

A47/A11 Thickthorn Junction

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Volume 6

6.1 Environmental Statement

Chapter 12 – Population and Human Health

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Infrastructure Planning

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**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

The A47/A11 Thickthorn Junction
Development Consent Order 202[x]

**CHAPTER 12
POPULATION AND HUMAN HEALTH**

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12. Population and human health

12.1. Introduction

- 12.1.1. Highways England (the Applicant) has submitted an application for an order to grant a development consent order (DCO) for the A47/A11 Thickthorn Junction (hereafter referred to as 'the Proposed Scheme'). The Proposed Scheme will create one new connector road between the A11 and A47 and provide a new link road between Cantley Lane South and the B1172 Norwich Road for continued access to the Thickthorn Interchange. Two new underpasses and two new overbridges will also be constructed along with improvements to the Thickthorn roundabout. The Proposed Scheme will reroute traffic away from the existing Thickthorn Junction, which currently experiences delays and high levels of congestion during peak hours.
- 12.1.2. Under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, the Proposed Scheme is an Environmental Impact Assessment (EIA) development and as such requires submission of an Environmental Statement (ES) presenting the likely significant environmental effects of the Proposed Scheme.
- 12.1.3. As part of the EIA process, this ES chapter reports the potential significant effects for population and human health as a result of the Proposed Scheme. This assessment includes a review of the existing baseline conditions, consideration of the potential impacts and identification of proportionate mitigation and enhancement.
- 12.1.4. The requirement to carry out an assessment of potential impacts on population and human health is set out in EIA Directive (2014/52/EU), which is implemented through Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
- 12.1.5. The approach to this assessment has been updated since the Scoping Report (February 2018) (**TR010037/APP/6.5**) and subsequent agreed Scoping Opinion (March 2018) (**TR010037/APP/6.6**) to ensure accordance with the most up to date guidance in the Design Manual for Roads and Bridges (DMRB), LA 112 Population and human health.
- 12.1.6. Key guidance on health effects identifies that any assessment should aim to predict the health and wellbeing outcomes of the policy or project being assessed. This includes the Institute for Environmental Management & Assessment (IEMA) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach 2017.

12.1.7. Potential impacts of the Proposed Scheme on population and human health may arise from a range of contributing elements including changes to traffic flows, temporary and permanent land take of agricultural land, changes to air quality and noise emissions, and changes to the landscape and townscape. These aspects are dealt with in the respective ES chapters. This chapter considers the effects on private property, land important to the community, future development, local businesses, agricultural land, walkers, cyclists and horse riders. An assessment of the impact of the Proposed Scheme on the health of local populations has also been undertaken, using information from other chapters where relevant.

12.2. Competent expert evidence

12.2.1. The competent expert is a Chartered Environmentalist with 17 years' relevant experience of similar projects and impact assessments. They have a Bsc (Hons) in Environmental Management and is a Full Member of the Institute of Environmental Management and Assessment (IEMA). They have used their EIA knowledge, experience with DMRB and road infrastructure projects and professional judgement in identifying the likely significant impacts associated with the Proposed Scheme and providing technical guidance through the assessment process.

12.3. Legislative and policy framework

12.3.1. The following legislation has been considered as part of this assessment:

- The Countryside and Rights of Way Act (2000) (CRoW Act). The CRoW Act regulates public rights of way (PRoW) and open access land and ensures access to them.
- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the assessment of population and human health as part of this ES.
- National Policy Statement for National Networks (NPS NN, 2014): The NPS NN sets out the need for, and the Government's policies to deliver development of, NSIPs on the national road network in England and also sets out the primary basis for making decisions of development consent for nationally significant infrastructure projects (NSIPs) in England. The Government recognises in the Appraisal of Sustainability accompanying the NPS NN that some developments would have some adverse local impacts on noise, air quality emissions, landscape and visual amenity. The significance of these effects and the effectiveness of mitigation is uncertain at the strategic and non-locational specific level of the NPS NN. Therefore, whilst applicants should deliver developments in accordance with government policy and in an environmentally sensitive way, including considering

opportunities to deliver environmental benefits, some adverse local effects of development may remain.

- Health and Social Care Act (2012): the Act was introduced following the Health and Social Care Bill 2011 and outlines the Secretary of State's duty to promote and improve the National Health Service (NHS), in pursuit of a number of key aims, which include:
 - An improvement in the quality of services.
 - A reduction in health inequalities.
 - The promotion of autonomy for General Practitioners (GPs) and health centres.
 - Improvements to the treatments and services offered to patients. The document focuses on the regulation of the NHS at a national and local level, and also promotes changes such as the abolition of NHS Trusts, support for the production of Joint Strategic Needs Assessments (JSNA), and establishment of health and well-being boards at a local authority level. These boards would be established for the purpose of advancing the health and well-being of people within each local authority area and aim to *“encourage persons who arrange for the provision of any health or social care services in that area to work in an integrated manner”*.
- Public Health England's Public Health Outcomes Framework (2019): This framework sets out a vision for public health, desired outcomes and the indicators that would help us understand how well public health is being improved and protected. The framework concentrates on two high-level outcomes (healthy life expectancy and differences in life expectancy and healthy life expectancy between communities) to be achieved across the public health system, and groups further indicators into four 'domains' that cover the full spectrum of public health. The outcomes reflect a focus not only on how long people live, but on how well they live at all stages of life.
- Norfolk County Council's Public Health Strategy 2016-2020: This strategy aims to prioritise public health actions which would promote healthy living and healthy places; protect communities and individuals from harm; provide services that meet community needs and work in partnerships to deliver better services. The guiding principles set out in the document include: increasing active travel, making streets safer and improving air quality.

12.4. Assessment methodology

12.4.1. The following standards and guidance have been used to inform the assessment:

- DMRB LA 112 Population and human health
- IEMA, Health in EIA: A Primer for a Proportionate Approach
- Health Impact Assessment Tools (Department of Health, 2010)

12.4.2. In line with DMRB LA 112, this assessment considers the impacts of the Proposed Scheme on the following:

- **Land use and accessibility, including:**
 - private property and housing (including planning applications and allocated land for housing)
 - community land and assets (including connections between communities and their assets)
 - development land and businesses
 - agricultural land holdings
 - walkers, cyclists and horse-riders (WCH)
- **Human health, including:**
 - health profiles of affected communities
 - health determinants, comprising the following:
 - access to healthcare facilities
 - access to community, recreation and education facilities
 - access to green and open space
 - existing and predicted levels of air and noise pollution
 - landscape amenity
 - sources and pathways of potential pollution (for example land and water contamination)
 - safety
 - likely health outcomes

12.4.3. Baseline information has been gathered using desktop sources and information collected for the other topic assessments in this Environmental Statement. The WCH assessment has also incorporated survey results, from surveys undertaken in 2017. The following desktop sources have been used:

- Ordnance Survey mapping
- OS Address Point Data
- Google street view
- Multi-Agency Geographic Information for the Countryside (MAGIC) mapping¹
- South Norfolk Council Site Allocations DPD document²
- Norfolk County Council PRoW mapping tool³

¹ Defra (2020) MAGIC Map. Accessed: <https://magic.defra.gov.uk/>

² South Norfolk Council (2015) Site Specific Allocations and Policies Document. Accessed: <https://www.south-norfolk.gov.uk/residents/planning/planning-policy/adopted-south-norfolk-local-plan/site-specific-allocations-and>

³ Norfolk County Council (2020) Public Right of Way Mapping Tool. Accessed: <https://maps.norfolk.gov.uk/highways/>

- Public Health England, Local Health Profile (Fingertips)⁴
- Office for National Statistics data⁵
- Census data

Update to guidance and scope of assessment

- 12.4.4. Following a review of the updates to DMRB LA 112 Population and human health published in 2019, the original scope as set out in the 2018 Scoping Report (TR010037/APP/6.5) has changed.
- 12.4.5. In the previous DMRB guidance, 'population and human health' topic was referred to as 'People and Communities' and often assessed under two separate chapters: 'Community and private assets' and 'Effects on all travellers'. Driver stress, view from the road and WCH⁶ amenity are no longer included within the scope of this chapter due to the changes to guidance.
- 12.4.6. Severance is now assessed in terms of separation of communities to assets and areas of community land, alterations to private properties (including their access) and severance of WCH routes.
- 12.4.7. Human health is now recognised as a key consideration in decision-making of development projects, including highways. As such, it is a new topic within DMRB LA 112 and has therefore been included within the scope of this assessment.
- 12.4.8. The study areas have also been updated in line with the latest DMRB, as explained in Section 12.6.

Surveys

- 12.4.9. WCH surveys were undertaken at the following locations, as shown on ES Figure 12.2 (TR010037/APP/6.2):
- NMU01 - A47 southbound off-slip crossing
 - NMU02 - A47 northbound off-slip crossing
 - NMU03 - Newmarket Road
 - NMU04 - B1172 Norwich Road crossing to Thickthorn Park & Ride
 - NMU05 - Cantley Lane footbridge

⁴ Public Health England (2020) Local Health Profiles. Accessed: <https://fingertips.phe.org.uk/profile/health-profiles>

⁵ Office for National Statistics (2020). <https://www.ons.gov.uk/>

⁶ The term Non-Motorised User (NMU) which was used in the previous DMRB guidance has now been replaced with walkers, cyclists and horse-riders (WCH) and this term has been used for the remainder of the Population and human health assessment

- NMU06 - Cantley Lane
- NMU07 - A11 Newmarket Road crossing
- NMU08 - Roundhouse Way roundabout crossing
- CYC01 - Thickthorn junction

12.4.10. The surveys were carried out between 0700 and 1900 hours for four consecutive days during school term time (Saturday 8 July to Tuesday 11 July 2017) and four consecutive days during the school summer holidays (Saturday 22 July to Tuesday 25 July 2017) using CCTV video cameras. The weather during both sets of surveys was dry and cloudy. As such, we would expect that the usage information collected are representative of typical weekday and weekend WCH activity in the vicinity of Thickthorn Junction and are sufficient to inform this assessment. The results from the surveys are presented in ES Appendix 12.1 (TR010037/APP/6.3).

Consultation

12.4.11. Updates to DMRB guidance have resulted in changes to the scope of this chapter. The changes have been confirmed to the key consultees (South Norfolk Council, Planning Inspectorate).

12.4.12. Statutory public consultation was undertaken from 3 June to 11 July 2019 and included public exhibition events. Non statutory public consultation was undertaken from 13 March to 21 April 2017. On conclusion of the non statutory public consultation a consultation report was completed and is included as an Annex to the Consultation Report submitted as part of the DCO application (TR010037/APP/5.1).

12.4.13. A meeting was held on 23 November 2017 with Norfolk County Council’s Cycling and Active Travel Officer and the Highways Manager (south) to discuss the Thickthorn junction and its impacts on walkers, cyclists and horse-riders. A summary of the key points raised is provided in Table 12-1.

Table 12-1: Summary of consultation comments

Consultee	Comment	Date
Norfolk County Council Active Travel Officer and Highways Manager (south)	Replacing the footbridge connecting Cantley Lane to Cantley Lane South on a like for like basis would not provide access for the full range of WCH which may wish to make east to west journeys. Similarly, the existing design does not cater for wheelchair users or others with impaired mobility.	23 November 2017
Norfolk County Council Active Travel Officer and Highways Manager (south)	The northern east to west WCH route through the junction is on a popular commuting route. Crossing the north facing	23 November 2017

Consultee	Comment	Date
	slip roads is via Toucan crossings which appear to be set to favour motor vehicles on the roundabout.	
Norfolk County Council Active Travel Officer and Highways Manager (south)	The southern east to west WCH route through the junction was introduced to enable equestrians to travel between Cantley Lane and Cantley Lane South. However, there is no evidence of the Pegasus crossing facilities on the slip roads, nor the bridleways adjacent to the slip roads ever being used.	23 November 2017

12.4.14. The key points raised have been investigated as part of the design process. The design, mitigation and enhancement measures incorporated into the Proposed Scheme (as set out later in this chapter) as part of the WCH strategy address these points.

12.4.15. A scheme update meeting was held with local stakeholders on 10 September 2020 to obtain feedback on the proposals from a WCH perspective. Those invited included representatives from local cycling groups, the Norwich Cycling Campaign, the British Horse Society, the Ramblers and the Local Access Forum. In general, the WCH facilities to be provided as part of the Proposed Scheme were favourably received.

Assessment criteria

12.4.16. DMRB LA 112 sets out the requirements for assessing and reporting the environmental effects on population and human health from construction, operation and maintenance of highway projects. This has been used for the assessments within this chapter, as explained below.

Land use and accessibility *Sensitivity of receptors*

12.4.17. The sensitivity of land use and accessibility receptors has been determined using the criteria presented in Table 12-2. These criteria are derived from Table 3.11 of DMRB LA 112.

Table 12-2: Sensitivity of receptors

Receptor value (sensitivity)	Description
Very High	Private property and housing: <ol style="list-style-type: none"> 1) existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (ONS data); and/or 2) existing housing and land allocated for housing (for example, strategic housing sites) covering >5ha and / or >150 houses. Community land and assets where there is a combination of the following:

Receptor value (sensitivity)	Description
	<p>1) complete severance between communities and their land/assets, with little/no accessibility provision;</p> <p>2) alternatives are only available outside the local planning authority area;</p> <p>3) the level of use is very frequent (daily); and</p> <p>4) the land and assets are used by the majority ($\geq 50\%$) of the community.</p> <p>Development land and businesses:</p> <p>1) existing employment sites (excluding agriculture) and land allocated for employment (for example, strategic employment sites) covering $>5\text{ha}$.</p> <p>Agricultural land holdings:</p> <p>1) areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and</p> <p>2) access between land and key agricultural infrastructure is required on a frequent basis (daily).</p> <p>Walkers, cyclists, horse-riders (WCH):</p> <p>1) national trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution.</p> <p>2) routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs.</p> <p>3) rights of way for WCH crossing roads at grade with $>16,000$ vehicles per day.</p>
High	<p>Private property and housing:</p> <p>1) private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data); and/or</p> <p>2) existing housing and land allocated for housing (for example, strategic housing sites) covering $>1\text{-}5\text{ha}$ and / or $>30\text{-}150$ houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>1) there is substantial severance between community and assets, with limited accessibility provision;</p> <p>2) alternative facilities are only available in the wider local planning authority area;</p> <p>3) the level of use is frequent (weekly); and</p> <p>4) the land and assets are used by the majority ($\geq 50\%$) of the community.</p> <p>Development land and businesses:</p> <p>1) existing employment sites (excluding agriculture) and land allocated for employment (for example, strategic employment sites) covering $>1 - 5\text{ha}$.</p> <p>Agricultural land holdings:</p> <p>1) areas of land in which the enterprise is dependent on the spatial relationship of land to key agricultural infrastructure; and</p> <p>2) access between land and key agricultural infrastructure is required on a frequent basis (weekly).</p> <p>Walkers, cyclists, horse-riders (WCH):</p> <p>1) regional trails and routes (for example, promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or</p>

Receptor value (sensitivity)	Description
Medium	<p>2) rights of way for WCH crossing roads at grade with >8,000 - 16,000 vehicles per day.</p> <p>Private property and housing:</p> <ol style="list-style-type: none"> 1) houses or land allocated for housing located in a local authority area where the number of households are expected to increase by >6-15% by 2041 (ONS data); and/or 2) existing housing and land allocated for housing (for example, strategic housing sites) covering <1ha and/or <30 houses. <p>Community land and assets where there is a combination of the following:</p> <ol style="list-style-type: none"> 1) there is severance between communities and their land/assets but with existing accessibility provision; 2) limited alternative facilities are available at a local level within adjacent communities; 3) the level of use is reasonably frequent (monthly); and 4) the land and assets are used by the majority (>=50%) of the community. <p>Development land and businesses:</p> <ol style="list-style-type: none"> 1) existing employment sites (excluding agriculture) and land allocated for employment (for example, strategic employment sites) covering <1ha. <p>Agricultural land holdings:</p> <ol style="list-style-type: none"> 1) areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly). <p>Walkers, cyclists, horse-riders (WCH):</p> <ol style="list-style-type: none"> 1) public rights of way and other routes close to communities which are used for recreational purposes (for example, dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys; and/ or 2) rights of way for WCH crossing roads at grade with >4000 - 8000 vehicles per day.
Low	<p>Private property and housing:</p> <ol style="list-style-type: none"> 1) proposed development on unallocated sites providing housing with planning permission/in the planning process. <p>Community land and assets where there is a combination of the following:</p> <ol style="list-style-type: none"> 1) limited existing severance between community and assets, with existing full Disability Discrimination Act (DDA) DDA 1995 [Ref 2.N] compliant accessibility provision; 2) alternative facilities are available at a local level within the wider community; 3) the level of use is infrequent (monthly or less frequent); 4) the land and assets are used by the minority (>=50%) of the community. <p>Development land and businesses:</p> <ol style="list-style-type: none"> 1) proposed development on unallocated sites providing employment with planning permission/in the planning process. <p>Agricultural land holdings:</p> <ol style="list-style-type: none"> 1) areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent). <p>Walkers, cyclists, horse-riders (WCH):</p>

Receptor value (sensitivity)	Description
	1) routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes; and/ or 2) rights of way for WCH crossing roads at grade with <4000 vehicles per day.
Negligible	Private property and housing: 1) N/A. Community land and assets where there is a combination of the following: 1) no or limited severance or accessibility issues; 2) alternative facilities are available within the same community; 3) the level of use is very infrequent (a few occasions yearly); and 4) the land and assets are used by the minority (>=50%) of the community. Development land and businesses: 1) N/A. Agricultural land holdings: 1) areas of land which are infrequently used on a non-commercial basis. Walkers, cyclists, horse-riders (WCH): 1) N/A.

Source: Design Manual for Roads and Bridges, LA 112 Population and human health, table 3.11

Magnitude of impact

12.4.18. The magnitude of impact on land use and accessibility has been determined using the criteria presented in Table 12-3. These criteria are derived from Table 3.12 of the DMRB LA 112.

Table 12-3: Magnitude of impact and typical descriptions

Magnitude of impact (change)	Typical description
Major	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: 1) loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. for example, direct acquisition and demolition of buildings and direct development of land to accommodate highway assets; and/or 2) introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision. Walkers, cyclists, horse-riders (WCH): >500m increase (adverse) / decrease (beneficial) in WCH journey length.
Moderate	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: 1) partial loss of/damage to key characteristics, features or elements, for example, partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings; and/or

Magnitude of impact (change)	Typical description
	<p>2) introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision.</p> <p>Walkers, cyclists, horse-riders (WCH): >250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Minor	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>1) a discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g. amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings; and/or</p> <p>2) introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision.</p> <p>Walkers, cyclists, horse-riders (WCH): >50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Negligible	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>1) very minor loss or detrimental alteration to one or more characteristics, features or elements. for example, acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings; and/or</p> <p>2) very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision.</p> <p>Walkers, cyclists, horse-riders (WCH): <50m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
No change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

Source: Design Manual for Roads and Bridges, LA 112 Population and human health, table 3.12

Significance of effect

12.4.19. The significance of effect for each element of the land use and accessibility sub-topic has been derived by combining the assigned value (sensitivity) of the receptor with the magnitude of the change (impact) arising from the Proposed Scheme. This is in accordance with the significance matrix set out in DMRB LA 104, Table 3.8.1. The significance matrix is also presented in Table 4-1 of this Environmental Statement in Chapter 4 (Environmental assessment methodology) (**TR010037/APP/6.1**).

12.4.20. Effects which have been evaluated as being of moderate, large or very large significance (beneficial or adverse) are considered to be significant.

12.4.21. The matrix has been used to guide the identification and assessment of effects on land use and access. Where professional judgement has resulted in a

deviation from the thresholds contained in the matrix these are explained within the relevant sections of the chapter and are supported by appropriate evidence.

- 12.4.22. Where impacts are referenced, these should be considered adverse, unless otherwise stated. Impacts of moderate significance or above are considered to be a significant effect.

Human health

- 12.4.23. Health is defined by the World Health Organisation (WHO) as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity' (WHO, 2019). A qualitative assessment of human health has been undertaken in line with the DMRB LA 112. The assessment considers the change to health determinants as a result of the construction and operation of the Proposed Scheme. Changes to health determinants can affect the health of individuals or communities differently depending on their sensitivity to change.

- 12.4.24. This chapter provides a systematic approach to assess the health effects of the Proposed Scheme. A qualitative approach has been undertaken as it is not possible to quantify the severity or extent of the effects which would give rise to health outcomes.

- 12.4.25. The health profile of local communities has been established using Public Health England Local Health profiles (2013 to 2017 and 2017 to 2018) and 2011 Census data (ONS, 2016). DMRB LA 112 sets out the following data requirements that should be used to determine the health profiles (which are set out in Table 12-8):

- percentage of the community with increased susceptibility to health issues (vulnerable members, for example, <16 and >65)
- percentage of the community with pre-existing health issues (for example, respiratory disease or chronic obstructive pulmonary disease (COPD))
- deaths from respiratory diseases
- percentage of community with long term illness or disability
- general health
- life expectancy
- income deprivation

- 12.4.26. The purpose of health profiling is to establish the sensitivity of the communities. Data has been collated for the following communities: Cringleford, Hethersett, Mulbarton and Stoke Holy Cross.

12.4.27. The next step undertaken was to determine the health determinants which are factors that contribute to the health of communities which may be changed as a result of the Proposed Scheme. Paragraph 3.26 in DMRB LA 112 identifies the following categories to be used to identify the key health determinants for communities:

- access to healthcare facilities
- access to community, recreation and education facilities
- access to green/open space
- existing and predicted levels of air and noise pollution
- landscape amenity
- sources and pathways of potential pollution (eg land/water contamination)
- safety

12.4.28. The health determinants have been derived to identify health outcomes within affected communities.

12.4.29. Once the health profiles of local communities are established, the sensitivity of those communities (in terms of their sensitivity to change) are identified using classifications set out in paragraph 3.31 of DMRB LA 112:

- low
- medium
- high

12.4.30. In the absence of specific guidance on how sensitivity should be measured or specific evidence to determine sensitivity, the sensitivity to change of communities would be considered to be **high**. Within each community there would be varying levels of sensitivity to change across different individuals, as some would be more vulnerable than others. We therefore consider this precautionary approach to be most appropriate for the purposes of this assessment.

Health outcomes

12.4.31. Health outcomes are derived by a different methodology when compared to the significance of effect that land use and accessibility receptors report. Health outcomes do not report the significance of an effect, but state if the outcome is positive, neutral, negative or uncertain. Potential health impacts during construction and operation have been categorised based on the outcomes provided in DMRB LA 112 Table 3.32, as shown in Table 12-4 below.

Table 12-4: Human health outcome categories

Health outcome category	Health outcome description
Positive	A beneficial health impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse health impact is identified
Uncertain	Where uncertainty exists as to the overall health impact

Source: Design Manual for Roads and Bridges, LA 112 Population and human health, table 3.2

12.5. Assessment assumptions and limitations

- 12.5.1. Data from 2011, 2013 to 2017 and 2017 to 2018 has been used to establish health profiles as this is the most recent available. Whilst some of this data is more than five years old, this is still considered appropriate for the purposes of this assessment.
- 12.5.2. It has been assumed that community assets, open space and businesses within the wards of Cringleford, Hethersett and Mulbarton and Stoke Holy Cross are essential to and used regularly by residents of these wards.
- 12.5.3. For the purpose of the agricultural holdings assessment, agricultural holdings have been defined as a single farming unit undertaking agricultural activities under the same management. Agricultural holdings may comprise of numerous land parcels, not all of which may be impacted by the Proposed Scheme. An assessment of the effects of the Proposed Scheme on the agricultural holdings has been made, not an assessment of the effects on the individual land parcels.
- 12.5.4. Land may be required for the Proposed Scheme from agricultural holdings temporarily, during the construction period, or permanently. Details of temporary and permanent agricultural land take are unknown. Areas used are indicated and have been estimated using overviews of the Proposed Scheme.
- 12.5.5. Agricultural questionnaires were sent out to six occupiers to facilitate the assessment of the impact on agricultural holdings. One occupier has been removed from the impact assessment because their holding is now outside of the DCO boundary. One occupier had been incorrectly identified as being an agricultural holding, the land affected was proposed to become sports fields as part of the Cringleford Residential Development. Only one questionnaire was received and this was only partially completed. As a result, a high level assessment of the four agricultural holdings was undertaken. This was achieved using Scheme Overview drawings and shape files and publicly available information, standard industry figures and professional knowledge. Sources of

publicly available information agri-environment scheme layers on MAGIC, Google Earth, Defra statistics pages and the Defra CAP payments website.

12.6. Study area

Land use and accessibility

12.6.1. The study area for the assessment of impacts on land use and accessibility extends 500m from the DCO boundary (including the construction footprint), in line with DMRB LA 112, paragraph 3.6. This has been selected as significant effects are unlikely to occur outside of the 500m study area as a result of the Proposed Scheme. The study area is shown in ES Figure 12.1 (TR010037/APP/6.2).

Human health

12.6.2. The study area for human health includes the following communities which are located within the South Norfolk district: Hethersett, Cringleford and Mulbarton and Stoke Holy Cross. This study area is based on the extent and characteristics of the Proposed Scheme, and the degree to which communities in Hethersett, Cringleford and Mulbarton and Stoke Holy Cross are likely to be affected by the Proposed Scheme, in line with paragraph 3.23 of DMRB LA 112.

12.7. Baseline conditions

Land use and accessibility

Private property and housing

- 12.7.1. The sensitivity of the properties is considered **very high** as the ONS data was reviewed and the number of households in the Cringleford area are expected to increase by >25% by 2041 (refer to the criteria in Table 12-2).
- 12.7.2. There are no residential properties which take direct access off the existing A47 or A11 within the study area.
- 12.7.3. There are two main areas of residential properties located in the study area. Residential properties in Cringleford are located to the east of Thickthorn Junction, either side of the A11. Round House Park housing estate is also located within Cringleford. Residential properties in Hethersett are located to the west of Thickthorn Junction.
- 12.7.4. Residential properties are also located to south of the existing Thickthorn Junction along Cantley Lane South. There are eight residential properties located in Intwood to the south of the Proposed Scheme, ten residential properties to the south west of the Proposed Scheme on Station Lane and 17 residential properties which take access off the B1172 Norwich Road.

- 12.7.5. A small metal outbuilding is located to the east of Cantley Lane South (south of Cantley Stream) and would be demolished as a result of the Proposed Scheme. Site visits identified that this outbuilding was not in use. The sensitivity of the outbuilding has been designated as low.
- 12.7.6. Land to the north east and south-east of Thickthorn Junction has planning permission for housing developments. Round House Park would provide 1,000 dwellings and is currently on course for construction as part of the Greater Norwich Development Partnership's Joint Core Strategy (Cringleford Neighbourhood Development Plan, 2014). This is in addition to a minimum of 1,200 dwellings allocated in Cringleford. This includes planning permission 2014/00025 (which was allowed on appeal and subsequently varied by planning permission 2017/2120). The residential development is subject to planning obligations requiring the provision of onsite public open space, both informal recreational space and formal space in the form of several football pitches. The Section 106 Agreement outlines areas required for both formal and informal public open space.
- 12.7.7. The following sites are located within the study area and are proposed to be developed with residential housing in the Greater Norwich Local Plan (GNLP), however at the time of reporting have no planning status:
- GNLP4037
 - GNLP4052
 - 2012/1644
 - 2015/1594
 - 2015/1681
 - 2011/1804
 - 2008/2347
 - 2013/1494
 - 2018/2404
 - 2018/2835
 - GNLP2014
 - GNLP3031
 - GNLP0177A
 - GNLP0327
 - GNLP0307
- 12.7.8. No other land, buildings or infrastructure used for residential housing has been identified within the study area.

Community land and assets

- 12.7.9. The existing A47 and A11 experience congestion during peak hours, creating a degree of severance and accessibility issues for local communities.
- 12.7.10. Intwood Carr Country Wildlife Site (SWS) is located within the study area, to the east of the DCO boundary. There are no other areas of community land within the

study area. The proposed public open space provision as part of the Cringleford Residential Development is assessed as a part of the private property and housing assessment.

- 12.7.11. There are community assets present to the north west of Thickthorn Junction. There are no community assets which take direct access off the A47 or A11 within the study area. In line with the specification outlined for sensitivities in Table 12-2, the sensitivity of community assets located to the north west of the Proposed Scheme within the study area are considered medium, as the level of use would be reasonably frequent and likely by the majority of the community within the catchment area. However, alternative facilities are available in Cringleford.
- 12.7.12. The closest hub of community assets to the Proposed Scheme are located in Cringleford, to the east of the Thickthorn Junction. The sensitivity of community assets in Cringleford are assessed as **medium**, as the level of use would be reasonably frequent and used by majority of the community. Such facilities include:
- Cringleford Church of England Voluntary Aided Primary School – 0.7km to the north east of the DCO boundary
 - Cringleford Primary School - 0.7km to the north east of the DCO boundary
 - Crackerjacks Pre School Playgroup - 0.7km to the north east of the DCO boundary
 - Cringleford GP Surgery- 0.4km to the east of the DCO boundary
 - Cringleford Post Office - 0.9km to the east of the DCO boundary
 - Clever Cloggs Childrens Nursery – 1km to the east of the DCO boundary
 - Nellie's Nursery – 0.08km to the north west of the DCO boundary
 - First Class Learning - 0.7km to the north east of the DCO boundary
 - Cringleford Tennis Club – 1km to the east of the DCO boundary
 - Cringleford Hall- 0.45km to the east of the DCO boundary
- 12.7.13. Norwich is approximately 3.4km to the east of Thickthorn Junction, it is therefore likely the residents in the communities of Cringleford, Hethersett and Mulbarton and Stoke Holy Cross travel to Norwich regularly for activities such as work, shopping and to use education facilities.

Development land and business

- 12.7.14. There are businesses located to the north west of the Proposed Scheme such as:
- Hotel – adjacent to the northern boundary of the A11, 0.02km from the DCO boundary
 - Restaurants– adjacent to the northern boundary of the A11, 0.02km from the DCO boundary

- Thickthorn Services including the Petrol Station – adjacent to the northern boundary of the A11, 0.02km from the DCO boundary

12.7.15. There are two driving schools, located to the north east and south-west of the Proposed Scheme on Cantley Lane South (0.02km to the north of Cantley Lane). Businesses are also present in Cringleford to the north west of Thickthorn Junction and on Station Lane, to the south west of the junction, north and south of the A11. The sensitivity of the businesses are considered **medium**, as the area covered for each business is less than 1ha.

12.7.16. There are no businesses which take direct access off the A47 or A11 within the study area.

12.7.17. The following sites are proposed to be developed in the Greater Norwich Local Plan (GNLP) with uses which may lead to future jobs, however at the time of reporting have no planning status:

- GNLP4053
- GNLP0177BR
- GNLP2014
- GNLP3031
- GNLP0177A
- GNLP0358R
- GNLP0486

Agricultural land holdings

12.7.1. The sensitivity of land use and accessibility receptors has been determined using criteria presented in Table 12.1. These criteria are derived from Table 3.11 of DMRB LA 112.

12.7.2. Defra farming statistics for Norwich and South Norfolk indicates that farmland is generally owner occupied with some areas occupied on short term tenancy agreements by neighbouring owner occupiers (Defra, 2020). It is known that one of the agricultural holdings is tenanted, the tenure of the other areas of land is unknown.

12.7.3. A map of the agricultural land area reviewed as part of this assessment can be found in ES Figure 12.3 (**TR010037/APP/6.2**). A review of the area using Google Earth shows that the farmsteads and major agricultural infrastructure, such as internal tracks and livestock handling facilities, are in most cases set back from the existing roads (A47, A11 and B172). The four agricultural holdings identified that could potentially be affected by the Proposed Scheme appear to be a mixture of arable and livestock grazing units. Based on the criteria derived from Table 3.11 of DMRB LA 112, two of the four agricultural holdings have been identified as being of **high** sensitivity due to the predominantly arable land use. This requires at least monthly access for normal agricultural operations;

however, access will be required more frequently during peak times including harvest and sowing. These two holdings do not appear to have infrastructure associated with arable farming affected by the Proposed Scheme.

12.7.4. One holding is a mix of arable and grassland enterprises. From aerial photographs the grassland appears to be a disused pig unit. This would not require daily use so sensitivity has been assessed as **high** for the whole holding.

12.7.5. The final agricultural area was identified as having a **very high** sensitivity. Land use appears to be pasture which would be used for grazing livestock and as such access is required daily. A study of the satellite images of this holding revealed a field shelter and stables in an adjacent but linked field, infrastructure typically associated with the keeping of horses rather than agricultural livestock. The keeping and rearing of horses is not considered agricultural use. However, in the absence of specific data, this holding remained in the assessment.

12.7.6. Table 12-5 provides a summary of this assessment.

Table 12-5: Sensitivity of WCH routes to changes in journey length

Farm Name	Land use	Land dependent on spatial relationship to infrastructure	Frequency of access required	Sensitivity
1	Arable	No	At least monthly	High
2	Arable + Grassland	No	Daily	High
3	Arable	No	At least monthly	High
4	Grassland	No	Daily	Very High

Walkers, cyclists and horse riders

12.7.7. The key WCH routes in the study area are as shown in ES Figure 12.1 (**TR010037/APP/6.2**). These routes provide an important means of access for local people to community assets and the wider study area and are described below:

- Cringleford footpath FP4a runs from Cantley Lane to a footbridge over the A47, providing a link to Cantley Lane South
- Cringleford bridleway BR5 which runs from Cantley Lane to Norwich A47 Southern Bypass
- Cringleford footpath FP1 runs from Cantley Lane to Newmarket Road
- Cringleford footpath FP2 runs south from Cantley Lane to Langley Close
- Cringleford footpath FP3 runs south west from Brettingham Avenue to Kedleston Drive
- Keswick bridleway BR 5 runs to the east of the A47 at Intwood

- Hethersett footpath FP6 which runs parallel to Cantley Lane South before heading west adjacent to the railway line and parallel to the Hethersett Bypass
- Permissive footpath and cycleway between Cantley Lane and Toucan crossing on A11 Newmarket Road
- Wymondham Circular cycle route, which follows Intwood Road
- Wymondham to Sprowston Pedalway
- Kett's Country Local walking route from Cringleford to Wymondham which follows Intwood Road
- Ketteringham FP1 runs southwest across fields between Station Lane at Hethersett and High Street.
- Hethersett bridleway open to all traffic (BOAT)2 runs eastwards from Station Lane at Hethersett.
- Hethersett FP5 runs in a south westerly direction across fields from Station Lane at Hethersett before turning north west to connect to Hethersett FP4

12.7.8. The receptors and their sensitivity are summarised in Table 12-6 below except for Ketteringham FP1, Hethersett BOAT2 and Hethersett FP5 which are not affected by the Proposed Scheme. The assignment of sensitivity has been based on Table 3.11 in DMRB LA 112, professional judgement and experience of undertaking similar assessments for similar schemes.

Table 12-6: Sensitivity of WCH routes to changes in journey length

Receptor	Sensitivity	Reasoning
Cringleford footpath FP4a	High	This public right of way (PRoW) provides a connection across the A47 between Cantley Lane and Cantley Lane South via a footbridge. On average, the route is used by 12 and 13 pedestrians on weekdays and weekend days respectively, during school term time, increasing to 17 and 30 pedestrians on weekdays and weekend day, respectively, during school holiday periods. Despite being a footpath and signed to prohibit cycle use, on average, the route is used by 27 and 36 cyclists on weekdays and on weekend days, respectively, during school term time, reducing to 10 and 7 cyclists on weekdays and weekend days respectively, during school holiday periods. This indicates that the route is used for both recreational and commuting purposes and is an important link in the network.
Cringleford bridleway BR5	Low	This PRoW is a short section of bridleway that is intended to provide a connection between Cantley Lane and Pegasus crossings on the southern side of Thickthorn Junction to enable equestrians to cross the A47 southbound merge and the A47 northbound diverge slip roads to reach Cantley Lane South. The bridleway is overgrown and there is no evidence of use of the bridleway or use of the Pegasus crossings from the surveys.
Cringleford footpath FP1	Low	This PRoW provides a connection between Cantley Lane and the verge on the southern frontage of the A11 Newmarket Road. It is a field footpath that does not offer a meaningful route for either utility or recreational purposes. Although not surveyed, usage was observed to be low during a site visit.
Cringleford footpath FP2	Medium	The PRoW, in combination with a section of permissive footpath, provides a connection between Brettingham Avenue and Cantley Lane in the residential

Receptor	Sensitivity	Reasoning
		area of Cringleford. It is mainly used from recreational purposes although there are alternative routes in the area.
Cringleford footpath FP3	Medium	This PRow provides a connection between Brettingham Avenue and Kedleston Drive in the residential area of Cringleford. It is mainly used for recreational purposes.
Keswick bridleway BR5	High	This PRow runs in a southeast direction to the east of the A47 Norwich Southern Bypass and provides connection between Intwood Road and Keswick Hall Road. Although not surveyed, the route is likely to be used for recreational purposes and there is limited potential for substitution.
Hethersett footpath FP6	High	This PRow runs parallel to the railway line and provides a connection between Cantley Lane South and Station Lane at Hethersett. It is a field footpath that is used for recreational purposes and there is limited potential for substitution.
Permissive footpath/cycleway between Cantley Lane Toucan crossing on A11 Newmarket Road	Very High	This permissive route and the Toucan crossing on Newmarket Road form a key route for pedestrians and cyclists. The surveys observed high usage of the route by pedestrians during both school term time and during the school holidays. Cyclist use was also high during school term time but much reduced during school holidays. High usage of the Toucan crossing was observed on both weekdays and weekend days and during both school term time and school holidays. The results of the surveys confirm that the route and crossing are used for both utility and recreational trips.
Wymondham Circular cycle route	High	This is a promoted, circular, cycle route that runs along the section of Intwood Road lying within the study area. It connects Norwich City Centre with the surrounding towns and is mainly used for recreational purposes
Wymondham to Sprowston Pedalway	Very High	This is a high quality, promoted, shared use route which forms part of the Norwich Pedalways network. It follows the B1172 Norwich Road in an east to west direction and passes through Thickthorn junction as a shared footway/cycleway on the northern side of the junction, connecting to Newmarket Road to the east. Toucan crossing facilities are provided to facilitate the safe crossing of the A47 northbound on slip road and southbound off slip road. On average, the route the route is used by 120 and 78 cyclists on weekdays and weekend days, respectively, during school term time, reducing to 42 cyclists on all days during school holiday periods. The route is also used by a modest number of pedestrians on all days. As such, it is evident that the route is used for both commuting and recreational purposes.
Kett's Country local walking route	Medium	This is a walking route which follows a section of Intwood Road which is used for recreational purposes. The route links to the

12.7.9. In relation to public transport in the area, a separate table listing bus stops and routes is provided in Table 12-7.

Table 12-7: Bus stop locations and services

Bus Stop	Location	Bus Service	Frequency	Destination
B1172 Norwich Road (E/B)	135m west of McDonald's roundabout	6	1 per hour	Norwich City Centre
		13A/13B/13C	Limited AM and PM services	Norwich City Centre (Spixworth for some journeys)
		14	2 per hour	Blofield
		15/15A/15B	2 per hour	Blofield, Acle or Lingwood
B1172 Norwich Road (W/B)	135m west of McDonald's roundabout	6	1 per hour	Watton
		13A/13B/13C	Limited AM and PM services	Attleborough
		14	2 per hour	Wymondham Cross
		15/15A/15B	2 per hour	Wymondham Cross
Thickthorn park and ride site		6	1 per hour	Norwich City Centre & Watton
		8	1 per hour Evenings only	Toftwood
		501	3-4 per hour	Airport Park and Ride via Norwich City Centre
Cringelford Interchange Stand A (N/B)	80m north of A11/Round House Way roundabout	3/4	1 per hour	Route terminus
		9	1 per 2 hours	Norfolk and Norwich University Hospital
		11/11A	4 per hour	Norfolk and Norwich University Hospital
		12/12A	2 per hour	Norfolk and Norwich University Hospital
		14	2 per hour	Blofield
		15/15A/15B	2 per hour	Blofield, Acle or Lingwood,
		X13	1 per Peak hours only	Attleborough
Cringelford Interchange Stands B & C (S/B)	80m north of A11/Round House Way roundabout	3/4	1 per hour	Norwich City Centre
		9	1 per 2 hour	Wymondham
		11/11A	4 per hour	Sprowston via Norwich City Centre
		12/12A	2 per hour	Hoveton via Norwich City Centre
		14	2 per hour	Wymondham Cross
		15/15A/15B	2 per hour	Wymondham Cross
		X13	1 per Peak hours only	Norwich City Centre
Cantley Lane (NE/B)	200m south west of Keswick Road	10/10A	2 per hour	Mousehold
Cantley Lane (SW/B)	200m south west of Keswick Road	10/10A	2 per hour	Cringelford
		3/4	1 per hour	Cringelford Interchange

Bus Stop	Location	Bus Service	Frequency	Destination
Newmarket Road (W/B)	Junction with Keswick Road	9	1 per 2 hours	Norfolk and Norwich University Hospital
		11/11A	4 per hour	Norfolk and Norwich University Hospital
		13/13A/13B/13C	2 per hour	Attleborough
Newmarket Road (E/B)	25m east of junction with Keswick Road	10/10A	2 per hour	Mousehold
Colney Lane (S/B)	Junction with Newmarket Road	3/4	1 per hour	Norwich City Centre
		11/11A	4 per hour	Sprowston via Norwich City Centre
		13/13A/13B/13C	2 per hour	Spixworth via Norwich City Centre

Human health

Health profiles

- 12.7.10. The data used to establish the health profiles of Cringleford, Hethersett and Mulbarton and Stoke Holy Cross is presented in Table 12-8, in comparison to the national average.
- 12.7.11. Across the South Norfolk district, the population was estimated to be 124,012 (Census, 2011). Table 12-8 shows the ward with the highest population in the study area to be Hethersett and the lowest to be Cringleford.
- 12.7.12. The data shows Cringleford, Hethersett and Mulbarton and Stoke Holy Cross to have better general health than the national average and the percentage of their populations with general health of bad or very bad is lower than the national average. The percentage of the population with limiting long term illnesses or disability for Hethersett is higher than the national average, and lower than the national average in Cringleford and Mulbarton and Stoke Holy Cross. Income-deprived households are higher than the national average in all three wards.
- 12.7.13. The data shows Cringleford, Hethersett and Mulbarton and Stoke Holy Cross to have a lower number of emergency hospital admissions for COPD as a percentage of all hospital admissions than the national average. The data shows deaths from respiratory diseases as a percentage of all deaths to be lower in Cringleford, Hethersett and Mulbarton and Stoke Holy Cross than the national average.
- 12.7.14. The data shows life expectancy for both females and males to be higher in all three wards than the national average.

12.7.15. This data shows little variation across the three communities in terms of health indicators. For the purposes of this assessment, as explained in 12.3.25, all three communities are considered to be of high sensitivity.

Table 12-8: Human health profile of the study area

Local Health Indicator	Wards			England
	Hethersett	Cringleford	Mulbarton and Stoke Holy Cross	
Census 2011				
Population	5691	5052	5121	53,012,456
Population aged under 16 (%)	17.5%	18%	18.4%	18.9%
Population aged over 65 (%)	23%	22%	18.9%	16.3%
Percentage of the community with increased susceptibility to health issues (65)	40.5%	40.4%	37.3%	35.2%
Income deprivation (people living in income-deprived households as % of population)	49.6%	41.6%	45%	23.9%
General health - bad or very bad (% of population)	4.7%	3.6%	3.7%	5.5%
Limiting long term illness or disability (% of population)	18.3%	15.9%	15.7%	17.6%
Public Health England				
Emergency hospital admissions for Chronic Obstructive Pulmonary Disease (SAR) 2013-14/ 2017-18	18 (1.2% of total admissions for all causes, any age)	21 (0.8% of total admissions for all causes, any age)	58 (1.7% of total admissions for all causes, any age)	613,747 (2.2% of total admissions for all causes, any age)
Deaths from respiratory diseases, all ages, all persons (SMR)	38 (13% of total deaths for all causes, any age)	34 (10% of total deaths for all causes, any age)	43 (12% of total deaths for all causes, any age)	335,078 (13.8% of total admissions for all causes, any age)

Local Health Indicator	Wards			England
	Hethersett	Cringleford	Mulbarton and Stoke Holy Cross	
Life expectancy at birth - males, 2013-17 (years)	83.3	80.2	81.2	79.5
Life expectancy at birth - females, 2013-17 (years)	85.6	83.3	85.4	83.1

Health determinants

12.7.16. The following health determinants have been identified for the local communities, using the factors outlined in DMRB LA 112.

Table 12-9: Health determinants for Cringleford, Hethersett, and Mulbarton and Stoke Holy Cross

Health determinant categories	Health determinants (Cringleford, Hethersett, and Mulbarton and Stoke Holy Cross)
The location and type of community, recreational and education facilities	<p>Community assets, green/open space and healthcare facilities that are within the 500m study area are identified in Figure 12.1 and considered under the Land use and accessibility sections within this chapter. These have been taken into account in identifying the likely health outcomes.</p> <p>There are also a large number of community assets located in Hethersett, approximately 400m west of the study area. Assets located here include Hethersett VC Primary School, Hethersett Academy, Hethersett Library, Hethersett Village Hall and Hethersett Library.</p>
The location of healthcare facilities	Norfolk and Norwich University Hospital is located approximately 1.2km to the north of Thickthorn Junction.
The location of green/ open space	There are no areas of green/ open space accessible to the public within the study area, therefore this health determinant has been scoped out of further assessment.
Outline spatial characteristics of the transport network and usage in the area including the surrounding road network, PRoW, cycle ways, non-designated public routes and public transport routes)	Usage data for the walking, cycling and horse-riding facilities in the vicinity of the Proposed Scheme are provided in Table 12.6. Table 12.7 summarises the bus stops and bus services within the study area.
Air quality management areas and ambient air quality	There are currently no Air Quality Management Areas (AQMAs) declared within the vicinity of the Proposed Scheme. The closest AQMA to the Proposed Scheme is the Central Norwich AQMA which is located approximately 5km to the north east. For further information refer to Chapter 5, Air quality.
Areas recognised as sensitive to noise, (for example, noise important areas, noise management areas and the ambient noise environment)	<p>Two Noise Sensitive Areas have been identified within the study area, both being located on the A11 to the north east of Round House roundabout.</p> <p>The noise environment is generally rural with the predominant noise sources in the area traffic from the A47 and A11. Sensitive receptors are principally concentrated in the village of Cringleford, as well as dispersed properties and isolated farmsteads within Hethersett and Mulbarton and Stoke Holy Cross.</p>

Health determinant categories	Health determinants (Cringleford, Hethersett, and Mulbarton and Stoke Holy Cross)
Sources and pathways of potential pollution (for example, land/ water contamination)	<p>The alignment at Cantley Lane is located in close proximity to the historical landfill site, within a former gravel pit at Cantley Lane. This is also the case for the proposed widening of the A11 at the proposed Cantley Lane overbridge.</p> <p>The landfill contains domestic, industrial, commercial and inert waste streams. It is likely that the landfill remains a significant source of gas and leachate given its age and waste composition.</p> <p>The potential exists for pollution of groundwater below the infilled pit which is a Secondary 'A' Aquifer.</p> <p>Cantley Stream is in close proximity and may be in hydraulic continuity. If this is the case then a second potential contaminant linkage may exist.</p> <p>The filling station at the services area is considered to be located remote from the proposed improvements work and, therefore, unlikely to represent a plausible risk.</p>
Landscape amenity	<p>The potential to experience views of the Proposed Scheme associates most notably with occupiers of residential properties and users of the local Public Rights of Way (PRoW) network. The PRoW network also includes the Tas Valley Way long distance route associated with the south-eastern extents of the Proposed Scheme area. The potential for views from residential properties includes those on the western edge of Cringleford, a smaller grouping of residential properties at the eastern end of Cantley Lane South, residential properties within the grounds of Thickthorn Hall and more widely dispersed individual properties on Cantley Lane South and Norwich Road. PRoW footpaths affording views across the study area include those linking with Cantley Lane, running alongside the railway line to Ely and crossing over the A47 by way of a footbridge to connect with a further spur of the PRoW extending to Round House Park on the western edge of Cringleford.</p> <p>Views of the Proposed Scheme would also be experienced by users of the Thickthorn Services and park and ride facilities and by road users of the A47, A11, B1172 Norwich Road and Cantley Lane.</p> <p>Landscape amenity is considered as part of the landscape and visual assessment. For details on exiting landscape amenity refer to Chapter 7, Landscape and visual.</p>
Safety information associated with the existing affected road network (for example, numbers killed and seriously injured)	<p>Personal injury collisions (PIC) for the key highways within the study area, namely, A47, A11, B1172 Norwich Road, Newmarket Road and Cantley Lane, have been reviewed for the period between 27 June 2014 and 22 February 2019. In total 50 collision were recorded of which 39 were classed as slight severity and 11 were classed as serious. No collision classed as fatal were record in the time period. A breakdown of the collision per highway is provided below:</p> <ul style="list-style-type: none"> • A total of 10 collisions were recorded on the A47 of which eight were slight and two were serious. • A total of 25 collisions were recorded on the A11, of which 23 were slight and two were serious • Two collisions were recorded on the B1172 Norwich Road, of which one was classed as slight and one was classed as serious. • A total of 12 collisions were recorded on Newmarket Road, of which seven were slight and five were serious. • One collision was recorded on Cantley Lane and was classed as minor. <p>An examination of the location and occurrence of the collisions highlights a number of clusters within the study area. These clusters are located at on the A11/A47 Thickthorn Junction at the A11 on and off slip roads, on the A47 on the overbridge section over the roundabout and at the A11/Round House Way roundabout.</p> <p>Of the collisions recorded, two involved cyclists, with both being classed as serious.</p>

Health determinant categories	Health determinants (Cringleford, Hethersett, and Mulbarton and Stoke Holy Cross)
	<p>The first serious crash occurred on Cantley Lane - although exactly where is unclear – at 3:55pm on 14 June 2016. It involved a cyclist commuting to or from work being struck, apparently head on, by a car being driven by someone over the age of 75. The cyclist was the only casualty.</p> <p>The second collision took place on the Newmarket Road, the local access road which runs parallel to, and just north of, the A11 between Round House Way and Colney Lane. It occurred at 6:10pm on 9 November 2015 and although it was dark, streetlights were present and lit. As with the previous collision, this incident involved a cyclist being struck head on by a car. It should be noted that although Newmarket Lane is one-way (eastbound) to motor vehicles, there is a contra-flow cycle lane. However, this is narrow, and cyclists are only separated from oncoming vehicles by a solid white line.</p>
<p>Information collated from stakeholder consultation</p>	<p><u>Safety</u></p> <p>Statutory and non-statutory consultation has identified a number of suggestions from members of the public, parish councils and consultees:</p> <ul style="list-style-type: none"> • Current junction dangerously unsafe due to driver behaviour • The provision of the new junction would create a safe and serviceable network • Some members felt the Proposed Scheme would create ‘dangerous conditions’ for traffic at the junction • Some respondents oppose the Cantley Lane underpass on the grounds of health and safety, as they believe such a development would exacerbate existing safety problems • Encourage the use of speed restrictions <p><u>Noise and air quality</u></p> <p>Statutory and non-statutory consultation has identified a number of suggestions from members of the public, parish councils and consultees:</p> <ul style="list-style-type: none"> • Encouragement of noise reducing road surfacing • Improvement of local pollution levels as the roundabout would reduce congestion • Construction nuisance concerns • Concerns that traffic increases using the Proposed Scheme would increase noise and pollution in the local area <p><u>Development land and business</u></p> <p>Statutory and non-statutory consultation has identified a number of suggestions from members of the public, parish councils and consultees:</p> <ul style="list-style-type: none"> • Concerns that the Proposed Scheme would impact future developments • Concerns regarding the proximity of the Proposed Scheme to their homes <p><u>Community land and severance</u></p> <p>Statutory and non-statutory consultation has identified a number of suggestions from members of the public, parish councils and consultees:</p> <ul style="list-style-type: none"> • Concerns that the closure of the Cantley Lane South slip road would lead to longer detours for residents

Health determinant categories	Health determinants (Cringleford, Hethersett, and Mulbarton and Stoke Holy Cross)
	<ul style="list-style-type: none"> Concerns the Proposed Scheme would hinder access to local schools and other community assets

12.8. Potential impacts

- 12.8.1. This section identifies potential impacts of the Proposed Scheme on population and human health which may result in significant effects. These are summarised below.
- 12.8.2. For readability, this section provides an overview of the construction and operational impacts and has not been sub-divided into the separate headers under land use and accessibility and human health.
- 12.8.3. There would be no residential property demolitions as a result of the Proposed Scheme. There would, however, be a demolition of an unoccupied shed.
- 12.8.4. Access along the A47, A11 and the local transport network may be temporarily disrupted during the 18-month construction period, the duration of disruption is dependent on the construction method chosen for the structures.

Construction

Land use and accessibility

- 12.8.5. Potential temporary construction impacts on land use and accessibility during the construction phase of the Proposed Scheme include the following:
- Temporary land-take from private properties, community land, development land, agricultural land and community assets required to undertake construction activities.
 - Temporary changes to severance and accessibility to private properties, community land, community assets and businesses during construction of the Proposed Scheme.
 - Two methods of construction for proposed structures have been assessed, of which one will be chosen: the push method, which will include two periods of five day disruption to the network; and the top down method, which would result in less disruption for a longer period, where traffic management would ensure impacts are minimised. Impacts on receptors caused by both methods have been considered for the purposes of this assessment.
 - Temporary diversions or stopping up of WCH routes.
 - Increased construction traffic on the existing A47, A11 and local roads leading to a temporary disruption to access private properties, community

assets and businesses as a result of road closures and traffic management.

12.8.6. Temporary impacts will be present either for the construction in phase in which the activity causing the impact is carried out, or for the duration of construction.

12.8.7. Potential permanent construction impacts during the construction phase of the Proposed Scheme include the following:

- Permanent land-take from private properties, community land, development land, agricultural land and community assets
- Permanent severance of land and buildings which form part of an agricultural holding
- Permanent change to access from the Proposed Scheme to private properties and businesses on Cantley Lane South
- Permanent loss of land from the proposed public open space area linked to the new residential development south of Cringleford
- Permanent changes to severance from the Proposed Scheme to private properties on Cantley Lane
- Permanent stopping up of PRow bridleway Cringleford BR5 and removal of the existing Pegasus crossing facilities at Thickthorn Junction
- Permanent diversion of PRow footpath Cringleford FP4a and the upgrade of the same to bridleway status.

Human health

12.8.8. Potential health impacts have been considered in relation to the aspects of the Proposed Scheme's construction, permanent development and operation that could give rise to changes to health determinants and potentially affect future health outcomes. The consideration of the potential for effects has taken account of the range of potential sensitivities of the communities affected along the Proposed Scheme corridor, including key aspects of their health profiles and with a judgement about the impact likelihood and pathways. Road users have also been considered.

12.8.9. Potential impacts to human health which could occur during construction of the Proposed Scheme include:

- Visual impacts of new infrastructure on sensitive visual receptors
- Impacts of noise and vibration from construction plant and vehicles on communities and residential receptors
- Impacts of changes in local air quality (including dust dispersal and deposition and odour) from construction vehicles and activities

- Stress, anxiety and related wellbeing impacts from exposure to (or concern about) sustained construction activity (or construction sites) in proximity to, for example living areas, open spaces, schools and amenities
- Stress, anxiety and related wellbeing impacts from exposure to (or concern about) construction traffic on local roads close to communities, including for users of roads affected by increased levels of traffic for construction

Operational

Land use and accessibility

12.8.10. Potential impacts during operation of the Proposed Scheme on land use and accessibility include the following:

- Permanent changes to severance for private properties, community assets, businesses
- Permanent land take from agricultural land holdings.
- Permanent changes to severance for WCH
- Improvements to safety for vehicle travellers and pedestrians when accessing community assets and businesses at Thickthorn Services due to the proposed implementation of a 40mph speed limit on the B1172 Norwich Road and installation of traffic lights

Human health

12.8.11. Potential impacts to human health which could occur during the operation of the Proposed Scheme include:

- Effects on changes in traffic noise and vibration on communities and residential receptors
- Changes in access (by foot, cycle or car) to public transport
- Changes in access (by foot, cycle or car) to other community assets
- Changes in community severance
- Perception of the proposed development, including psychosocial effects from concerns about changes in the environment
- Secondary impacts from consequential developments
- Reduced accident rates and severity on the Proposed Scheme
- Increased accessibility (reduced car journey times using new road) to key employment locations, with potential for improved employment opportunities
- Increased accessibility (reduced walking and cycling journey times between communities using the shared use path)

12.9. Design, mitigation and enhancement measures

Land use and accessibility

- 12.9.1. Enhancement measures suggested as part of the Proposed Scheme are shown on ES Figure 12.4 (**TR010037/APP/6.2**).
- 12.9.2. The Environmental Management Plan (EMP) (**TR010037/APP/7.4**) will detail key construction mitigation which will be in place by the principal contractor during construction of the Proposed Scheme.
- 12.9.3. Traffic management measures will be put in place as part of the Traffic Management Plan (**TR010037/APP/7.5**) to ensure disruption is minimised on those travelling between communities and those travelling to facilities and businesses.
- 12.9.4. Communication with local residents will take place during construction to highlight potential periods of disruption. This will be via newsletters, radio announcements, the Highways England scheme web-page, and an appointed Community Liaison Officer.
- 12.9.5. The Highways England Customer Contact Centre will be available to deal with queries and complaints from the public. An information line will be staffed and a complaint management system in place, used on other major infrastructure projects, to ensure complaints are investigated, action is taken and the complainant receives a response.
- 12.9.6. The Proposed Scheme will be constructed in a way so as to reduce the need to close and divert footways, PRoW and cycle facilities. Where a closure of a WCH route is required, safe and appropriate alternative routes will be provided to ensure access is maintained during construction. The principal contractor would agree all temporary diversion routes with the local authority. Appropriate signage for all closures or diversions will be used to provide sufficient notice of such closures or diversions.
- 12.9.7. The metal outbuilding to the east of Cantley Lane South will be relocated as part of the Proposed Scheme. A site visit concluded the outbuilding is disused, however discussions will be held with the landowner during the DCO process regarding the location the metal shed will be moved to.
- 12.9.8. Discussions are ongoing during the DCO process with the developer to determine the mitigation for the loss of committed formal public open space provision (0.83Ha).

Human health

- 12.9.9. The principal contractor will be required to put in place measures to minimise noise, dust and visual effects. These mitigation measures are set out in the EMP (TR010037/APP/7.4) and detailed in the respective chapters in this ES. Further details can be found in the following chapters: Chapter 5, Air quality, Chapter 7, Landscape and visual and Chapter 11, Noise and vibration (TR010037/APP/6.1).

Operation

Land use and accessibility

- 12.9.10. The Proposed Scheme includes the provision of a new footbridge spanning the south facing slip roads at Thickthorn Junction, to link Cantley Lane and Cantley Lane South. The new Cantley Lane Footbridge (Cringleford) will be suitable for all WCH users and will replace the existing footbridge which is to be demolished. The PRoW footpath Cringleford FP 4a will be diverted to the new Cantley Lane Footbridge (Cringleford) and will be upgraded to bridleway status.
- 12.9.11. A shared footway and cycleway will be provided on the eastern frontage of the Cantley Lane Link Road as part of the Proposed Scheme. A refuge island will also be incorporated into its junction with B1172 Norwich Road to facilitate the safe crossing between the shared footway and cycleway and the existing facility provided on the northern frontage of Norwich Road, which comprises part of the Wymondham to Sprowston Pedalways cycle route.

12.10. Assessment of likely significant effects

Construction

Land use and accessibility

- 12.10.1. During construction, some journeys may be slightly longer due to traffic management, however these effects are anticipated to be minimal and for short time periods. Two methods of construction have been considered when constructing the underpass structures required on the A11 to A47 link road as part of the Proposed Scheme consisting of the push method and top down construction.
- 12.10.2. If the push method of construction is chosen as the preferred method, disruption would take place for a shorter period (approximately two periods of five days each) however, this method would require full carriageway closure.
- 12.10.3. If the top down method is chosen as the preferred method, there would be less disruption to the network, however construction would take longer. The traffic management measures will aim to keep traffic moving, and the construction

phasing and offline working would minimise impacts on people accessing community assets and other communities.

Private property and housing

- 12.10.4. All private properties would have an access maintained, however there may be a change in journey length for vehicle travellers to access some properties as a result of the Proposed Scheme. The Proposed Scheme would include altered and newly formed accesses to private properties where required.
- 12.10.5. The small metal outbuilding identified to the east of Cantley Lane South (south of Cantley Stream) would be demolished as a result of the Proposed Scheme. Site visits identified that this outbuilding was not in use and the sensitivity would be low. Discussions with the landowner during the DCO process would identify a location for a relocation of the outbuilding, thereby mitigating any adverse effects to this outbuilding. The magnitude of impact is considered **minor** as the relocation will result in a minor loss of key characteristics, however due to the outbuildings disuse, this will not result in changes to operating conditions that not compromise overall viability of the property, outlined in Table 3.12 of DMRB LA 112. The effect would be assessed as **Slight adverse**, however due to the relocation of the outbuilding, the effect has been assessed as **Neutral**.
- 12.10.6. The area of public open space proposed as part of the Cringleford Residential Development would be partly taken as a part of the Proposed Scheme. The area of open space required for the Proposed Scheme was designated as formal open space (0.82Ha) and informal opens pace (0.98Ha). As the informal open space is a surplus requirement of the planning obligations, the loss as a result of the Proposed Scheme is not considered to impede the planning obligations set for the Cringleford Residential Development. However, as the loss of formal open space land would result in half of a proposed football pitch being lost, it is considered the facility as a whole will be undeliverable. The sensitivity of this area of public open space would be medium as there would be alternative facilities available at a local level with other football pitches proposed as part of the development. The magnitude of impact is considered **major** as there would be a loss of resource. However, mitigation to either compensate this loss or relocate the football pitch will be determined during DCO examination. Therefore the effect would be assessed as the worst case scenario that the football pitch would not be relocated resulting in a **Large adverse** effect.
- 12.10.7. The north section of Cantley Lane South which currently has access onto the A47 exit slip road to Thickthorn Junction would be severed as a result of the Proposed Scheme. The direct connection onto Cantley Lane South from the A11 exit slip road would also be severed; both changes in access are due to the construction of the proposed free-flow link road.

- 12.10.8. Residents of Cantley Lane South (north of Cantley Stream) would be required to undertake a permanent 1.2km journey length increase for journeys to and from the westbound carriageway of the A47 and 1.3km increase to the eastbound carriageway. Residents would be required to travel south on Cantley Lane South and take the proposed Cantley Lane Link Road onto the B1172 Norwich Road. The magnitude is considered **minor** as the impact will result in a minor addition of severance where there is already adequate accessibility provision. Effects are therefore assessed as **Slight adverse**.
- 12.10.9. Due to the severance of Cantley Lane South onto the A47 exit slip road, the journey length to Thickthorn Junction from private properties on Cantley Lane South, south of the Cantley Stream and north of the railway line, would increase permanently by 0.8km. The magnitude is considered **minor** as the impact would result in a minor addition of severance where there is already adequate accessibility provision. Effects are therefore assessed as **Slight adverse**.
- 12.10.10. Due to the severance of Cantley Lane South onto the A47, the journey length to Thickthorn Junction from private property 'High View' on Cantley Lane, south of the Cantley Stream and south of the railway line, would increase permanently by 0.6km. The magnitude is considered **minor** as the impact would result in a minor addition of severance where there is already adequate accessibility provision. Effects are therefore assessed as **Slight adverse**.
- 12.10.11. Table 12-10 outlines the assessment of significant effects.

Table 12-10: Significance of effects on private property and housing during construction

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Demolition and replacement of metal outbuilding to the east of Cantley Lane South	Low	Minor	Slight adverse	Neutral
Loss of public open space proposed as part of the Cringleford Residential Development	Medium	Major	Large adverse	Large adverse
Increase in journey length when accessing Thickthorn Junction from private properties on Cantley Lane South (north of Cantley Stream) (1.2km westbound, 1.3km eastbound)	High	Minor	No mitigation	Slight adverse
Increase in journey length when accessing Thickthorn Junction from private properties on Cantley Lane South (south of Cantley Stream, north of the railway line) (0.8km)	High	Minor	No mitigation	Slight adverse

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Increase in journey length when accessing Thickthorn Junction from private property 'High View' on Cantley Lane (0.6km)	High	Minor	No mitigation	Slight adverse

Community land and assets

12.10.12. There are no areas of community land or community assets which are anticipated to experience loss of land, loss of curtilage, permanent changes to access or permanent changes to journey length as a result of construction of the Proposed Scheme. Anticipated changes to journey times and severance for community land and assets within the study area are assessed in the operation section and presented in Table 12-16.

Development land and business

12.10.13. Due to the severance of Cantley Lane South onto the A47 exit slip road, the journey length to Thickthorn Junction from Leavers Driving Tuition, north of the Cantley Stream, would increase permanently by 1.3km. The magnitude is considered **minor** as the impact would result in a minor addition of severance where there is already adequate accessibility provision. Effects are therefore assessed as **Slight adverse**.

12.10.14. There are no further areas of development land or businesses which are anticipated to experience loss of land, loss of curtilage, permanent changes to access or permanent changes to journey length as a result of the Proposed Scheme. Anticipated changes to journey times and severance for development land and businesses within the study area are assessed in the operation section and presented in Table 12-17.

12.10.15. Table 12-11 details significance of effects on development land and business during construction.

Table 12-11: Significance of effects on development land and business during construction

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Development land and business				
Increase in journey length when accessing Thickthorn Junction from business 'Leavers Driving Tuition' on Cantley Lane South	Medium	Minor	No mitigation	Slight adverse

WCH

- 12.10.16. The Proposed Scheme would result in the diversion or temporary closure of the following routes during construction, which would become permanent diversions or closures during the operation of the Proposed Scheme:
- Cringleford FP4a (permanent diversion)
 - Cringleford BR5 (permanent closure)
- 12.10.17. The Proposed Scheme would require the permanent diversion of Cringleford FP4a to the new Cantley Lane Footbridge (Cringleford) spanning the south facing slip roads at Thickthorn Junction, to link Cantley Lane and Cantley Lane South. This would increase journey length for users by around 70 metres resulting in a **minor** impact. As the sensitivity of the footpath is classed as **high**, due to the usage of the footpath which would result in a **Moderate adverse** outcome.
- 12.10.18. Construction of the Proposed Scheme would permanently remove the section of bridleway Cringleford BR5 and the Pegasus crossing facilities at the Thickthorn Junction. Although the bridleway is a PRow, its sensitivity has been classified as **low** as it is overgrown and there is no evidence of its use or use of the Pegasus facilities.
- 12.10.19. Prior to the implementation of mitigation, the magnitude of the impact is **major** as the section of the bridleway concerned would be lost during construction of the Proposed Scheme. This would result in a **moderate adverse** outcome. However, when considering mitigation, the magnitude of the potential impact is **major beneficial**. This is because the provision of the new Cantley Lane Footbridge (Cringleford) would result in a large reduction in journey length for cyclists and horse-riders and also provide a grade separated crossing of the A47 when travelling between Cantley Lane and Cantley Lane South. Effects are therefore assessed as **Moderate beneficial**.
- 12.10.20. The Proposed Scheme would not impact on Cringleford footpath FP1, Cringleford footpath FP2, Cringleford footpath FP3, Keswick bridleway BR5, Hethersett footpath FP6, the permissive footpath and cycleway between Cantley Lane and A11 Newmarket Road, the Wymondham Circular cycle route, the Wymondham to Sprowston Pedalway or the Kett's Country local walking route. As such, the magnitude of the impact is assessed as **no change**. Although these WCH routes have varying sensitivities, the residual effects are considered to be **Neutral**. The residual effects on WCH are included in Tale 12-12.

Table 12-12: Residual effects on WCH during construction

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Walkers, cyclists and horse-riders (WCH)				
Diversion of Cringleford footpath 4a	High	Minor	Moderate adverse	Moderate adverse
Stopping up of Cringleford bridleway BR5	Low	Major	Moderate adverse	Moderate beneficial
Cringleford footpath FP1	Low	No change	Neutral	Neutral
Cringleford footpath FP2	Medium	No change	Neutral	Neutral
Cringleford footpath FP3	Medium	No change	Neutral	Neutral
Keswick bridleway BR5	High	No change	Neutral	Neutral
Hethersett footpath FP6	High	No change	Neutral	Neutral
Permissive footpath/cycleway between Cantley Lane and A11 Newmarket Road	Very high	No change	Neutral	Neutral
Wyndham Circular cycle route	High	No change	Neutral	Neutral
Wyndham to Sprowston Pedalway	Very high	No change	Neutral	Neutral
Kett's Country local walking route	Medium	No change	Neutral	Neutral

Agricultural land holdings

12.10.21. Using the criteria outlined in Table 12-2 the methodology of assessment considered the magnitude of an impact on an agricultural holding. In the absence of questionnaires, this has been determined by a high level assessment of agricultural holdings. This was achieved using Scheme Overview drawings and shape files and publicly available information, standard industry figures and professional knowledge, sources of publicly available information agri-environment scheme layers on MAGIC, Google Earth, Defra statistics pages and the Defra CAP payments website. In Table 12-13, this has been considered for the period during construction.

Table 12.13: Significance of effects on agricultural land holdings during construction

Farm No	Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Agricultural land holdings					
1	Land take of an entire 8.59ha arable parcel. No farm infrastructure on site.	Medium	Minor	Land take of circa 8.59ha	Slight adverse
2	Impact upon multiple arable and grassland fields. Access amendments required to southern arable block. Construction impact on fixed assets within a Higher Level Stewardship agreement.	Medium	Moderate	Land take of circa 20ha	Moderate adverse
3	Land take of an entire 1.75ha arable parcel. No farm infrastructure on site.	Medium	Minor	Land take of circa 1.75ha	Slight adverse
4	Construction will be carried out on the outer fringe of a grassland parcel used for grazing livestock. Access will not be affected.	Very High	Negligible	Land take of circa 0.2ha	Slight adverse

Human health

12.10.22. Effects of construction on human health determinants and health outcomes are described below in Table 12-14.

Table 12-14: Health outcomes as a result of construction of the Proposed Scheme

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
Access to healthcare facilities	<p>During the construction of the Proposed Scheme, traffic management and the increase in construction traffic to the area would temporarily restrict traffic movements. However, diversions would be provided as part of the mitigation for the Proposed Scheme, therefore access to healthcare facilities would be retained.</p> <p>The temporary change in access is not considered to have a detrimental effect to the human health of the communities and therefore the health outcome is assessed as neutral.</p>	Neutral
Access to community, recreation and education facilities	<p>Physical inactivity is a primary contributor to a wide range of chronic diseases including, but not limited to, coronary heart disease, stroke and diabetes. Physical activity is important for the mental health of the population and helps to prevent obesity, therefore any temporary stopping up of paths during construction would potentially have negative impacts to human health.</p> <p>For WCH, mitigation measures have been proposed to ensure paths are maintained throughout the construction period, by using diversion routes. This would be agreed with the local authority and would reduce any adverse effects.</p> <p>For vehicle users, diversion routes will be in place during construction, ensuring access to community, recreation and</p>	Neutral

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
	<p>educational facilities is still permitted throughout the construction period.</p> <p>It is not predicted that any temporary works would have a significant effect on population and human health as a result of changes to access and local networks, therefore the health outcome is assessed as neutral.</p>	
<p>Existing and predicted levels of air and noise pollution</p>	<p>There is the potential for residents and members of the communities to be temporarily affected by increases of noise or dust disturbance during the construction period.</p> <p>The noise generating activities associated with construction include vehicle movements such as HGVs and heavy machinery, all of which could increase noise and vibration impacts for residents or members of the community. Temporary noise barriers would help to reduce these impacts, however negative health effects may be experienced by some communities due to the noise created by construction activities. Residents of private properties Bridge Cottages, Meadow Farm Cottages, and 128 Cantley Lane NR4 6TF is anticipated to experience temporary negative effects during construction, identified in ES Chapter 11, Noise and vibration (TR010037/APP/6.1). A Section 61 notice will be submitted by the Contractor to the local authority prior to the works taking place. Mitigation measures for the construction of the Proposed Scheme are provided in Chapter 11, Noise and vibration (TR010037/APP/6.1) and in the Environmental Management Plan (TR010037/APP/7.4).</p> <p>As ES Chapter 11, Noise and vibration (TR010037/APP/6.1) identifies significant effects at the closest receptors to construction activities, however this is a temporary impact. The health outcome of changes to noise disturbance during construction of the Proposed Scheme is assessed to be Negative.</p> <p>ES Chapter 5, Air quality (TR010037/APP/6.1) details that no significant effects on receptors have been identified due to changes in air quality during construction of the Proposed Scheme. When mitigation measures are implemented during the construction phase of the Proposed Scheme, fugitive emissions of dust from the construction site would be monitored and managed appropriately and as such should not cause significant nuisance at nearby receptors. The conditions would be monitored by checking the weather conditions and identifying those activities where fugitive dust emissions could be generated. Measures to minimise the impacts would be implemented and actioned as appropriate and regularly reviewed. Mitigation measures for the construction of the Proposed Scheme are provided in ES Chapter 5, Air quality (TR010037/APP/6.1) and in the Environmental Management Plan (TR010037/APP/7.4).</p> <p>The change in HGV traffic would not remain constant for the period of construction and is predicted to vary depending on the construction programme. All traffic associated with construction would be managed via a Traffic Management Plan which would aim to route traffic away from sensitive receptors (where possible) and schedule deliveries outside of peak times if possible.</p> <p>As ES Chapter 5, Air quality (TR010037/APP/6.1) identifies no significant impacts during construction due to changes in air quality, therefore the health outcome of changes to air quality during construction of the Proposed Scheme is assessed to be Neutral.</p>	<p>Noise and vibration: Negative</p> <p>Air quality: Neutral</p>

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
Stress and anxiety	During the construction of the Proposed Scheme there is the potential for temporary increases in stress and anxiety due to temporary traffic management measures.	Negative
Landscape amenity	<p>ES Chapter 7, Landscape and visual (TR010037/APP/7.4) reports potential significant effects at the following residential properties as a result of construction the Proposed Scheme:</p> <ul style="list-style-type: none"> • 128 Cantley Lane South (large adverse) • Nos'. 1 and 2 Bridge Cottages at Cantley Lane South (large adverse) – particularly No.1 Bridge Cottages closest to the proposed works with side and rear views overlooking them at close quarters • The six northern-most properties (in a horse-shoe formation) at the north eastern end of Cantley Lane South (closest to and potentially visually enclosed by the new pedestrian footbridge ramp and embankment) (moderate adverse) • The additional six properties at north western end of Cantley Lane South (moderate adverse) <p>Significant effects are also identified at the following PRowS:</p> <ul style="list-style-type: none"> • Railside footpath (FP6) (large adverse) • Short footpath link over pedestrian footbridge over the A47 (FP4) (large adverse) <p>The health outcome of changes to landscape amenity during construction of the Proposed Scheme is assessed to be Negative.</p>	Negative
Sources of pollution	<p>During construction, there is the potential for earthworks within or in close proximity to the Cantley Lane landfill or the infilled gravel pit leading to increased ground gas risk to construction workers.</p> <p>There is also potential risk to the health of maintenance workers from ground gas, which has the potential to migrate and accumulate in structures located close to potential ground gas sources for example, the Cantley Lane landfill, and the infilled gravel pit on the south east of the Proposed Scheme.</p> <p>The reuse of made ground in sensitive areas of the Proposed Scheme could increase the risk to human health and controlled waters.</p> <p>The EMP (TR010037/APP/7.4) will set out controls to ensure that all identified environmental risks are appropriately managed and minimised. Mitigation measures within the EMP will include best practice environmental management procedures and appropriate waste management. With the mitigation measures enforced, no residual effects are anticipated on human health after mitigation during the construction period, therefore the health outcome is assessed as neutral.</p>	Neutral
Safety	The construction of the Proposed Scheme is not considered to have any impact to the safety of communities or individual residents.	Neutral

Operation

Land use and accessibility

Private property and housing

- 12.10.23. Where access is altered for a private property as a part of the construction of the Proposed Scheme, this has been assessed as part of the construction assessment. Permanent effects to access of private property resulting in a change to journey length are reported under the construction section.
- 12.10.24. The journey time changes for those travelling between points on the A47 and A11 have been calculated as part of the transport assessment undertaken for the Proposed Scheme (summarised in the Case for the Scheme **(TR010037/APP/7.1)**).
- 12.10.25. The Do Minimum (DM) and Do Something (DS), as defined in Chapter 4, Environmental assessment methodology **(TR010037/APP/6.1)** indicate the journey times based on whether the Proposed Scheme is implemented (Do Something) or whether no action is taken (Do Minimum). Baseline route refers to the 2015 baseline year traffic flows. Journey time savings are predicted in all directions, in both the AM and PM peak. Further information can be found in the Case for the Scheme **(TR010037/APP/7.1)**.
- 12.10.26. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from residential properties in Cringleford, north and south of the A11 Newmarket Road. However, journey times are predicted to improve as a result of the Proposed Scheme. When approaching from the A11 south, journey time savings of approximately three minutes are predicted. Traffic congestion is likely to improve at Thickthorn junction due to the proposed free-flow link road providing an alternative route, directing traffic away from the junction. The magnitude of impact is assessed as **negligible** due to a very minor removal of severance from journey time savings. Effects are therefore assessed as **Slight beneficial**.
- 12.10.27. There would be no impacts to journey length or access when making journeys to or from residential properties on Station Lane both north and south of the A11 Hethersett Bypass, via Thickthorn Junction. Journey time savings are predicted for westbound traffic from the A47 south to the A11 Hethersett Bypass of approximately four minutes during 2040, which may provide a reduction in severance when accessing residential properties on Station Lane. The magnitude of impact is assessed as **negligible** due to a very minor removal of severance from journey time savings. Effects are therefore assessed as **Slight beneficial**.

12.10.28. There would be no impacts to journey length or access for residents of private properties on the B1172 Norwich Road and in Hethersett when accessing Thickthorn Junction. Table 12-15 details significance of effects on private property and housing during operation.

Table 12-15: Significance of effects on private property and housing during operation

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Journey time savings when accessing residential properties in Cringleford (north and south of A11 Newmarket Road) when approaching from the A11 south	High	Negligible	No mitigation	Slight beneficial
Journey time savings when accessing residential properties on Station Lane (north and south of A11 Hethersett Bypass) when approaching from the A47 westbound	High	Negligible	No mitigation	Slight beneficial

Community land and assets

- 12.10.29. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from the community assets in Cringleford, consisting of Cringleford Doctors Surgery and Eaton Veterinary Practice. The journey time savings that are anticipated to be experienced when accessing residential properties in Cringleford from Thickthorn Junction are expected to be experienced when accessing Cringleford Primary School and Cringleford Doctors Surgery. The magnitude of impact on community assets in Cringleford is assessed as **negligible** due to a very minor removal of severance from journey time savings. Effects are therefore assessed as **Slight beneficial**.
- 12.10.30. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from the community asset Nellies Nursery, located off the B1172.
- 12.10.31. The proposed 40mph speed limit on the B1172 Norwich Road from Thickthorn Junction and proposed traffic lights from Thickthorn Junction onto the B1172 Norwich Road may improve safety when accessing community assets at Thickthorn services.
- 12.10.32. Table 12-16 presents anticipated changes to journey times and severance for community land and assets during operation.

Table 12-16: Significance of effects on community land and assets during operation

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Journey time savings when accessing Cringleford Doctors Surgery, and Eaton Veterinary Practice from Thickthorn Junction.	Medium	Negligible	No mitigation	Slight beneficial
Safety improvements when accessing Thickthorn services due to the proposed 40mph speed limit on the B1172 Norwich Road from Thickthorn Junction and proposed traffic lights from Thickthorn Junction onto the B1172 Norwich Road.	High	Minor	No mitigation	Slight beneficial

Development land and business

- 12.10.33. Residual effects on development land and businesses during operation are only in relation to journey time savings, as shown Table 12-17.
- 12.10.34. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from businesses located in Cringleford, north and south of the A11 Newmarket Road. The following businesses are located to the north of the A11: Tawsy's Driving School and Ellie's Hampers.
- 12.10.35. Journey time savings are anticipated as a result of the Proposed Scheme when accessing businesses in Cringleford from the A11 south. Savings of approximately three minutes are anticipated by 2040. The sensitivity of the businesses is considered **medium** as they cover <1ha. The magnitude is considered **negligible** as the journey time savings provide a minor removal or severance. Effects are therefore classified as **Slight beneficial**.
- 12.10.36. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from the following businesses located on the B1172 Norwich Road: Sign and Print Poster Shop, Church Farm Shop and John Kemp 4x4's.
- 12.10.37. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from the following businesses located on the Thickthorn Services: McDonalds Norwich Thickthorn, Travelodge, Burger King, Gregg's, Shell and Jetwash car wash.
- 12.10.38. There would be no anticipated changes to journey length or access when accessing Thickthorn Junction from the following businesses located on Station Lane, both north and south of the A11 Hethersett Bypass. Businesses to the north of the A11 (Hethersett Bypass) consist of: NFU Mutual Hethersett, Tots Town, Flashpoint Fabrications, Hulleys Frozen, D A Culling Scrap Metals, and CJ's Garden Machinery, Ellipsis Brands Limited. Businesses to the south of the

A11 (Hethersett Bypass) consist of NR Asphalt, Ketteringham Depot- South Norfolk Council, Norfolk County Council Highway Depot (South), Ketteringham Recycling Centre, Norfolk Environmental Waste Services, Fast Lane Training Services.

12.10.39. However, the Proposed Scheme would result in journey time savings when accessing businesses on Station Lane to the south of the A11. When accessing from the A47 westbound carriageway, journey time savings of approximately four minutes are predicted. When accessing the A47 from the A11 eastbound, journey time savings of approximately two minutes are predicted in the AM peak and one minute in the PM peak. Savings of approximately three seconds are predicted when approaching from the A47 north of Thickthorn Junction. The magnitude is considered **negligible** as the journey time savings provide a minor removal of severance. Effects are therefore classified as **Slight beneficial**.

Table 12-17: Significance of effects on development land and business during operation

Description of impact	Sensitivity	Magnitude of impact	Potential impacts (pre-mitigation)	Residual effect
Development land and business				
Journey time savings when accessing businesses in Cringleford from the A11 westbound	Medium	Negligible	No mitigation	Slight beneficial
Journey time savings when accessing businesses on Station Lane from the A47 westbound and eastbound and A11 eastbound	Medium	Minor	No mitigation	Slight beneficial

Walkers, cyclists and horse riders (WCH)

12.10.40. A new replacement shared footway and cycleway would be provided on the eastern frontage of the Cantley Lane Link Road as part of the Proposed Scheme. A refuge island would also be incorporated into its junction with B1172 Norwich Road to facilitate the safe crossing between the shared footway and cycleway and the existing facility provided on the northern frontage of Norwich Road, which comprises part of the Wymondham to Sprowston Pedalways cycle route. The provision of this infrastructure would provide a safer and pleasant route for users travelling between Wymondham and Cringleford, avoiding the need to pass through Thickthorn Junction. Effects are classified as **Slight beneficial**. Residual effects to WCH are shown in Table 12-18.

Table 12-18: Residual effects to WCH

Impact	Sensitivity	Magnitude of impact	Residual effect
New shared footway/cycleway on the eastern frontage of the Cantley Lane Link	n/a	n/a	Slight beneficial

Agricultural land holdings

- 12.10.41. The Proposed Scheme would result in permanent land take of approximately 8.59ha for holding 1. The land is formed of an entire arable field, currently tenanted on a short term agreement. There is no farm infrastructure located on the site. The estimated size of the tenanted holding is 69ha. The scale of the permanent land take would equate to 12% of the farm so it is unlikely that this would impact on the long term viability. As holding 1 is identified as being of **medium** sensitivity, with a **minor** magnitude of permanent impact, the residual effect is considered to be **Slight adverse**.
- 12.10.42. Holding 2 is a mixed arable and grazing livestock farm with an estimated size of 126ha. The Proposed Scheme would require temporary and permanent land take to the north and south of the A11 to accommodate the Cantley Lane link road, associated earthworks and the potential extension to the Thickthorn park and ride. Access to remaining arable and grassland areas would need to be reconfigured. The timescales of this may adversely impact on farm operations. A Countryside Stewardship Higher Level agreement exists on the land. Farmers are paid to carry out certain environmental actions on their farmland through the scheme and failure to meet the obligations of the agreement may result in a reduction in the annual payment. It is unclear whether any options would be impacted upon by the Proposed Scheme, and it may be possible to make a minor adjustment to an agreement. The scale of the permanent land take is estimated to be approximately 16ha, which equates to 13% of the farm. It is unlikely that this would impact on the long term viability of the holding. As holding 2 is identified of being of **medium** sensitivity, with a **moderate** magnitude of permanent impact, the residual effect is considered to be **Moderate adverse**.
- 12.10.43. The Proposed Scheme would result in permanent land take of approximately 1.75ha for holding 3. The land is formed of an entire arable field, the tenure of which is unknown. There is no farm infrastructure located on the site. As it cannot be established how the land fits in with a wider agricultural holding, the impact assessment has been made on the basis of standard figures. The average farm size in the area is 101ha. On this basis the scale of the permanent land take is 2% of an average farm. The land has been identified as being of **medium** sensitivity. On the basis of standard figures, the permanent

impact would be of **negligible** magnitude; therefore, the residual effect is considered to be **Slight adverse**.

12.10.44. No information is available for holding 4, which is a land parcel used for grazing livestock, which may include the keeping of horses. The permanent land take would only affect the western edge of the site and would not affect the existing access. On the basis of standard figures the 0.17ha land take would equate to less than 1% of an average farm. The land has been identified as being of **very high** sensitivity, with a **negligible** magnitude of permanent impact. As a result, the residual effect is considered to be **Slight adverse**. Table 12-19 shows significance of effects on agricultural land holdings during operation.

Table 12-19: Significance of effects on agricultural land holdings during operation

Farm No	Impact	Sensitivity	Magnitude of impact (pre-mitigation)	Magnitude of impact (post-mitigation)	Residual effect
Agricultural land holdings					
1	Permanent arable land take of approximately 8.59ha.	Medium	Minor	Minor	Slight adverse
2	Permanent arable and grassland land take of 16.3ha.	Medium	Moderate	Moderate	Moderate adverse
3	Permanent arable land take of approximately 1.75ha.	Medium	Negligible	Negligible	Slight adverse
4	Permanent grassland land take of approximately 0.17ha.	Very High	Negligible	Negligible	Slight adverse

Human health

12.10.45. Effects of operation of the Proposed Scheme on human health determinants and health outcomes are described in Table 12-20.

Table 12-20: Health outcomes as a result of operation of the Proposed Scheme

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
Access to healthcare facilities	<p>It is anticipated that there would be journey time savings when accessing healthcare facilities such as Cringleford Doctor's Surgery from Thickthorn Junction as a result of the Proposed Scheme, therefore resulting in reduced severance and improved access to healthcare facilities in these communities.</p> <p>Access to Norfolk and Norwich University Hospital would be improved by the Proposed Scheme due to journey time savings when approaching from the A11 west to the A47 northbound. Savings of 4 minutes are predicted during the AM peak and 3 minutes during the PM peak in 2040.</p>	Positive

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
	<p>Access to healthcare facilities is anticipated to be improved by the Proposed Scheme due to decreased congestion and improved journey times. Therefore, the health outcomes are assessed to be positive.</p>	
<p>Access to community, recreation and education facilities</p>	<p>Cringleford and Hethersett are the main hubs of community and education facilities within the study area, with facilities such as Cringleford Primary School and Cringleford Tennis Club. Journey times when accessing Cringleford are anticipated to be improved as a result of the Proposed Scheme. The proposed Cantley Lane Link Road would provide improved access between Cantley Lane South and the B1172 Norwich Road to access facilities in Hethersett, and the proposed free-flow link road would assist in reducing congestion at Thickthorn Junction. For WCH, the provision of a new shared footway and cycleway is anticipated to facilitate improved access between Cringleford and Wymondham.</p> <p>Access to community assets in Hethersett would be improved due to journey time savings predicted for westbound traffic from the A47 south to the A11 west of approximately four minutes during 2040. There are also journey time savings of approximately 2 minutes in the AM peak and 1 minute in the PM peak when travelling in this direction from the A11 north, and the proposed Cantley Lane Link Road will allow improved access for those travelling from Cantley Lane South to community assets in Hethersett.</p> <p>Access to community, recreation and education facilities is anticipated to be improved by the Proposed Scheme due to decreased congestion at the Thickthorn Junction, improved journey times for some routes and the provision of a proposed footway and cycleway, enabling improved access to facilities in Cringleford when approaching from the west. Therefore, the health outcomes are assessed to be positive.</p>	<p>Positive</p>
<p>Existing and predicted levels of air and noise pollution</p>	<p>The operational effect of the Proposed Scheme on air quality is not anticipated to result in negative health effects. ES Chapter 5, Air Quality identifies the greatest improvement in air quality to be expected to occur at two receptors on Skipping Block Row and Pople Street, in Wymondham located approximately 5.8km southwest of the Proposed Scheme. Although 50 receptors within the study area are showing a slight deterioration in air quality, the predicted air quality concentrations are well below the Air Quality Objectives with the majority of receptors indicating a small or imperceptible change.</p> <p>The operational effects of the Proposed Scheme on noise and vibration is not anticipated to result in negative health effects. ES Chapter 11, Noise and vibration (TR010037/APP/6.1) identifies that all minor adverse and beneficial impacts are predicted at noise sensitive receptors with absolute noise levels below the SOAEL and the long-term impact is predicted to be negligible. As such, all minor impacts are not predicted to have significant effects.</p> <p>Therefore, the health outcome of the Proposed Scheme from air quality and noise pollution is assessed to be Neutral.</p>	<p>Neutral</p>
<p>Stress and anxiety</p>	<p>The implementation of the Proposed Scheme is not anticipated to have an impact on the stress and anxiety of local residents.</p>	<p>Neutral</p>
<p>Landscape amenity</p>	<p>ES Chapter 7, Landscape and visual effects (TR010037/APP/6.1) does not identify any significant effects on residential properties or</p>	<p>Neutral</p>

Health Determinant	Predicted impacts on determinants	Residual effect of health outcome
	PRoW by year 15 of operation. Therefore, the health outcome of the Proposed Scheme from landscape amenity is assessed to be Neutral.	
Sources of pollution	No significant effects to human health as a result of sources of pollution during the operation of the Proposed Scheme are anticipated. Therefore, the health outcome is assessed as neutral.	Neutral
Safety	The Proposed Scheme is not considered to have any impact to the safety of communities or individual residents.	Neutral

12.11. Monitoring

- 12.11.1. Monitoring will take place for receptors in which significant effects have been identified due to changes in noise and vibration, during construction and operation of the Proposed Scheme. For further detail please refer to ES Chapter 11, Noise and vibration (**TR010037/APP/6.1**).

12.12. Summary

- 12.12.1. Overall, impacts on population and human health are predominantly non-significant once the Proposed Scheme is operational. The exception to this is users of Cringleford footpath 4A where a **Moderate adverse** effect is anticipated due to journey increases associated with the permanent diversion of the footpath across the new Cantley Lane Footbridge (Cringleford). Beneficial effects would be experienced by horse-riders and cyclists travelling between Cantley Lane and Cantley Lane South via the new Cantley Lane footbridge (Cringleford) and by pedestrians and cyclists travelling along the shared footway/cycleway to be provided on the eastern frontage of the Cantley Lane Link road .
- 12.12.2. For those travelling to access properties, businesses and community assets using the Proposed Scheme, benefits would be experienced in terms of journey time savings and safety for road users. During construction the Proposed Scheme would result in changes to access for private properties along Cantley Lane and Cantley Lane South. However, these changes are not considered to be significant. The loss of a proposed area of public open space at Cringleford Residential Development would result in a **Large adverse** effect should an alternative solution not be agreed with the developer and local planning authority.
- 12.12.3. The Proposed Scheme is unlikely to have an impact on the long term viability of the majority of the agricultural holdings identified as part of this assessment. However, during the construction works, there is potential for considerable disruption to access of adjacent agricultural blocks farmed by holding 2.

However the permanent land take required from holding 2 will result in a **Moderate adverse** effect for both the construction and operation of the Proposed Scheme

- 12.12.4. During construction, there are likely to be some effects on local communities and potentially their health in terms of the noise and dust created by construction activities and the visual amenity impact of construction vehicles and compounds. Mitigation measures including producing an EMP (TR010037/APP/7.4) and provision of a Community Liaison Officer will seek to minimise these effects as far as possible.

12.13. References

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12.14. Glossary

Term	Definition
Accessibility	The ability of users to access land, property, infrastructure, businesses and community assets.
Access	The means by which to approach or enter land, property and assets.
Agricultural Land Holdings	Land and associated infrastructure for the purpose of agricultural production, for example, arable farming, dairy farming etc.
Businesses	Land and buildings for the purpose of commercial/industrial enterprise.
Community	A group of people living in the same place or having a particular characteristic in common.
Community land and assets	Land, buildings and infrastructure providing a service/resource to a community, for example, open spaces, village greens, village halls, healthcare and education facilities etc.
Development land	Land identified in national or local plans, policies or strategies for development (including intensification of existing uses) and land subject to planning permission.

Term	Definition
Health Determinants	Personal, social, economic and environmental factors which determine the health status of individuals and communities.
Human health	A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity
Health Outcome	The health status of an individual, group or population, attributable to a planned intervention (for example, a project).
Health profile	Statistical picture of the baseline health conditions and trends within an area. NOTE: A profile can be built up for a variety of scales (for example, ward, Local Authority or more strategic levels for example, Local Enterprise Partnerships).
Journey length	Physical length of a journey.
Land take	Temporary or permanent use of land for a project which takes it from private or public landholdings.
Population	All individuals located in a particular location (this can be local, regional or at a national scale).
Private property and housing	Land, buildings and infrastructure for the purpose of residential use.
Severance	The extent to which members of communities are able (or not able) to move around their community and access services/facilities.
Strategic housing sites	Large scale sites/land allocated in local planning policy for the provision of residential land use.
Strategic employment sites	Large scale sites/land allocated in local planning policy for the provision of employment land use.