the relevant population health, and the magnitude of the impact, as set out in **Table 11-5**. Where two options are shown for the assessment of significance (e.g. minor/negligible), professional judgement is used to determine which of the two options is most appropriate.

Table 11-5: Impact Assessment and Significance

Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Very Low
High	Major	Major/ moderate	Moderate/ minor	Minor/ negligible
Medium	Major/ moderate	Moderate	Minor	Minor/ negligible
Low	Moderate/ minor	Minor	Minor	Negligible
Negligible	Minor/ negligible	Minor/ negligible	Negligible	Negligible

Source: Adapted from Table 4.1: Generic indicative EIA significance matrix, in IEMA Guidance for Determining Significance for Human Health (Ref. 11-1).

- 11.4.24 In accordance with the methodology set out within **Chapter 5: EIA Methodology** of the ES [EN010142/APP/6.1], the following assessment criteria are also applied.

11.4.25 Effects are defined as follows:

- a. **Beneficial** classifications of effect indicate an advantageous effect on human health, which may be minor, moderate or major in effect;
- a. **Adverse** classifications of effect indicate a disadvantageous effect on human health, which may be minor, moderate or major in effect;
- b. **Negligible** classifications of effect indicate imperceptible effects on human health; and
- c. **No effect** classifications indicate that there are no effects on human health.

11.4.26 The geographical scales considered to assess significance for each human health effect considered are described in **Table 11-2**.

11.4.27 Duration of effect is also considered, with more weight given to longer-term or permanent changes than to shorter-term or temporary ones.

11.4.28 In accordance with the methodology set out in **Chapter 5: EIA Methodology** of this ES [EN010142/APP/6.1], the following criteria are applied:

- a. 'Moderate' or 'major' effects are classed '**significant**';
- b. 'Minor' effects are classed as '**not significant**', although they may be a matter of local concern; and
- c. 'Negligible' effects are classed as '**not significant**'.

11.5 Stakeholder Engagement

11.5.1 An EIA Scoping Report (**Appendix 1-1** of this ES [EN010142/APP/6.2]) was submitted to the Secretary of State through the Planning Inspectorate in 2022 in order to request an EIA Scoping Opinion (**Appendix 1-2** of this ES [EN010142/APP/6.2]). Consultation responses in relation to human health are presented in **Table 11-6** below.

Table 11-6: Engagement Undertaken

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate (ID 3.6.2) and Environmental Hazards and Emergencies Department, UK Health Security Agency	The Scoping Report sets out that the health assessment will adopt the NHS' Healthy Urban Development Unit (HUDU) assessment tool and notes that this guidance does not provide significance criteria. The ES should provide significance criteria for this assessment so the reader can understand the potential of any significant effects arising from the health assessment.	The NHS HUDU assessment tool is used in combination with IEMA guidance <i>IEMA Guide to Determining Significance for Health</i> published in November 2022 (Ref. 11-1). In line with the guidance, this chapter sets out a significance assessment of the potential human health impacts of the Scheme.	Sections 11.4 and 11.8.
Planning Inspectorate (ID 3.6.3) and Environmental Hazards and Emergencies Department, UK Health Security Agency	The ES should consider vulnerable populations within the health assessment.	Vulnerable populations are considered within this chapter through the consideration of sensitivity, in line with 2022 IEMA guidance (Ref. 11-1).	Sections 11.6 and 11.8.
Planning Inspectorate (ID 2.2.1)	The ES should consider the possible health impacts of Electric and Magnetic Fields (EMF) arising from any electrical equipment associated with the development or a statement explaining why EMFs can be scoped out.	The impacts of EMFs have been scoped out of this assessment. The justification for this can be found in Section 11.4. An assessment of the effects of the Scheme on Electric and Electro-Magnetic Fields is included in Chapter 17: Other Environmental Topics (Section 17.9 Electric and Electro-Magnetic Fields) of this ES [EN010142/APP/6.1] .	Section 11.4.

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
<p>Environmental Hazards and Emergencies Department, UK Health Security Agency</p>	<p>The presence of significant numbers of workers could have an impact on local availability of affordable housing and tourist accommodation. The impact on local accommodation should be considered, and in particular across the wider Study Area in a cumulative effects assessment.</p>	<p>As set out in Chapter 14: Socio-economics and Land Use of this ES [EN010142/APP/6.1] the construction of the Scheme is expected to require an average of 812 direct jobs on-site over the minimum 24 month construction period. Approximately 690 of these jobs are expected to be taken by people living outside the 60 minute drive time Study Area. The potential effect on local accommodation is assessed within Chapter 14: Socio-economics and Land Use of this ES [EN010142/APP/6.1].</p>	<p>Chapter 14: Socio-economics and Land Use of this ES [EN010142/APP/6.1]</p>
<p>West Lindsey District Council</p>	<p>The Human Health chapter should consider the cumulative effects with the other three local solar project NSIPs.</p>	<p>The cumulative human health impacts of the Scheme are considered in the cumulative effects analysis.</p>	<p>Section 11.11 and Chapter 18: Cumulative Effects and Interactions of this ES [EN010142/APP/6.1].</p>
<p>Fillingham Parish Council</p>	<p>Of particular concern to the community for a development at this scale are access to open space and nature and access to work and training.</p>	<p>The impacts of the Scheme on access to open space and nature and access to work and training are considered within the assessment of likely impacts and effects.</p>	<p>Section 11.8 Community connectivity including access to services, facilities (including open space) and access to employment; and Employment and Income. A Framework Skills, Supply Chain and Employment Plan submitted alongside the DCO application [EN010142/APP/7.18].</p>

11.5.2 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information Report (PEI Report). **Table 11-7** outlines the statutory consultation responses relating to human health and how these have been addressed through the ES. Responses have been grouped thematically where relevant, with all relevant consultees listed. No additional comments were received during the subsequent round of targeted consultation.

Table 11-7: Main matters raised through the Statutory Consultation

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Brampton Parish Meeting (and other individuals)	On mental health, the Parish Council stated that <i>“the human impact of such a huge development cannot be underestimated... The residents of Brampton Village deserve more than to be surrounded by inefficient solar panels sited at an outrageous cost on green belt land.”</i>	Consideration of mental health has been made as part of this chapter. No significant effects are envisaged. It is also noted that the Scheme is not located on Green Belt land.	Section 11.8.
UK Health Security Agency (UKHSA)	UKHSA is satisfied with the justification for scoping out the potential health effects of EMFs, as presented in Volume 1 Chapter 11 Human Health (Section 11.4.11).	This comment is noted.	The justification is detailed in Section 11.4 and further detail on EMFs can be found in Chapter 17: Other Environmental Topics of the ES [EN010142/APP/6.1]
Bassetlaw District Council	On electromagnetic fields, the council stated that <i>“human health is a material consideration and the District consider that this</i>	See above regarding response from UKHSA. Additionally, EMFs are considered as part of Chapter 17: Other Environmental Topics of the ES [EN010142/APP/6.1]	Further detail on EMFs can be found in Chapter 17: Other Environmental Topics of the ES [EN010142/APP/6.1]

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	<i>should be scoped into the ES."</i>	No significant effects are envisaged.	

11.6 Baseline Conditions

11.6.1 **Chapter 2: Scheme Location** of the **ES [EN010142/APP/6.1]** contains a description of existing conditions within and surrounding the Order limits. This section describes the baseline conditions of relevance to human health. First, a population health baseline of the local population is set out. Then an infrastructure baseline is laid out, which considers the existing local infrastructure relevant to each aspect of the health and wellbeing assessment. This is followed by a summary of baseline conditions from other chapters of the ES which are relevant to the assessment of health and wellbeing, and then discussion of the future baseline.

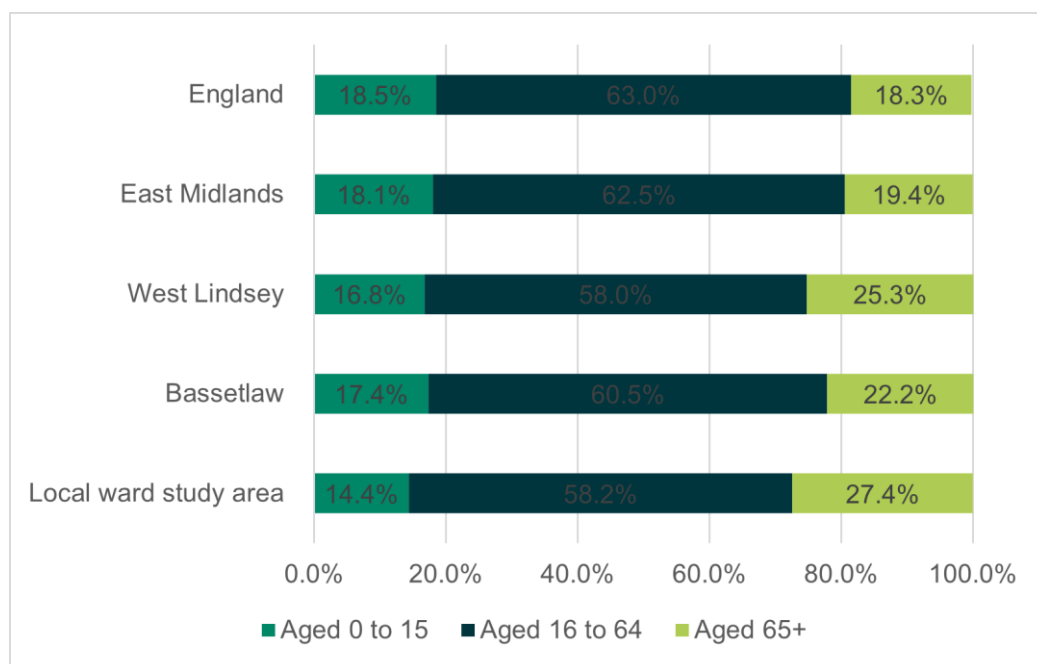
Existing Baseline

Population Health Baseline

Population

- 11.6.2 Data from the 2021 Census (Ref. 11-10) shows the total population of the local ward Study Area is 15,145. The population in Hemswell is 2,625; in Lea is 2,116; in Scampton is 2,806; in Stow is 2,445; in Torksey is 2,858; and, in Rampton is 2,295.
- 11.6.3 **Plate 11-3** shows the breakdown of total population by age groups for the local ward Study Area, West Lindsey, Bassetlaw, the East Midlands, and England.
- 11.6.4 The proportion of residents aged 0-16 in the local ward Study Area is 14.4%. This is slightly lower than the proportions in West Lindsey (16.8%), Bassetlaw (17.4%), the East Midlands (18.1%) and England (18.5%).
- 11.6.5 The proportion of residents of working age (16-to-64-year-olds) in the Study Area is 58.2%. This is slightly higher than the proportion across West Lindsey (58%), but lower than the proportion across Bassetlaw (60.5%), the East Midlands (62.8%) and England (63%).
- 11.6.6 The proportion of residents aged 65 and over in the Study Area is 27.4%. This is higher than the proportions in West Lindsey (25.3%) and Bassetlaw (22.2%), the East Midlands (19.4%) and nationally across England (18.3%).

Plate 11-3: Age Breakdown by Geography



Source: ONS, (2022); Census 2021. (Ref. 11-10). Note that figures may not equal 100 due to rounding.

Ethnicity

11.6.7 Census 2021 (Ref. 11-10) provides the latest data showing residents self-identified ethnicity. As shown in **Table 11-8**, at the time of the 2021 Census, the proportions of White residents living in the local ward Study Area (97.8%), West Lindsey (97.0%) and Bassetlaw (96.4%) were all recorded as higher than in the East Midlands (85.7%) and England as a whole (81.0%) (Ref. 11-10).

11.6.8 Correspondingly, the proportions of residents of each ethnic minority group recorded by the 2021 Census living in the local wards, West Lindsey and Bassetlaw was lower than the proportions across the East Midlands region and England as a whole.

Table 11-8: Ethnicity (Census 2021)

Ethnic Group	Local ward Study Area	West Lindsey	Bassetlaw	East Midlands	England
White (%)	97.8	97.0	96.4	85.7	81.0
Mixed /multiple ethnic groups (%)	1.2	1.1	1.2	2.4	3.0
Asian /Asian British (%)	0.5	1.2	1.2	8.0	9.6

Ethnic Group	Local ward Study Area	West Lindsey	Bassetlaw	East Midlands	England
Black /African /Caribbean /Black British (%)	0.4	0.3	0.6	2.7	4.2
Other ethnic group (%)	0.3	0.4	0.5	1.3	2.2

Source: ONS, (2022); Census 2021 (Ref. 11-10). Note that figures may not equal 100 due to rounding.

Deprivation

- 11.6.9 The Government's English Index of Multiple Deprivation (IMD) provides an overall deprivation score for each Lower Super Output Area (LSOA) and Local Authority in England. The overall score is based on a number of domains and sub-domains which together provide a measure of deprivation. Each area is ranked according to its score, and the index provides a measure of relative deprivation across all areas.
- 11.6.10 Levels of overall deprivation vary across the local LSOA Study Area. No areas fall within the 1st (most) deprived decile in England, however Bassetlaw 015C LSOA falls within the 2nd most deprived decile in England. West Lindsey 005C falls into the 4th most deprived decile, West Lindsey 007D falls into the 5th most deprived decile, West Lindsey 005C and West Lindsey 007C fall into the 6th decile, and West Lindsey 007A falls into the 7th decile. None of the local LSOA Study Areas fall into the 30% least deprived areas in England.
- 11.6.11 Across each LSOA levels of overall deprivation have remained relatively consistent between the 2015 and 2019 releases of IMD data. Bassetlaw 015C LSOA became relatively more deprived (moving from the 3rd to the 2nd decile), as did West Lindsey 005A (moving from the 5th to the 4th decile). Levels of relative deprivation improved in West Lindsey 007D (moving from the 4th to the 5th most deprived decile). All other areas remained within the same decile between 2015 and 2019.
- 11.6.12 In terms of relevant sub-domains of deprivation, the health and disability domain measures the risk of premature death and the impairment of quality of life through poor physical or mental health. Bassetlaw 015C LSOA is ranked in the 3rd most deprived decile with respect to health and disability deprivation, and West Lindsey 007B is in the 5th most deprived decile. All other areas within the local LSOA Study Area are in the 50% least deprived areas in England with respect to health deprivation.
- 11.6.13 The barriers to housing and services sub-domain of deprivation includes a consideration of physical proximity to local services, as well as wider barriers including housing affordability. All areas of the LSOA Study Area are in the

three most deprived deciles with respect to barriers to housing and services deprivation.

- 11.6.14 The living environment sub-domain of deprivation measures the quality of the local environment. The indicators fall into two sub-domains. The 'indoor' living environment measures the quality of housing; while the 'outdoor' living environment contains measures of air quality and road traffic accidents. West Lindsey 005A LSOA falls into the most deprived decile in England with respect to quality of the local environment, while Bassetlaw 015C falls into the 2nd most deprived decile. West Lindsey 005C and West Lindsey 007D fall into the 4th most deprived decile. West Lindsey 007A and West Lindsey 007B are in the 50% least deprived areas in England in terms of living environment deprivation.
- 11.6.15 West Lindsey is ranked 146th most deprived out of England's 317 Local Planning Authority areas¹. In West Lindsey, 8% of LSOAs are within the 10% most deprived LSOAs in England, 10% are within the 20% most deprived LSOAs and 6% are within the 30% most deprived LSOAs in England (overall 24% of its LSOAs are in the 30% most deprived in England). This is an increase from 2015 when 20% of West Lindsey LSOAs were in the 30% most deprived in England.
- 11.6.16 Bassetlaw is the 108th most deprived of England's 317 Local Planning Authority areas, with 7% of LSOAs are within the 10% most deprived LSOAs in England, 14% are within the 20% most deprived LSOAs and 16% are within the 30% most deprived LSOAs in England (overall 37% of its LSOAs are in the 30% most deprived in England). This is an increase from 2015 when 35% of Bassetlaw LSOAs were in the 30% most deprived in England.
- 11.6.17 A summary of relevant IMD data across the LSOA Study Area and West Lindsey and Bassetlaw districts is shown in **Table 11-9**.

Table 11-9: IMD (2019 and 2015)

	West Lindsey 005A	West Lindsey 005C	West Lindsey 007A	West Lindsey 007B	West Lindsey 007D	Bassetlaw 015C	West Lindsey	Bassetlaw
Sub-domain	Decile						Decile/ Rank	
Overall deprivation (2019)	4 th	6 th	7 th	6 th	5 th	2 nd	5 th / 146 th	4 th / 108 th
Overall deprivation (2015)	5 th	6 th	7 th	6 th	4 th	3 rd	5 th / 147 th	4 th / 112 th

¹ Based on IMD rank of average summary measure.

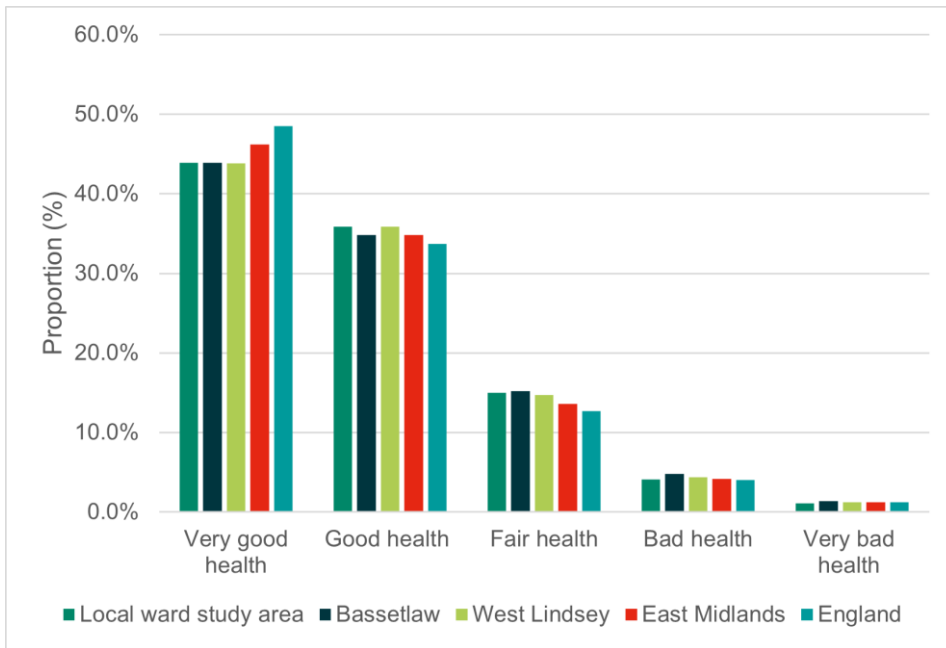
	West Lindsey 005A	West Lindsey 005C	West Lindsey 007A	West Lindsey 007B	West Lindsey 007D	Bassetlaw 015C	West Lindsey	Bassetlaw
Health deprivation (2019)	6 th	7 th	8 th	5 th	6 th	3 rd	5 th / 143 rd	3 rd / 68 th
Barriers to housing and services (2019)	2 nd	3 rd	1 st	3 rd	2 nd	1 st	5 th / 135 th	6 th / 187 th
Living environment deprivation (2019)	1 st	4 th	7 th	6 th	4 th	2 nd	5 th / 128 th	8 th / 224 th

Source: MHCLG English Indices of Deprivation (Ref. 11-11).

Health Profile and Outcomes

- 11.6.18 The 2021 Census (Ref. 11-10) provides the most recent data available showing residents' self-assessment of health with individuals identifying their overall health ranging from 'Very Good' to 'Very Bad'.
- 11.6.19 Across the local ward Study Area, most residents identified that they are in 'Very Good' or 'Good' health. At the time of the 2021 Census 5.2% of residents in the ward-level Study Area believed that they were living in 'bad' or 'very bad' health. This rate is lower than the proportions in West Lindsey (5.6%), Bassetlaw (6.6%), across the East Midlands (5.6%), and the same as the rate for England as a whole (5.2%). The full breakdown of self-assessed health across the ward-level Study Area, West Lindsey, Bassetlaw, the East Midlands, and England is shown in **Plate 11-4** below.

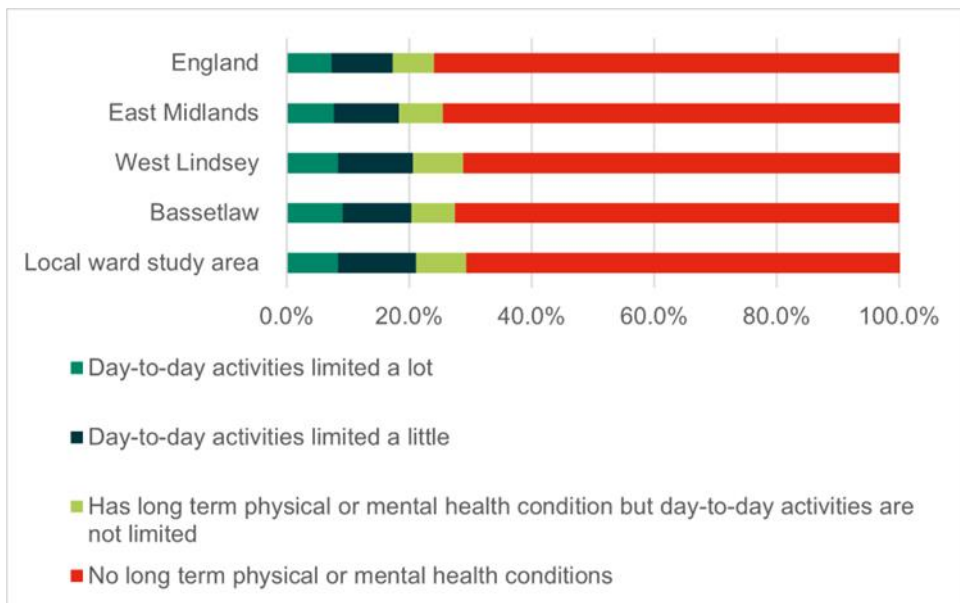
Plate 11-4: Self-Assessment of Health



Source: ONS, (2022); Census 2021. (Ref. 11-37)

11.6.20 **Plate 11-5** illustrates self-assessment of the extent to which residents’ day to day activities are impacted by long-term health problems or disability, also based on self-assessment and reported in 2021 Census data. The proportion of residents in the local ward Study Area that experience limitations to their daily activities a little or a lot as a result of a health problem or disability is 21.1%. This is slightly higher than the proportion of residents in Bassetlaw (20.4%), West Lindsey (20.6%) the East Midlands (18.4%) and England as a whole (17.3%).

Plate 11-5: Self-Assessment of Long-Term Health or Disability



Source: ONS, (2022); Census 2021. (Ref. 11-37)

- 11.6.21 OHID publishes data on a range of health indicators at ward and local authority level (Ref. 11-12). A summary of relevant indicators is shown in **Table 11-10**.
- 11.6.22 Generally, across the local ward Study Area, life expectancy at birth for males is equal to or better (higher) than the national average for England (79.5 years). However, life expectancy at birth for males in Rampton ward is lower, at 77.5 years. Life expectancy at birth for females across the local ward Study Area is lower than the national average (83.2 years) in Lea ward and Stow ward (both 81.0 years) and Rampton ward (83.1 years). In all other local Study Area wards, life expectancy at birth for females is higher than the national average.
- 11.6.23 Data showing inequality between populations with respect to life expectancy at birth is not available at local ward level. Inequality in life expectancy at birth² for males in both West Lindsey (8.0 years) and Bassetlaw (6.7 years) districts is lower (less unequal) than the national average across England (9.7 years). Inequality in life expectancy at birth for females is higher in West Lindsey (8.9 years) and lower in Bassetlaw (5.8 years) compared to the national average across England (7.9 years).
- 11.6.24 In terms of the number of deaths among the local population aged 75 and under, generally fewer deaths than national averages rates took place over the years 2016-2020 across the local ward Study Area, with the exception of Stow ward where there were a higher than national average proportion of deaths among under 75s (Standardised Mortality Ratio (SMR)³ of 119.8).
- 11.6.25 With respect to deaths from respiratory diseases all areas across the local ward Study Area performed significantly better than the national average over the years 2016-2020.
- 11.6.26 Rates of deaths from all causes considered preventable (2016-2020) are generally better than the national average across the local ward area, other than in Hemswell ward (SMR of 100.6) and Rampton ward (SMR of 101.2).
- 11.6.27 Levels of childhood obesity are not available across all wards due to small sample sizes. The proportion of Year 6 children who are obese (3-years data combined 2019 to 2020, to 2021 to 2022) is lower in West Lindsey (18.8%), and higher in Bassetlaw (22.8%), compared to the regional and national average (21.6%).

² Inequality reported based on ONS reporting on the Slope Index of Inequality (SII) between populations.

³ The standardized mortality rate (SMR) is the ratio of the number of deaths observed in a population over a given period to the number that would be expected over the same period if the study population had the same age-specific rates as the standard (England national) population.

Table 11-10: Community Health Profile

	Hemswell ward	Lea ward	Stow ward	Scampton ward	Torksey ward	Rampton ward	West Lindsey	Bassetlaw	East Midlands	England
Life Expectancy at Birth (males) (2018-2020)	79.5	79.5	79.5	84.2	81.1	77.5	79.7	78.8	n/a	79.5
Life Expectancy at Birth (females) (2018-2020)	86.0	81.0	81.0	86.9	88.3	83.1	83.5	82.1	n/a	83.2
Inequality in Life Expectancy at Birth (males 2018-2020)	<i>Data not available at ward level</i>						8.0	6.7	9.2	9.7
Inequality in Life Expectancy at Birth (females 2018-2020)	<i>Data not available at ward level</i>						8.9	5.8	7.6	7.9
Deaths from all causes, under 75 years, Indirectly standardised ratio 2016 to 2020 (Standardised mortality ratio (SMR))	97.0	71.5	119.8	64.2	66.8	94.8	91.0	107.3	n/a	100.0
Deaths from respiratory diseases, all ages, Indirectly standardised ratio, 2016 to 2020 (SMR)	91.6	73.6	63.9	69.0	83.3	56.6	83.5	101.0	n/a	100.0
Deaths from causes considered preventable, under 75 years, Indirectly standardised	100.6	52.4	98.8	49.6	69.6	101.2	82.7	106.5	n/a	100.0

	Hemswell ward	Lea ward	Stow ward	Scampton ward	Torksey ward	Rampton ward	West Lindsey	Bassetlaw	East Midlands	England
ratio, 2016 to 2020 (SMR)										
Smoking prevalence (%) (at age 15) (2014)	4.7	7.9	4.8	6.5	4.0	3.3	5.6	5.3	n/a	5.4
Obese Children (%) (Year 6) 3-years data combined 2019 to 2020, to 2021 to 2022	21.4	*	*	15.8	*	18.2	18.8	22.8	21.6	21.6

Source: OHID, (2022); Public Health Profiles. (Ref. 11-12). *Data not available due to small sample size.

Mental Health

- 11.6.28 Mental health and well-being profiles produced by OHID (Ref. 11-12) provide a summary of the mental health of people within local authority areas and a comparison of local mental health with average values for all areas of England. The most recent data published is from 2017 and is detailed in **Table 11-11**. Data at ward level is unavailable for this indicator and so, the local authorities of West Lindsey and Bassetlaw have been used to inform the baseline for this indicator.
- 11.6.29 **Table 11-11** shows that the prevalence of mental health disorders is lower across the East Midlands, than England overall, with the prevalence in West Lindsey lower than average, but the prevalence across Bassetlaw being slightly higher than average.

Table 11-11: Mental Health Disorder Prevalence

Geographical level	People estimated to have any common mental health disorder (% of population ages 16 & over)
West Lindsey	15.3%
Bassetlaw	17.7%
East Midlands	16.3%
England	16.9%

Source: OHID, (2022); Public Health Profiles. (Ref. 11-12).

Local Health Priorities

- 11.6.30 Relevant local health priorities are set out at county level within Lincolnshire's Joint Health and Wellbeing Strategy (2022) (Ref. 11-4) and Nottinghamshire's Joint Health and Wellbeing Strategy, 2022-2026 (2022) (Ref. 11-5).
- 11.6.31 Relevant priorities within Lincolnshire's Joint Health and Wellbeing Strategy include:
- a. Promoting physical activity, including integrating physical activity into strategic planning and delivering improved local services; and
 - b. Reducing obesity, including engaging with spatial planning and design to develop places that support healthy individuals and communities.
- 11.6.32 The four key ambitions set out within Nottinghamshire's Joint Health and Wellbeing Strategy include:
- a. Give every child the best chance of maximising their potential;
 - b. Create healthy and sustainable places;
 - c. Everyone can access the right to improve their health; and
 - d. Keep our communities safe and healthy.
- 11.6.33 Ensuring good air quality is also referenced as an area of focus and is of relevance to this assessment.

Transport Modes, Access and Connections Baseline

Community Connectivity

- 11.6.34 **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1] sets out that the following communities are within 1km of the Principal Site Order limits: Hemswell approximately 700m to the north; Harpswell adjacent to the north; Hemswell Cliff approximately 700m to the east; Glentworth adjacent to the east; Heapham approximately 700m to the west; and Springthorpe approximately 800m to the west.

PRoW

- 11.6.35 **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1] sets out the PRoW within the Order limits. There is one PRoW located within the Principal Site Order limits: an approximately 500m stretch of Glw/85/1, (which is the prolongation of Fill/85/1, Fill/85/2 and Fill/767/1). These PRoWs connect Willingham Road to Kexby Road. There is also a claimed bridleway (Claimed Glentworth and Harpswell Public Bridleway 1209) which runs through the eastern extent of the Principal Site, running in a north westerly direction for approximately 535 m from Northlands Road in Glentworth to Hermitage Farm in Harpswell.
- 11.6.36 Along the Cable Route Corridor, there are 12 PRoWs and three claimed PRoWs that are within or cross the Order limits.
- 11.6.37 There are a further number of PRoWs within 500m of the Order limits. Further details of the PRoWs can be found in Section 14.6 of **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1].

Public Transport

- 11.6.38 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] sets out the existing public transport baseline:
- Bus services 100, 103, 106 and 354 serve the Principal Site. Bus stops are located on the A631, B1398 (Middle Street) and B1241 (Willingham Road), which are in close proximity to the Order limits. Routes provide regular services Monday-Saturday to Gainsborough, Lincoln and Scunthorpe; and
 - The closest rail stations to the Scheme are in Gainsborough, to the west of the Principal Site (Gainsborough Central Station and Gainsborough Lea Road Station, located circa. 10km from the Principal Site). Gainsborough Lea Road provides connections to Sheffield, Leeds, Lincoln, Cleethorpes, Peterborough and Doncaster. Gainsborough Central provides one morning and evening service in each direction only, Sheffield to Gainsborough to Lincoln/ Cleethorpes.

Access to Services, Facilities and Employment

Healthcare Facilities

- 11.6.39 The nearest hospital (with an accident and emergency department) to the Principal Site is Lincoln County Hospital, which is approximately 16.5km to the south of the Order limits.
- 11.6.40 The closest General Practices (GPs) to the Principal Site are Willingham-By-Stow Surgery, which is approximately 3.5km south-west of the Principal Site

and the Ingham Practice, which is approximately 4km south-east of the Principal Site. Both practices are currently accepting new patient registrations. There are further GP surgeries in the town of Gainsborough, approximately 6km west of the Principal Site.

- 11.6.41 The latest General Practice (from December 2023) data published by NHS Digital (Ref. 11-15) indicates that Willingham-By-Stow Surgery has 4.4 GPs FTE (full time equivalent) that provide care to 4,590 registered patients. This corresponds to 1,053 patients per GP, which is below and therefore meeting the Royal College of General Practitioners target of 1,800 patients per GP. Data indicates that the Ingham Practice has 2.2 FTE GPs, providing care to 3,834 registered patients. This equates to approximately 1,743 patients per GP, which is also below the Royal College of General Practitioners target of 1,800 patients per GP. Therefore, across the two GP surgeries, the average number of patients per GP is approximately 1,284.
- 11.6.42 Despite the below recommended (i.e. better) patient to GP ratio across the two surgeries closest to the Principal Site, it is important to note the ratios across the whole Integrated Care Boards (ICB) which cover the Order Limits. As of December 2023, Lincolnshire ICB – 71E had an average of approximately 2,447 patients per GP, and Nottingham and Nottinghamshire ICB - 02Q Bassetlaw had an average of approximately 2,120 patients per GP. These rates are both slightly higher (i.e. worse) than recommended by the Royal College of General Practitioners.

Education Facilities

- 11.6.43 The closest primary school to the Principal Site Order limits is Hemswell Cliff Primary School (approximately 1.3km to the east of the Principal Site). Corringham CofE VC Primary School is also approximately 1.3km to the north-west of the Principal Site.
- 11.6.44 The closest secondary schools to the Principal Site are to the west in Gainsborough. The Gainsborough Academy is around 5.3km from the Principal Site and The Queen Elizabeth's High School is approximately 7km away.

Community and Recreational Facilities

- 11.6.45 Glentworth Village Hall is within 500m of the Principal Site Order limits. There are no other community facilities within 500m of the Principal Site.

Employment

- 11.6.46 Existing uses within the Principal Site Order limits comprise largely agricultural land in use for arable cropping. There are no businesses within the Principal Site Order limits, beside agricultural businesses.
- 11.6.47 There are a number of businesses within 500m of the Principal Site, including within the settlements of Harpswell and Glentworth, and a number of isolated businesses. These businesses include visitor accommodation, a café, florists, dog grooming and breeding businesses and agricultural businesses. A larger number of employees are located in Hemswell Cliff business park approximately 700m from the Principal Site.

- 11.6.48 Larger employment centres are located in the larger towns of: Gainsborough to the west; Lincoln to the south; Scunthorpe to the north; and Grimsby to the north-east.

Prioritisation of Walking and Cycling Baseline

- 11.6.49 In addition to the PROW baseline set out above, **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] sets out baseline information with respect to walking and cycling routes close to the Principal Site. Due to the location of the Principal Site in rural Lincolnshire, there is limited footway provision in the surrounding area. Footways are limited to parts of the A631 and are further detailed in **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1].
- 11.6.50 There are no on- or off-road dedicated or marked cycling facilities within the immediate vicinity of the Principal Site. Relatively fast vehicle speeds and high traffic flows on the A631 and A15 may deter cyclists, however, the B1241 (Willingham Road) to the west of the Principal Site, the B1398 (Middle Street) to the east and the smaller roads within the Order limits itself are likely to be attractive to leisure cycling.
- 11.6.51 The nearest National Cycle Network route (between Harby and Lincoln) is located approximately 25km to the south of the Principal Site. There is also a narrow footway/cycle path on the eastern side of the A15 running for approximately 5.1km between RAF Scampton and Lincoln, to the south of the Principal Site.
- 11.6.52 The Principal Site could potentially be accessed by cyclists from Corringham, Hemswell and Springthorpe as all are located within an approximate 3-4km cycle distance (10 minutes cycle) of one of the proposed accesses along the A631.

Road and Route Safety Baseline

- 11.6.53 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] sets out baseline personal injury and collision (PIC) data relevant to the local area. A total of 127 collisions (87 slight, 34 serious and 6 fatal) have occurred within the Study Area, for the most recent five-year period for which data is available.
- 11.6.1 One collision cluster was identified at the A1500/ B1241 Sturton by Stow junction, where five collisions occurred over the five-year study period equating to one collision per year.
- 11.6.2 Full details are set out in Chapter 16: Transport and Access of this ES [EN010142/APP/6.1].

Employment Baseline

- 11.6.3 **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1] sets out the existing baseline with respect to employment:
- a. The proportions of working-age residents with a degree-level qualification or higher is lower in West Lindsey (34.0%) and Bassetlaw (31.2%), compared to the averages across the East Midlands (35.7%) and England (43.2%). The proportion of residents holding no formal

qualifications is higher in West Lindsey (9.4%) and lower in Bassetlaw (4.9%) than averages across the East Midlands (7.5%) and England (6.4%).

- b. With respect to the sub-domains of deprivation, West Lindsey is the 96th most deprived local authority with respect to employment deprivation, and Bassetlaw is the 72nd most deprived.
- c. In 2023, the economic activity rate among working-age residents (16-64 year-olds) was 83.0% in West Lindsey and 80.0% in Bassetlaw. These rates are higher than the averages of 77.7% in the East Midlands and 78.6% in England.
- d. In 2022, the unemployment rate for working-age residents was 1.3% in West Lindsey and 3.8% in Bassetlaw, compared to the average rates across the East Midlands (2.9%) and England (3.7%). Claimant count data shows the proportion of residents aged 16-64 claiming Jobseeker's Allowance and the number of Universal Credit claimants placed in the 'Searching for Work' conditionality group. The most recent data recorded in July 2023, showed the claimant count was 2.9% in West Lindsey and 3.1% in Bassetlaw, lower than the rates across the East Midlands (3.8%) and England (3.4%). Across all areas, except West Lindsey, the latest Claimant Count data is higher than the rates reported in January 2020, prior to the Covid-19 pandemic. These are 3.0% in West Lindsey, 2.8% in Bassetlaw, 2.6% across the East Midlands and 2.9% across England.
- e. The most recent recorded gross value added (GVA) per head data (income approach) indicates a lower GVA per head in Lincolnshire (£18,959) and North Nottinghamshire (£18,816) compared to the averages across the East Midlands (£21,845) and England (£27,949). Data is not available at local authority level.

Air Quality Baseline

11.6.4 **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1] sets out the existing baseline with respect to air quality, a summary of those elements which are of relevance to this chapter is below:

- a. There are no Air Quality Management Areas (AQMAs) declared in West Lindsey District Council or Bassetlaw District Council. Concentrations of Nitrogen Dioxide (NO₂) and particulate matter of 10 micrometres and smaller (PM₁₀) are considered to meet the UK objectives across the districts, which is rural with no large conurbations.
- b. West Lindsey District Council undertakes routine ongoing monitoring of NO₂ as part of their Local Air Quality Management (LAQM) responsibilities under Part IV of the Environment Act 1995 at 12 locations in the district. All monitoring sites have recorded concentrations in compliance with the annual mean objective value of 40 micrograms per cubic metre (µg/m³) since monitoring began.
- c. Bassetlaw District Council also conducts routine monitoring of NO₂ via a network of 23 diffusion tube monitoring sites as part of their LAQM responsibilities. All monitoring sites have recorded concentrations in compliance with the annual mean NO₂ objectives from 2015 to 2019, with no data currently available on the Council's website after this date.

- d. A three-month NO₂ diffusion tube monitoring survey was undertaken at nine roadside sites in the vicinity of the Scheme in 2022, in order to produce annual mean 2021 equivalent concentrations for model verification purposes. Annual mean NO₂ concentrations for 2021 at monitoring sites within the vicinity of the Scheme were all below the annual mean NO₂ objective of 40 µg/m³.
- e. Background pollutant concentrations data for the relevant 1 km x 1 km grid squares related to the Study Area have been sourced from Defra Background Maps for 2021. Concentrations are below the relevant air quality objectives across all grid squares which encompass the Scheme.
- f. Baseline rates of soiling are considered normal (based on professional judgement and current background levels).
- g. Existing local sources of particulate matter includes wind-blown dust from exhaust emissions from energy plant and road vehicles, brake and tyre wear from road vehicles and the long-range transport of material from outside the Study Area.

Noise and Vibration Baseline

11.6.5 **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] sets out the existing baseline with respect to noise, a summary of which of relevance to this chapter is below:

- a. Sources of noise close to the Principal Site and the Cable Route Corridor include road traffic noise, wind, bird song, local farming activity noise, aircraft using Sturgate Airfield, fauna and local resident activities.
- b. Road traffic noise from the surrounding road network was present at the majority of locations surveyed, with wind noise being the most dominant noise source at those locations furthest from roads.

Climate Change Baseline

11.6.6 **Chapter 7: Climate Change** of this ES [EN010142/APP/6.1] sets out the existing baseline with respect to GHG emissions. Land within the Order limits consists mainly of Agricultural Land Classification (ALC) Grade 3b (moderate quality agricultural land) with some Grade 3a (good quality agricultural land). Baseline agricultural GHG emissions are dependent on soil and vegetation types present, and fuel use for the operation of vehicles and machinery. While there will be some emissions from the use of machinery on the land, for the purposes of the GHG emissions assessment a conservative estimate of zero existing emissions is assumed.

Landscape and Visual Amenity Baseline

11.6.7 **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1] sets out in detail the existing baseline with respect to landscape and visual amenity. Overall, across the Principal Site, the combination of low-lying farmland with limited woodland cover, sparse built form and low or absent hedgerows creates a very expansive character with open and long-range views. The exception is the locally distinctive landform of Lincoln Cliff to the east, which provides a backdrop to many of these views, as well as offering panoramas from the feature itself.

- 11.6.8 Full details are set out in Chapter 12: Landscape and Visual Amenity of this ES [EN010142/APP/6.1].

Future Baseline

- 11.6.9 Observing trends from **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1] highlights that the population for the relevant Study Area and at a national level is trending towards a growing elderly population (65+) and a smaller working aged population, with ages 16-64 and the 0-15 age group shrinking as a proportion of the population. Other trends covered in the health baseline do not have future projections and are difficult to project due to a large number of influencing factors which are currently unknown. Therefore, in lieu of this information, the current baseline factors have been assumed to be the same for the future baseline.
- 11.6.10 Due to the broad range of individual and environmental determinants that can influence physical and mental health outcomes, the future community health baseline over the medium-term is highly uncertain. Due to this uncertainty, for the purposes of this assessment, it is assumed the future baseline for the Scheme Study Area would be unchanged from the current baseline.
- 11.6.11 The future health and wellbeing baseline reflects, where applicable, that set out within other technical assessments.

11.7 Embedded Design Mitigation

- 11.7.1 This section contains the mitigation measures relevant to this chapter that are already incorporated into the Scheme design, as described in **Chapter 3: Scheme Description** of this ES [EN010142/APP/6.1], and management plans submitted with the DCO application.
- 11.7.2 The Scheme has been designed to take into account sensitive receptors, including human receptors, including by positioning infrastructure to be sensitively located in respect of receptors such as PRow, residential properties and communities, as far as possible.
- 11.7.3 Permissive Paths to enhance the current PRow network will be provided as part of the Scheme, which have been included as embedded mitigation. Two routes are shown on **Figure 3-1: Indicative Principal Site Layout Plan** of this ES [EN010142/APP/6.1]. Both routes are proposed within the Principal Site and are to be along Common Lane to the West of Glentworth. The first is a 1.5 km stretch, joining Northlands Road to the south-west of the Principal Site. The second is a 2 km stretch passing through to Kexby Road to the south.
- 11.7.4 Details on the **Framework Construction Environmental Management Plan (CEMP)** [EN010142/APP/7.8], **Framework Operational Environmental Management Plan (OEMP)** [EN010142/APP/7.9], **Framework Decommissioning Environmental Management Plan (DEMP)** [EN010142/APP/7.10], **Framework Construction Traffic Management Plan (CTMP)** [EN010142/APP/7.11] and **Framework Public Rights of Way**

Management Plan (PRoWMP) [EN010142/APP/7.16] submitted alongside the DCO application are set out below.

- 11.7.5 Further details with respect to specific embedded mitigation measures relevant to minimising amenity impacts associated with traffic, noise and air quality are set out in **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1], **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] and **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1].

Framework Construction Environmental Management Plan

- 11.7.6 A **Framework CEMP** has been prepared as part of the DCO application [EN010142/APP/7.8]. The **Framework CEMP** sets out measures to mitigate against amenity impacts on sensitive receptors during the construction phase (such as noise, air quality, transport and landscape), GHG emissions impacts and flood risk impacts.

- 11.7.7 The Plan sets out the general arrangements for the construction of the Scheme, those of relevance to the health and wellbeing chapter include: key roles and responsibilities for managing environmental impacts (such as a Community Liaison Officer); working hours; implementation of the CEMP; control of noise and light; traffic management; recovery, recycling and disposing of waste; best practice measures; and, security. The Framework CEMP also sets out the mitigation and management measures to be included as a minimum in the detailed CEMP(s).

Framework Operational Environmental Management Plan and Framework Decommissioning Environmental Management Plan

- 11.7.8 **The Framework OEMP [EN010142/APP/7.9] and Framework DEMP [EN010142/APP/7.10]** which have been prepared for the DCO application, set out measures to mitigate against amenity impacts on sensitive receptors during the operational and decommissioning phases, respectively.

- 11.7.9 The Framework OEMP sets out the general arrangements for the operational phase of the Scheme, including: operational activities; replacement schedule; operational programme; control of light; management of vegetation planting; recovery, recycling and disposing of waste; and, security. The Framework OEMP also sets out the mitigation and management measures to be included as a minimum in the detailed OEMP(s).

- 11.7.10 The Framework DEMP sets out the general arrangements for the decommissioning phase of the Scheme, those of relevance to the health and wellbeing chapter include: decommissioning activities and programme; working hours; control of noise and light; traffic management; recovery, recycling and disposing of waste; responding to environmental incidents and emergencies; and, security. The Framework DEMP also sets out the mitigation and management measures to be included as a minimum in the detailed DEMP(s).

Framework Construction Traffic Management Plan

- 11.7.11 A **Framework CTMP** has been prepared as part of the DCO application [EN010142/APP/7.11]. The **Framework CTMP** includes measures to

mitigate against amenity impacts associated with construction traffic during the construction and decommissioning phases.

- 11.7.12 The Framework CTMP supports **Chapter 16: Transport and Access** of the ES [EN010142/APP/6.1] and sets out the Applicant's proposals to manage construction traffic and staff vehicles within the vicinity of the Scheme along the local highway network during the construction period of the works, in order to limit any potential disruptions and implications on the wider transport network. It identifies the management of freight traffic i.e. Heavy Goods Vehicles (HGVs), as well as staff (construction worker) vehicles.

Framework Public Rights of Way Management Plan

- 11.7.13 A **Framework PRowMP [EN010142/APP/7.16]** has been prepared for the DCO application, which outlines how PRow will be managed by the Applicant for the Scheme to ensure they have been suitably considered and able to operate, in terms of both user safety and accessibility, during construction, operation and decommissioning.
- 11.7.14 The document outlines the current PRow which pass through or run adjacent to the Scheme and demonstrates how safe access will be maintained along and across these PRow during the construction, operation, and decommissioning of the Scheme, in accordance with relevant policy.

11.8 Assessment of Likely Impacts and Effects

- 11.8.1 The Scheme as outlined in **Chapter 3: Scheme Description** of this ES [EN010142/APP/6.1] has been considered in assessing the likely impacts and effects, whilst considering the embedded mitigation described in the previous section of this chapter.
- 11.8.2 The Scheme has the potential to impact human health during construction, operation and during decommissioning, due to impacts on the following health determinants:
- a. Community connectivity including access to services, facilities (including open space) and employment;
 - b. Prioritisation of travel by walking and cycling;
 - c. Road and route safety;
 - d. Employment and income;
 - e. Air quality;
 - f. Noise and vibration;
 - g. Climate change; and
 - h. Landscape and visual amenity.

Construction (2025 to 2027)

Community connectivity including access to services, facilities (including open space) and access to employment

Access to Healthcare Services

- 11.8.3 Construction activities from the Scheme has the potential to restrict or create temporary severance to the accessibility of healthcare services for residents in the Study Area.
- 11.8.4 As outlined in **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1], the Applicant estimates that the Scheme will require an average of 812 gross FTE workers during the construction period. Of these, approximately 122 are expected to be taken up by residents within the 60-minute study area and approximately 690 are expected to be taken up by non-home-based workers. The construction workers required to build the Scheme may place extra demand on healthcare services if they move to the area, or if emergency treatment is required.
- 11.8.5 Baseline analysis shows that GP practices local to the Site are operating considerably below benchmark patient to GP ratios and are accepting registrations from new patients. Given the high levels of deprivation experienced across the local Study Area with respect to IMD (2019) barriers to housing and services domain, the low levels of existing services locally, the higher than average proportion of residents aged 65 and over (who could be more likely to require more regular access to services including health services requiring travel into Gainsborough or further afield), but the lower than average levels of poor health among the local population, the sensitivity of the local population with respect to access to healthcare services is assessed to be Medium.
- 11.8.6 The average proportion of the population aged over 65 within the local ward study area is higher than in West Lindsey, Bassetlaw, East Midlands, and England and is projected to increase as a proportion of the population much faster than in England. In addition to this, while the general population is considered to have medium sensitivity, there are likely to be some more vulnerable sub-populations within this; for example those experiencing high deprivation or with pre-existing health conditions, within the small pockets of deprivation identified in the baseline. Therefore, the elderly and more vulnerable sub-populations are likely to have higher reliance on health services and have therefore been assessed as having a High sensitivity to effects on healthcare services.
- 11.8.7 If workers reside locally already, they will be registered at a local practice currently and will not therefore place additional demand for services on local GPs. It is unlikely that many workers would move to live in the immediate area and access the two closest GP surgeries (Willingham-By-Stow Surgery and the Ingham Surgery). However, assuming a worst-case, whereby all of the approximately 690 construction workers who are not likely to live locally require places at local GPs, this would increase the average patients per GP provision across the two surgeries from 1,284 to 1,389 patients per GP, which would remain significantly better than the national target.

- 11.8.8 Due to the limited scale of impacts upon healthcare services, the short-term duration of effect and reversibility, the magnitude of these adverse impacts is assessed to be Negligible.
- 11.8.9 The assessment of effects on healthcare infrastructure reflects impacts related to increasing demand on GP services. For the general population (with a medium sensitivity), it is judged that this would result in a **Minor Adverse** effect, which is considered **not significant**. For the over 65s and more vulnerable sub-populations, which have a high sensitivity, this is also considered a **Minor Adverse (not significant)** effect.

Community Connectivity

- 11.8.10 Activities related to the construction phase of the Scheme (e.g. arising from temporary or permanent closures, diversions or amenity impacts on PRow or impacts on the local road network) may impact access to healthcare and wider community services (including open space), and/or access to employment.
- 11.8.11 As set out in **Chapter 14: Socio-economics and Land Use** of this ES **[EN010142/APP/6.1]**, there is one PRow and one claimed PRow (a bridleway) located within the Principal Site Order limits, eight PRow (all footpaths) located within 500m of the Principal Site, 12 PRow and three claimed PRow that are within the Cable Route Corridor Order limits and 13 PRow and seven claimed PRow within 500m of the Cable Route Corridor.
- 11.8.12 As a result of the Scheme, two new permissive pathways are proposed within the Principal Site, as detailed in **Chapter 14: Socio-economics and Land Use** of this ES **[EN010142/APP/6.1]**, which will offer further safe and direct pathways within the Principal Site, and which connect with the existing PRow network.
- 11.8.13 No permanent closures to PRow are expected during the construction (or operation or decommissioning phases) of the Scheme. In a worst-case scenario, there may be a small number of diversions or temporary closures required. Where temporary closures are needed, there will be a diversion around the works and these diversions managed through traffic management measures, as set out within the **Framework PRowMP** submitted alongside the DCO application **[EN010142/APP/7.16]**. There is one exception; the temporary closure of a 1.7km section of PRow Rampton BOAT13, however this will only be for a maximum of four weeks.
- 11.8.14 **Chapter 16: Transport and Access** of this ES **[EN010142/APP/6.1]** sets out as a reasonable worst-case scenario of traffic generated during the construction phase. It is forecast that there would be up to 120 HGVs and 60 LGVs travelling to/ from the Principal Site per day, representing 240 daily two-way HGV movements and 120 daily two-way LGV movements. It is forecast that there will be a peak of up to 272 HGVs travelling to/ from any four Cable Route Corridor accesses and any two trenchless crossing sites per day, representing 544 daily two-way HGV movements. In addition, during the peak construction period, there will be up to 500 construction staff vehicles (1,000 daily movements) and 14 shuttle bus services (28 daily movements) associated with staff for the Principal Site, representing 1,028 daily movements. It is forecast that there will be a peak of up to 131

construction staff vehicles travelling to/ from any four Cable Route Corridor compounds and any two trenchless crossing sites per day, representing 262 daily two-way vehicle movements.

- 11.8.15 Based on the initial highway impact assessment, there is expected to be less than a 30% increase in traffic flows across several road link receptors (considered a very low magnitude of change with respect to severance, pedestrian delay and pedestrian and cyclist amenity) within the Study Area, resulting in negligible effects.
- 11.8.16 Road link receptors that are expected to see more than a 30% increase in traffic flow are discussed in further detail in **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1]. It should be noted that for those receptors with large percentage changes, they are often caused by low baseline flows recorded on the link. Additionally, after considering embedded mitigation within the Scheme, in particular making use of the spare capacity on the highway outside of the network peak hour, there are not expected to be residual significant effects regarding transport and access as a result of the Scheme on the majority of affected road links. This is with the exception of the B1241, North of Fleets Road which would be subject to a moderate adverse (significant) effect during the AM peak as a result of impacts on severance, pedestrian delay and non-motorised user amenity. However, this effect would only occur if the construction of the Cable Route Corridor is concentrated in this particular area with works being carried out at multiple Cable Route Corridor sites accessed via the B1241. Any overlap of such works would be for a very short period (in the region of weeks).
- 11.8.17 Overall, for the receptors which see an above 30% increase in traffic flow, given the sensitivity of receptors in transport terms and the temporary nature of the construction works, impacts in terms of severance, pedestrian delay and pedestrian and cyclist amenity during the construction phase are expected to be minor adverse, and temporary.
- 11.8.18 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] also sets out an assessment of temporary traffic management impacts, discussing any potential impact of temporary partial or full road closures required in some locations to complete the works associated with the Scheme. There are not expected to be any significant effects on driver and passenger delay and severance due to the following reasons. Any partial or full road closures are expected to be short in duration to minimise impacts on the local highway network. Full closures would only be required where and when necessary on narrow roads where options for retaining public access through the use of two-way traffic signals is not feasible. Additionally, wherever possible access for emergency vehicles, pedestrians and cyclists will be maintained during the temporary closures. Advance warning will be provided in line with local highway authority guidance and diversion routes will be put in place. No permanent road closures will be required.
- 11.8.19 Overall, across the Study Area, additional traffic movements as a result of the Scheme are considered to be within the overall capacity of the highway network, and junction modelling is not deemed to be required, as set out in **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1].

- 11.8.20 Given the high levels of deprivation experienced across the local Study Area with respect to IMD (2019) barriers to housing and services domain, the low levels of existing services locally, the higher than average proportion of residents aged 65 and over, but the lower than average levels of poor health among the local population, the sensitivity of the local population with respect to community connectivity and access to services is assessed to be Medium.
- 11.8.21 Given the short-term duration of the impacts (24 month construction period), the moderate change in quality of life that could arise for residents affected by increased traffic flows, and the rapid reversal in the effect once the construction phase is completed, the overall magnitude of change anticipated on community connectivity and access to services and employment is assessed to be Low.
- 11.8.22 Overall, the likely effect on human health arising from impacts on community connectivity and access to services during the construction phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Prioritisation of walking and cycling

- 11.8.23 Activities related to the construction phase of the Scheme, such as temporary closures, diversions or amenity impacts on PRow or impacts on the local road network, which are used by cyclists and pedestrians, may impact on journeys made by active travel modes, which could therefore have an impact on human health.
- 11.8.24 As set out above, no permanent closures to PRow are expected during the construction (or operation or decommissioning phases) of the Scheme. In a worst-case scenario, there may be a small number of diversions or temporary closures required. Where temporary closures are needed, routes will be re-provided with an alternative within close proximity of the original route. There is one exception; the temporary closure of a 1.7km section of PRow Rampton BOAT13, however this will only be for a maximum of four weeks. The diversions will be managed through traffic management measures, as set out within the **Framework PRowMP** submitted alongside the DCO application [EN010142/APP/7.16].
- 11.8.25 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] assesses the impact of severance, pedestrian delay and non-motorised user amenity during the construction phase, which includes the impact on pedestrian and cyclist amenity (as non-motorised users). As referenced above, the assessment concludes that the impact of severance, pedestrian delay and non-motorised user amenity on road link receptors is expected to be moderate adverse at one receptor, minor adverse at 19 receptors and negligible at all other receptors. It should be noted that significance of effect is forecast during the peak period of construction which is short-term and temporary and the effects will not all occur at the same time. In respect of temporary road closures, as discussed above, access for pedestrians and cyclists will be maintained wherever possible during the temporary closures. The impact of severance, pedestrian delay and non-motorised user amenity for PRow has been assessed as negligible or minor adverse and thus not significant, with one exception, as detailed in **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1].

- 11.8.26 Additionally, in the Order limits there will be two new permissive pathways connecting Common Lane with Kexby Road and Northlands Road, which are detailed in Section 11.7 of this chapter. These routes will provide a safe and direct pathway within the Principal Site, which connects with the existing PRow network.
- 11.8.27 Supporting physical exercise is a key local health priority, as set out in local health strategies. As set out in the baseline section above, due to the location of the Principal Site in rural Lincolnshire, there is limited footway provision in the surrounding area, and there are no dedicated cycle routes. Local residents are however in relatively good health overall in comparison with national indicators, suggesting that a loss of cycling amenity will be less impactful to healthy residents and communities. The sensitivity of the local population with respect to prioritisation of walking and cycling is therefore assessed to be Medium.
- 11.8.28 Given the medium-term duration of the impacts (24 month construction period), the minimal change in quality of life that could arise for cyclists and pedestrians affected by increased traffic flows, and the rapid reversal in the effect once the construction phase is completed, as well as the addition of two permissive pathways, the overall magnitude of change anticipated on prioritisation of walking and cycling during the construction phase is assessed to be Low.
- 11.8.29 Overall, the likely effect on human health arising from impacts on prioritisation of walking and cycling during the construction phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Road and route safety

- 11.8.30 Activities related to the construction phase of the Scheme, such as temporary increases in traffic on the local road network, have the potential to impact on road safety, which may in-turn impact human health.
- 11.8.31 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] assesses the likely impact of the Scheme on fear and intimidation for road users, and road safety, during the construction phase. For fear and intimidation, the Scheme is expected to result in a minor adverse or negligible effect. With regards to road safety, the Scheme is expected to result in a minor adverse effect.
- 11.8.32 There have been relatively low levels of baseline accidents across the Study Area over the last five years, as set out in the Section 11.6. Numbers of deaths from preventable causes (which could include road traffic incidents) are also lower than national averages. The sensitivity of the local population with respect to road and route safety is therefore assessed to be Very Low.
- 11.8.33 Given the conclusions of the transport assessment, the magnitude of change anticipated with respect to road and route safety during the construction phase is assessed to be Low.
- 11.8.34 Overall, the likely effect on human health arising from impacts on road and route safety during the construction phase of the Scheme is assessed to be **Negligible (not significant)**.

Employment and income

- 11.8.35 Construction activities associated with the Scheme will provide access to employment in this phase, which will provide a beneficial health impact to these workers. There is evidence that employment matters to health, not only from an economic perspective, but also in terms of quality of life (Ref. 11-16). Good quality work protects against social exclusion through the provision of income, social interaction, identity and purpose.
- 11.8.36 As set out above, the construction period for the Scheme is expected to be a minimum of 24 months, which includes the construction of the Principal Site and the Cable Route Corridor.
- 11.8.37 The Applicant estimates that the Scheme will require a peak of 1,420 full-time equivalent (FTE) jobs, and an average of approximately 812 gross direct FTE jobs on-site over the minimum 24 month construction period, although in practice the number will vary across the period. **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1] estimates that, taking account of displacement and indirect and induced employment, the Scheme could result in up to 138 net additional jobs per annum that could be taken up by local residents in the 60-minute drive time Study Area, and 776 jobs by people who reside outside this Study Area.
- 11.8.38 Baseline data with respect to employment indicates lower rates of economic activity, higher rates of unemployment and lower GVA per worker within West Lindsey and Bassetlaw compared to national averages. The sensitivity of the local population with respect to employment and income is therefore assessed to be Medium, due to its capacity to benefit from additional employment opportunities.
- 11.8.39 The jobs arising from the construction phase of the Scheme would be temporary over the minimum 24 month construction period. The up to 138 additional jobs within the 60-minute drive time Study Area would represent local job growth, although the overall change would be small in the context of the overall number of jobs locally. Overall, the magnitude of change anticipated with respect to employment and income during the construction phase is therefore assessed to be Low within the 60-minute drive time Study Area.
- 11.8.40 Overall, the likely effect on human health arising from impacts on employment and income during the construction phase of the Scheme is assessed to be **Minor Beneficial (not significant)**.

Air quality

- 11.8.41 The construction activities associated with the Scheme have the potential to reduce air quality, which could potentially lead to adverse health effects on residents.
- 11.8.42 An assessment of potential air quality effects during the construction phase of the Scheme is set out in **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1]. The dust risk assessment identifies the potential for high risk associated with dust soiling, human health and ecological effects, with low risk to human health. Following implementation of good practice

measures, the risk of dust impact during construction is classified as low risk to human health.

- 11.8.43 An assessment of the effect of construction traffic emissions on local air quality is included in Section 6.8. The modelled results at all receptors show that that all predicted annual mean concentrations of air pollutants are well below their respective air quality objectives. The predicted change in concentration as a result of increased construction traffic due to the Scheme is estimated to be negligible at all modelled receptors. Therefore, the increased construction traffic has been assessed to have no effect on air quality in the areas surrounding the Order limits and no mitigation is required.
- 11.8.44 Baseline data with respect to air quality indicates low concentrations of NO₂, and background pollutants in the local Study Area. Rates of deaths from respiratory diseases are also lower in the local area, relative to national average rates. Achieving good air quality is a local policy priority, however. The sensitivity of the local population with respect to air quality is therefore assessed to be Low.
- 11.8.45 The air quality impacts arising from the construction phase of the Scheme would be temporary over the minimum 24 month construction period. Based on the conclusions of the air quality assessment set out in **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1], local impacts are likely to be minimal, following mitigation including best practice measures set out in the **Framework CEMP** submitted alongside the DCO application [EN010142/APP/7.8]. Overall, the magnitude of change anticipated with respect to air quality impacts on human health during the construction phase is therefore assessed to be Very Low.
- 11.8.46 Overall, the likely effect on human health arising from impacts on air quality during the construction phase of the Scheme is assessed to be **Negligible (not significant)**.

Noise and vibration

- 11.8.47 The construction activities associated with the Scheme have the potential to produce noise and vibration impacts which could potentially lead to adverse health effects on residents within the Study Area. These impacts could include changes in affected individuals' health perceptions and mental health (annoyance/ disturbance).
- 11.8.48 **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] sets out the anticipated noise impacts associated with the construction (and decommissioning) phases of the Scheme and the chapters conclusions relevant to human health are summarised below. All predicted noise levels remain below the daytime Significant Observed Adverse Effect Level (SOAEL) (75 dB) for all daytime construction scenarios and are therefore not significant. . There are two Noise Generating Activities (NGAs) where predicted noise levels are expected to be equal to or above Lowest Observed Adverse Effect Level (LOAEL) but below SOAEL, at a limited number of receptors. As detailed in **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1], construction noise levels that are equal to or exceed the LOAEL represent noise that is present and intrusive. Mitigation

measures and noise management plans will be put into place to ensure that construction noise is minimised at all times throughout the construction programme, in accordance with the **Framework CEMP** submitted alongside the DCO application [EN010142/APP/7.8].

- 11.8.49 The night-time LOAEL is defined at 45 dB LAeq,T and the night-time SOAEL is defined at 55 dB LAeq,T. The construction noise assessment indicates that significant effects (an exceedance of SOAEL) may occur at night at sensitive receptors within 200 m of potential trenchless crossing locations. Adverse levels of noise (an exceedance of LOAEL) may also occur at receptors farther away; however, the **Framework CEMP** submitted alongside the DCO application [EN010142/APP/7.8] outlines reasonable steps to reduce these effects. It should be noted that this identification of a likely significant effect is precautionary, as the activities expected to generate the noise would only occur outside of the daytime period if there is a clear and obvious benefit for night-time working, such as for safety reasons, or to avoid daytime disruption to many people, or if required by the asset owner (e.g. in the case of East Midlands Railway). **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] further details that with the implementation of mitigation measures for the trenchless crossings, as listed in Section 13.7, any previously identified receptors which may experience significant noise effects would reduce to below the night-time SOAEL of 55dB LAeq,T, and therefore no significant effects are expected.
- 11.8.50 Additionally, for all works that are undertaken outside core work periods, a Section 61 consent would be voluntarily applied for and will contain details on the methodology, mitigation, communication strategy and monitoring.
- 11.8.51 The assessment also details the potential impact of construction vibration and concludes that any construction phase vibration impacts would be not significant.
- 11.8.52 In terms of the residual effects of the construction traffic noise assessment, **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] details that, after accounting for the mitigation measures set out in the CEMP no significant effects are expected to result.
- 11.8.53 Baseline data with respect to noise indicates low levels of existing noise across the local Study Area. Given the rural setting the local area could be sensitive to changes in noise levels potentially impacting quality of life for residents should local tranquillity be impacted. The sensitivity of the local population with respect to noise and vibration is therefore assessed to be Medium.
- 11.8.54 The noise and vibration impacts arising from the construction phase of the Scheme would be temporary over the minimum 24 month construction period. Based on the conclusions of the assessment set out in **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1], local impacts are likely to be minimal. Overall, the magnitude of change anticipated with respect to noise and vibration impacts on human health during the construction phase is therefore assessed to be **Low**.

- 11.8.55 Overall, the likely effect on human health arising from impacts on noise and vibration during the construction phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Climate Change – GHG emissions

- 11.8.56 Climate change poses a threat to the health, safety and security of the global population, both through direct hazards and indirectly due to damage to the living environment. **Chapter 7: Climate Change** of this ES **[EN010142/APP/6.1]** sets out the anticipated GHG emissions impacts associated with the construction phase of the Scheme. GHG emissions from the construction phase could potentially have an indirect impact on human health, as emissions will contribute towards changing climatic conditions which may lead to extreme weather, heat and flood risk and exacerbation of cardiovascular and respiratory conditions.
- 11.8.57 GHG emissions are expected to be generated by the manufacture of the Scheme's components (embodied carbon impact) and the transport of these components from where they are made to the Order limits. Other sources of GHG emissions include water, energy and fuel use for construction; fuel use for the transportation of construction materials to the Order limits; and the transportation and disposal of waste. Total emissions from construction are estimated at around 946,500 tCO₂e. This represents 0.05% of the 4th UK carbon budget.
- 11.8.58 Taking into consideration the moderate levels of deprivation experienced across the local Study Area, the higher than average proportion of residents aged 65 and over, and the lower than average levels of poor health among the local population, the sensitivity of the health of the local population with respect to climate change effects such as extreme weather events, flooding and temperature change is assessed to be Medium.
- 11.8.59 It is noted that whilst there will be GHG emissions during the construction phase (27.8% of total emissions expected across the Scheme), there is expected to be GHG emissions saving throughout the lifetime of the Scheme, additionally it can be considered that the emissions will be 'offset' by the net positive impact of the Scheme on GHG emissions and the UK's ability to meet its carbon targets.
- 11.8.60 The climate change assessment also notes the key role the construction and operation of solar farms such as the Scheme play in Government policy to decarbonise the national grid and for the UK to meet its net zero emissions target by 2050. Additionally, **Chapter 7: Climate Change** of this ES **[EN010142/APP/6.1]**, highlights the importance of understanding the net lifecycle GHG impact of the Scheme due to the long-term, cumulative nature of GHG emissions of its operational lifetime. Overall, the likely effect on human health arising from impacts on GHG emissions during the construction phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Landscape and Visual Amenity

- 11.8.1 Residents, workers and visitors in communities close to the Scheme, as well as visitors in the Study Area, may experience changes to views, landscape and neighbourhood amenity, during the construction phase, as a result of the

Scheme. These temporary changes may have an impact on the mental health and wellbeing of the population.

- 11.8.2 An assessment of the likely impact of the Scheme on the local landscape and visual amenity during the construction phase of the Scheme is provided in **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1].
- 11.8.3 During the construction phase, significant visual effects, in relation to the Principal Site, may arise as a worst-case scenario for up to 11 representative viewpoints. Any other visual effects for the Principal Site during construction are not considered to be significant. Additionally, **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1] notes that the relative absence of PRow in proximity to the Principal Site, other than those described above, also contributes to there being fewer significant visual effects overall.
- 11.8.4 There are expected to be two representative viewpoints which experience significant visual effects during construction in relation to the Cable Route Corridor. These significant effects are likely to arise, as a worst-case scenario, where the Cable Route Corridor's trenchless crossing drilling points and access routes will be on and/or in very close proximity to PRow and receptors on the River Trent.
- 11.8.5 Given the rural setting, the local area could be sensitive to changes in visual effects potentially impacting quality of life for residents, should local tranquillity be impacted. The sensitivity of the population with respect to human health effects of changes to the landscape and visual amenity is therefore assessed to be Medium.
- 11.8.6 Based on the receptors experiencing significant adverse effects being representative of a low number of residents being affected, with effects being short-term and reversible, the magnitude of impact in relation to human health from landscape and visual amenity is assessed to be Low.
- 11.8.7 Overall, the likely effect on human health arising from impacts on landscape and visual amenity during the construction phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Operation

Community connectivity including access to services, facilities (including open space) and access to employment

Access to Healthcare Services

- 11.8.8 As a result of the operation of the Scheme and the associated employment, there is the potential for local healthcare services to be impacted due to restrictions to, or severance to, the accessibility of health infrastructure.
- 11.8.9 In terms of access to healthcare services, during the operational phase, the Applicant has estimated that there are expected to be between 10-12 gross FTE long-term jobs generated by the Scheme. Additionally, due to the low number of operational staff, the Scheme is likely to only generate very low levels of traffic and will not impact on local residents' ability to access

healthcare facilities. Overall, due to the very low levels of traffic expected during the operation phase, and assuming a worst-case scenario whereby ten employees from the Scheme move to the area and require places at local surgeries, the impact on access to healthcare services in the area would be Negligible.

- 11.8.10 For the general population (with a medium sensitivity), these adverse impacts are judged to result in a **Negligible effect (not significant)**. For the over 65s and other more vulnerable sub-populations, which have a high sensitivity, this is also judged to result in a **Negligible (not significant)** effect.

Community connectivity

- 11.8.11 Activities related to the operational phase of the Scheme (e.g. arising from temporary or permanent closures, diversions or amenity impacts on PRow or impacts on the local road network) may impact access to healthcare and wider community services (including open space), and/or access to employment.
- 11.8.12 As set out above, **Chapter 14: Socio-economics and Land Use** of this ES **[EN010142/APP/6.1]** sets out that no effects on local community severance or users of PRow are anticipated to arise from the operation of the Scheme.
- 11.8.13 There will be two new permissive pathways within the Order limits, connecting Common Lane with Kexby Road and Northlands Road, as detailed in 11.7. These routes will provide a safe and direct pathway within the Principal Site, which connects with the existing PRow network. As discussed in **Chapter 14: Socio-economics and Land Use** of the ES **[EN010142/APP/6.1]**, the addition of the new permissive pathways results in a minor beneficial (not significant) effect.
- 11.8.14 **Chapter 16: Transport and Access** of this ES **[EN010142/APP/6.1]** sets out that the Scheme is expected to generate a low level of vehicle trips during operation – a worst case of up to 13 vehicles (26 movements) per day associated with on-site staff, and an average of five visits per week from four-wheel drive vehicles, HGVs or transit vans for maintenance.
- 11.8.15 As above, the sensitivity of the local population with respect to community connectivity and access to services and employment is assessed to be Medium.
- 11.8.16 Given the very low level of traffic movements expected during the operational phase and the addition of the two new permissive pathways, the overall magnitude of change anticipated to community connectivity and access to services and employment as a result of the Scheme is assessed to be Negligible. Overall, the likely effect on this during the operation phase of the Scheme is therefore assessed to be **Negligible (not significant)**.

Prioritisation of walking and cycling

- 11.8.17 Activities related to the operational phase of the Scheme, such as temporary closures, diversions or amenity impacts on PRow or impacts on the local road network, which are used by cyclists and pedestrians, may impact on journeys made by active travel modes, which could therefore have an impact on human health.

- 11.8.18 No temporary or permanent diversions to PRow would be required during the operational phase of the Scheme.
- 11.8.19 As discussed above, there will be two new permissive pathways within the Order limits, connecting Common Lane with Kexby Road and Northlands Road, as detailed in 11.7. These routes will provide a safe and direct pathway within the Principal Site, which connects with the existing PRow network. As discussed in **Chapter 14: Socio-economics and Land Use** of the ES [EN010142/APP/6.1], the addition of the new permissive pathways results in a minor beneficial (not significant) effect.
- 11.8.20 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] does not specifically assess effects on pedestrian and cyclist amenity during operation. These effects have been scoped out, as agreed with local highway authorities, on the basis of the overall low levels of traffic arising from the operation of the Scheme.
- 11.8.21 As above, the sensitivity of the local population with respect to prioritisation of walking and cycling is assessed to be Medium. This is because supporting physical exercise is a key local health priority, as set out in local health strategies. As established in the baseline section above, due to the location of the Principal Site in rural Lincolnshire, there is limited footway provision in the surrounding area, and there are no dedicated cycle routes. Local residents are however in relatively good health overall in comparison with national indicators.
- 11.8.22 Due to the very limited transport and access impacts expected during the operational phase, exemplified by the fact a detailed assessment has been scoped out. Given this and the addition of the two new permissive pathways, overall, the magnitude of change anticipated on human health arising from prioritisation of walking and cycling during the operation of the Scheme is assessed to be Low (beneficial). Overall, the likely effect is assessed to be **Minor beneficial (not significant)**.

Road and route safety

- 11.8.23 Activities related to the operational phase of the Scheme, such as increases in traffic on the local road network, have the potential to impact on road safety, which may in-turn impact human health.
- 11.8.24 **Chapter 16: Transport and Access** of this ES [EN010142/APP/6.1] does not specifically assess effects on road and route safety during operation. These effects have been scoped out, as agreed with local highway authorities, on the basis of the overall low levels of traffic arising from the operation of the Scheme.
- 11.8.25 As above, the sensitivity of the local population with respect to road and route safety is also assessed to be Very Low. This is because there have been relatively low levels of baseline accidents across the Study Area over the last five years, as set out in the baseline section above. Numbers of deaths from preventable causes (which could include road traffic incidents) are also lower than national averages.

- 11.8.26 The magnitude of change anticipated on human health arising from road and route safety during the operation of the Scheme is assessed to be Very Low. Thus, overall the likely effect is assessed to be **Negligible (not significant)**.

Employment and income

- 11.8.27 Operational activities associated with the Scheme will provide access to employment in this phase, which will provide a beneficial health impact to these workers. There is evidence that employment matters to health, not only from an economic perspective, but also in terms of quality of life (Ref. 11-16). Good quality work protects against social exclusion through the provision of income, social interaction, identity and purpose.
- 11.8.28 As set out in **Chapter 14: Socio-economics and Land Use** of this ES [EN010142/APP/6.1], the Scheme will generate an estimated 10 FTE long-term jobs during the operational phase as the worst-case. After accounting for additionality and existing employment displaced it is estimated that the Scheme will result in the net additional creation of zero jobs.
- 11.8.29 As above, the sensitivity of the local population with respect to employment and income is assessed to be Medium.
- 11.8.30 Overall, given that no net new jobs would be created, the magnitude of change anticipated with respect to employment and income during the operation of the Scheme is therefore assessed to be Negligible. Overall, the likely effect is assessed to be **Negligible (not significant)**.

Air quality

- 11.8.31 The operational traffic associated with the Scheme has the potential to reduce air quality, which could potentially lead to adverse health effects on residents.
- 11.8.32 As set out in **Chapter 6: Air Quality** of this ES [EN010142/APP/6.1], the impacts of the Scheme on air quality during its operation are scoped out since the air quality effects arising from the traffic movements expected are anticipated to be Negligible.
- 11.8.33 As above, the sensitivity of the local population with respect to air quality is assessed to be Low.
- 11.8.34 Based on these conclusions, the magnitude of change anticipated with respect to air quality impacts on human health during the operation of the Scheme is assessed to be Negligible. Thus, overall the likely effect is assessed to be **Negligible (not significant)**.

Operational Noise

- 11.8.35 The operational activities associated with the Scheme have the potential to produce noise impacts which could potentially lead to adverse health effects on residents within the Study Area. These impacts could include changes in affected individuals' health perceptions and mental health (annoyance/disturbance).
- 11.8.36 As set out in **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1], there is not anticipated to be any noticeable impulsive or intermittent characteristics from plant noise emissions experienced at the

surrounding receptors. Transformers within the BESS compound can have tonal features, although noise emissions from the BESS will be dominated by the cooling fans such that any tonal features of the transformers will not be noticeable. However, overall plant noise emissions experienced at receptors will likely be perceived as a distinctive continuous and steady hum.

- 11.8.37 As above, the sensitivity of the local population with respect to noise and vibration is assessed to be Medium.
- 11.8.38 **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1] sets out that no significant effects are predicted during operation. Although the Scheme has the potential for some non-significant adverse effects on some receptors during operation, which have been minimised as set out within **Chapter 13: Noise and Vibration** of this ES [EN010142/APP/6.1]. Overall, the magnitude of change anticipated with respect to noise impacts on human health during the operational phase is therefore assessed to be Low. Therefore, the likely effect on human health arising from impacts on noise during the operation of the Scheme is assessed to be **Minor Adverse (not significant)**.

Climate Change – GHG emissions

- 11.8.39 Climate change poses a threat to the health, safety and security of the global population, both through direct hazards and indirectly due to damage to the living environment. **Chapter 7: Climate Change** of this ES [EN010142/APP/6.1] sets out the anticipated GHG emissions impacts associated with the operation of the Scheme. GHG emissions are expected to be generated by operational energy use, fuel used for the transportation of workers to the Scheme, and maintenance activities.
- 11.8.40 Based on the expected operational lifetime of the Scheme of at least 60 years, total emissions during operation are estimated at 2,470,621tCO_{2e}.
- 11.8.41 **Chapter 7: Climate Change** of this ES [EN010142/APP/6.1] sets out any adverse GHG emissions impacts would be far outweighed by the beneficial impact of the Scheme as a result of renewable energy generation. As described in the chapter, as the operational carbon intensity of the Scheme remains below a CCGT (Combined Cycle Gas Turbine) facility throughout its lifetime, it is considered that the overall GHG impact of the Scheme is beneficial and significant, as it will play a part in achieving the rate of transition required by nationally set policy commitments and supporting the trajectory towards net zero.
- 11.8.42 As above, the sensitivity of the health of the local population with respect to GHG emissions is assessed to be Medium.
- 11.8.43 **Chapter 7: Climate Change** of this ES [EN010142/APP/6.1] explains that the Scheme has very low emissions relative to the sectoral carbon budgets and the Scheme will achieve substantial emissions reductions relative to the without-scheme baseline. Based on the conclusions of **Chapter 7: Climate Change** [EN010142/APP/6.1], the magnitude of impact is assessed to be Low (beneficial).

- 11.8.44 The overall likely effect on human health arising from impacts on GHG emissions during the operation of the Scheme is assessed to be **Minor Beneficial (not significant)**.

Landscape and Visual Amenity

- 11.8.45 Residents, workers and visitors in communities close to the Scheme, as well as visitors in the Study Area, may experience changes to views, landscape and neighbourhood amenity, during the operational phase, as a result of the Scheme. These changes may have an impact on the mental health and wellbeing of the population.
- 11.8.46 An assessment of the likely impact of the Scheme on the local landscape and visual amenity during Operation Year 1 (Winter) and Operation Year 15 (Summer) is provided in **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1].
- 11.8.47 The visual effects related to the Principal Site at Operation Year 1, will be similar to those described for the construction phase. In a worst-case scenario, significant visual effects may arise during Operation Year 1 (Winter) for up to 11 representative viewpoints. Further visual effects of the Principal Site and in relation to the Cable Route Corridor are not expected to be significant.
- 11.8.48 As discussed in **Chapter 12: Landscape and Visual Amenity** of this ES [EN010142/APP/6.1], mitigation planting will be sufficiently mature to reduce the magnitude of visual effects at Operation Year 15 relative to Operation Year 1 in the majority of cases. For Operation Year 15 (Summer), significant visual effects may still remain for up to three representative viewpoints. No significant visual effects are expected for the Cable Route Corridor.
- 11.8.49 As above, the sensitivity of the population with respect to the human health effects of changes to the landscape and visual amenity is therefore assessed to be Medium.
- 11.8.50 Based on the receptors experiencing significant adverse effects being representative of a low number of properties, a low number of residents will be affected in Operation Year 1 (Winter). This also applies to those affected in Operation Year 15 (Summer), with this number of residents being lower. Additionally, over the course of the operational phase it is likely that people will become used to the change in landscape and visual amenity and it will therefore have less of an impact on mental health and wellbeing. Overall, the magnitude of impact in relation to human health is therefore assessed to be **Low**.
- 11.8.51 Overall, the likely effect on human health arising from impacts on landscape and visual amenity during the operational phase of the Scheme is assessed to be **Minor Adverse (not significant)**.

Decommissioning

- 11.8.52 Drawing on the assessments set out in Chapter 6: Air Quality, Chapter 7: Climate Change, Chapter 13: Noise and Vibration Chapter 14: Socio-economics and Land Use, Chapter 12: Landscape and Visual Amenity; and Chapter 16: Transport and Access of this ES [EN010142/APP/6.1], effects on

human health during the decommissioning of the Scheme are anticipated to be in line with or no worse than effects during the construction phase of the Scheme.

11.9 Additional Mitigation and Enhancements

Additional Mitigation

- 11.9.1 No additional mitigation is required with respect to human health effects arising from the Scheme.

Enhancements

- 11.9.2 No additional enhancements are required or provided with respect to human health effects arising from the Scheme.

11.10 Residual Effects

- 11.10.1 This section summarises the residual effects of the Scheme on human health following the implementation of embedded and additional mitigation.
- 11.10.2 **Table 11-12** and **Table 11-13** outline the likely residual effects after mitigation.
- 11.10.3 No significant residual effects are anticipated to occur during construction, operation or decommissioning of the Scheme.

Table 11-12 Summary of Residual Effects – Human Health (construction and decommissioning)

Receptor	Description of Impact	Significance of Effect Without Mitigation	Mitigation/ Enhancement Measure	Residual Effect After Mitigation
Community connectivity including access to services, facilities (including open space) and employment	Impacts arising from temporary or permanent closures, diversions or amenity impacts on PRoW, or impacts on the local road network, as well as employment, and associated impacts on access to healthcare and wider community services (including open space), and/or access to employment.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)
Prioritisation of travel by walking and cycling	Impact on journeys made by active travel modes from construction activities of the Scheme, such as temporary closures, diversions or amenity impacts on PRoW or impacts on the local road network.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)
Road and route safety	Impacts on road safety related to activities from the construction phase of the Scheme, such as temporary increases in traffic on the local road network.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)
Employment and income	Generation of employment and income associated with the construction phase.	Minor Beneficial (not significant)	None required beyond measures set out in Section 11.7.	Minor Beneficial (not significant)

Receptor	Description of Impact	Significance of Effect Without Mitigation	Mitigation/ Enhancement Measure	Residual Effect After Mitigation
Air quality	Air quality impacts from the construction of the Scheme and associated health impacts.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)
Noise and vibration	Noise and vibration impacts from the construction of the Scheme and associated amenity and mental health impacts.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)
Climate change	Potential indirect impact on human health, as emissions from the construction phase will contribute towards changing climatic conditions which may lead to extreme weather, heat and flood risk	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)
Landscape and visual amenity	Changes to views, landscape and neighbourhood amenity due to construction of the Scheme and associated mental health and wellbeing impacts.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)

Table 11-13 Summary of Residual Effects – Human Health (operation)

Health Determinant	Description of Impact	Significance of Effect Without Mitigation	Mitigation/ Enhancement Measure	Residual Effect After Mitigation
Community connectivity including access to services, facilities (including open space) and employment	Impacts arising from temporary or permanent closures, diversions or amenity impacts on PRow, or impacts on the local road network, as well as employment, and associated impacts on access to healthcare and wider community services (including open space), and/or access to employment.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)
Prioritisation of travel by walking and cycling	Impact on journeys made by active travel modes from operation activities of the Scheme, such as temporary closures, diversions or amenity impacts on PRow or impacts on the local road network, or the creation of new routes.	Minor Beneficial (not significant)	None required beyond measures set out in Section 11.7.	Minor Beneficial (not significant)
Road and route safety	Impacts on road safety related to activities from the operation phase of the Scheme, such as temporary increases in traffic on the local road network.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)
Employment and income	Generation of employment and income associated with the operation phase.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)

Health Determinant	Description of Impact	Significance of Effect Without Mitigation	Mitigation/ Enhancement Measure	Residual Effect After Mitigation
Air quality	Air quality impacts from the operation of the Scheme and associated health impacts.	Negligible (not significant)	None required beyond measures set out in Section 11.7.	Negligible (not significant)
Noise	Noise impacts from the operation of the Scheme and associated amenity and mental health impacts.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)
Climate change	Potential indirect impact on human health, as emissions from the operation phase will contribute towards changing climatic conditions which may lead to extreme weather, heat and flood risk.	Minor Beneficial (not significant)	None required beyond measures set out in Section 11.7.	Minor Beneficial (not significant)
Landscape and visual amenity	Changes to views, landscape and neighbourhood amenity due to operation of the Scheme and associated mental health and wellbeing impacts.	Minor Adverse (not significant)	None required beyond measures set out in Section 11.7.	Minor Adverse (not significant)

11.11 Cumulative Effects

- 11.11.1 An assessment of cumulative effects is presented in **Chapter 18: Cumulative Effects and Interactions** of this ES [EN010142/APP/6.1].

11.12 References

- Ref. 11-1. IEMA (2022), Determining Significance For Human Health In Environmental Impact Assessment (EIA).
- Ref. 11-2. IEMA, (2022), Effective Scoping of Human Health in EIA.
- Ref. 11-3. NHS HUDU, (2019), Rapid Health Impact Assessment (HIA) Tool.
- Ref. 11-4. Lincolnshire Health and Wellbeing Board. (2022). Joint Health and Wellbeing Strategy for Lincolnshire. Available at: <https://www.lincolnshire.gov.uk/directory-record/63751/joint-health-and-wellbeing-strategy> [Accessed 08 February 2024].
- Ref. 11-5. Nottinghamshire Health and Wellbeing Board and Nottinghamshire County Council, (2022), Nottinghamshire Joint Health and Wellbeing Strategy 2022-2026.
- Ref. 11-6. WHO, (1946), Constitution of the World Health Organisation.
- Ref. 11-7. Dahlgren, G. & Whitehead, M, (2021), The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows.
- Ref. 11-8. Barton, H. & Grant, M. (2006). A health map for the local human habitat. The Journal for the Royal Society for the Promotion of Health, 126 (6). Pp.252-253. ISSN 1466-4240 developed from the model by Dahlgren and Whitehead, 1991.
- Ref. 11-9. ONS, 2011. Census.
- Ref. 11-10. ONS, 2021. Census.
- Ref. 11-11. MHCLG, (2020), English Indices of Deprivation (2019).
- Ref. 11-12. OHID, (2022), Public Health Profiles.
- Ref. 11-13. ONS, (2022). Claimant Count.
- Ref. 11-14. NHS Digital. (October 2022). General Practice Data.
- Ref. 11-15. NHS Digital (2023). General Practice Workforce, 31 December 2023.
- Ref. 11-16. Public Health England, (2019). Health matters: health and work. Available at: <https://www.gov.uk/government/publications/health-matters-health-and-work/health-matters-health-and-work> [Accessed 08 February 2024].
- Ref. 11-17. Central Lincolnshire Local Plan; Health Impact Assessment for Planning Applications, Guidance Note, Updated April 2023. (2023). Available at: <https://www.n-kesteven.gov.uk/sites/default/files/2023-04/HIA%20Guidance%20Note%202023.pdf> [Accessed 08 February 2024].