

# Southampton to London Pipeline Project

## Volume 6

Environmental Statement (Volume D)  
Appendix 13.4 Human Health Technical Note  
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## Appendix 13.4 Human Health Technical Note

### 1.1 Introduction

- 1.1.1 This appendix describes the potential for human health effects to result from the construction and operation of the project. The assessment aims to identify potential impacts on human health that may be caused by the project, and whether these potential effects are either beneficial or adverse, and significant or not significant in nature.
- 1.1.2 The World Health Organization (WHO) defines health as ‘...a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ (WHO, 2018). For the purposes of this assessment, health encompasses physical and mental health, and incorporates the broader concept of well-being.
- 1.1.3 Illustration 1.1 shows the key determinants of health and well-being. The approach presented here puts people in the centre of the diagram, surrounded by the ecosystem on which they depend, thereby showing the broader cultural, economic and political forces which affect health and well-being (Barton & Grant, 2006).

Illustration 1.1: Determinants of Health and Well-being





## 1.2 Approach and Methods

- 1.2.1 The scope of the assessment is detailed in the Scoping Report (Esso, 2018), which includes a scoping exercise of potentially significant impacts in relation to human health. The Scoping Report was issued to the Planning Inspectorate in July 2018 along with a request for a Scoping Opinion in accordance with Regulation 8 of the Infrastructure Planning (Environmental Impact Assessment) Regulations.
- 1.2.2 Refer to Chapter 5 Consultation and Scoping for more details on scoping (including the Scoping Opinion from the Planning Inspectorate (2018)) and for details of any relevant consultation.
- 1.2.3 This assessment considers the significance of potential effects on human health as a result of the construction and operation of the project. The assessment was supplemented by an extended study of the environmental and health baselines, public consultation and further assessment where deemed appropriate.
- 1.2.4 This assessment has had regard for and was carried out in accordance with the relevant national and EU legislation and guidance, including but not limited to the following:
- Overarching National Policy Statement for Energy (EN-1);
  - National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4);
  - National Planning Policy Framework; and
  - Health and Social Care Act 2012.
- 1.2.5 EN-1 contains the following paragraphs relating to people and communities which have been considered within this chapter:
- Paragraph 4.13.2 states that '*Where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health.*'
- 1.2.6 Potential effects on human health are considered and assessed via biophysical factors, and as such, this Human Health Technical Note makes use of and references out to the findings of other technical chapters and appendices within this Environmental Statement (ES), particularly the following:
- Appendix 13.2 Air quality ;
  - Chapter 8 Water Environment ;
  - Chapter 10 Landscape and Visual ;
  - Chapter 11 Soils and Geology ;
  - Appendix 13.3 Noise and vibration ;
  - Chapter 13 People and Communities ;



- Appendix 13.1 Traffic and Transport ; and
- Chapter 14 Major Accidents .

1.2.7 In addition, the assessment considers other factors that may influence the degree to which human health is affected by the project. As such, the assessment is further informed by the use of the National Health Service (NHS) – London Healthy Urban Development Unit’s ‘Rapid Health Impact Assessment Tool’ (NHS, 2017).

### Scope of Assessment

1.2.8 The scope of the appendix has been informed by the Scoping Opinion, provided by the Planning Inspectorate in September 2018, on behalf of the Secretary of State, following the submission of the Scoping Report (Esso, 2018).

1.2.9 Table 1.1 summarises the scope of the assessment for health. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

**Table 1.1: Matters Scoped In and Out of the Assessment (Grey Shading Indicates Matters Scoped Out Following Feedback from the Planning Inspectorate)**

| Receptor   | Matter / Potential Effect  | Conclusion in the SR (July 2018) | Further Assessment and Comments from the Planning Inspectorate in the Screening Opinion (September 2018)   |
|--|--|----------------------------------|--|
| Disruption to green space and nature   | Construction activities resulting in loss of green space used for physical activity and stress relief.                         | Scoped out                       | (ID 4.8.2) In the absence of detailed mitigation measures, the Inspectorate does not agree that this matter can be scoped out of the ES. Scoped in.  |
|  | Visual amenity during and beyond construction resulting in reduced use of green space for physical activity and stress relief. | Scoped out                       | (ID 4.8.1) Construction: In the absence of detailed mitigation measures, the Inspectorate did not agree that this could be scoped out of the ES for the construction phase. Scoped in.<br>Operation: The Inspectorate agreed that consideration of these potential impacts during the operational phase of the project could be scoped out of the ES. <b>Scoped out.</b> |
| Effects on communities   | Disruption to communities causing decreased social cohesion and associated negative effects.                                   | Scoped out                       | (ID 4.8.4) Construction: In the absence of detailed mitigation measures, the Inspectorate did not agree that this could be scoped out of the ES. Scoped in.<br>Operation: The Inspectorate agreed that consideration of these potential impacts during the operational phase of the project could be scoped out of the ES. <b>Scoped out.</b>                            |
| Traffic, transport, connectivity, severance and physical injury from accidents | Health effects as a result of increased congestion, driver stress and severance.   | Scoped out                       | (ID 4.8.7) Urban areas: The Inspectorate cited the potential for these potential effects to be significant in urban areas. Scoped in.  |
|  |  |                                  | Rural areas: The Inspectorate agreed that significant effects resulting from increased congestion, driver stress and severance are   |



| Receptor             | Matter / Potential Effect  | Conclusion in the SR (July 2018) | Further Assessment and Comments from the Planning Inspectorate in the Screening Opinion (September 2018)   |
|----------------------|--|----------------------------------|--|
|                      |  |                                  | unlikely within rural areas and that this matter can be scoped out of the ES. <b>Scoped out.</b>   |
| Soil contamination   | Health effects resulting from a build-up of ground gases and/or soil contamination.                          | Scoped out                       | (ID 4.8.9) Construction: In the absence of detailed mitigation measures, the Inspectorate did not agree that this could be scoped out of the ES for the construction phase. Scoped in.   |
|                      |  |                                  | Operation: The Inspectorate agreed that the consideration of these potential impacts during the operational phase of the project could be scoped out of the ES. <b>Scoped out.</b>   |
| Noise and vibration  | Health effects as a result of noise disruption, such as sleep disturbance.                                   | Scoped out                       | (ID 4.8.11) In the absence of detailed mitigation measures, the Inspectorate does not agree that this matter can be scoped out of the ES. Scoped in.   |
|                      | Health effects during operation  | Scoped out                       | (ID 4.8.12) The Scoping Report does not provide a description of the likely works at Alton, including any anticipated noise and vibration. It also does not describe the likely noise and vibration emissions and characteristics for the new pigging station at Boorley Green. The ES should describe the noise and vibration emissions and characteristics of these elements during operation, where significant. Scoped in. |
| Water                | Health effects during construction from contaminants of groundwater entering public water supplies           | Scoped out                       | (ID 4.8.13) In the absence of detailed evidence to support this assertion, the Inspectorate does not consider that detailed information has been provided to justify a scoping out of the assessment at this stage. The ES should assess the matter where significant effects are likely to occur. Scoped in.  |
|                      | Potential health effects during construction from flooding such as stress                                    | Scoped out                       | (ID 4.8.14) In the absence of detailed mitigation measures, the Inspectorate did not agree that this could be scoped out of the ES for the construction phase. Scoped in.  |
|                      | Health effects from contaminants of groundwater during operation entering public water supplies or flooding. | Scoped out                       | The Inspectorate agreed that consideration of these potential impacts during the operational phase of the project could be scoped out of the ES. <b>Scoped out.</b>  |
| Major accidents      | Health effects from major accidents during construction  | Scoped out                       | The Inspectorate directs the applicant to the comments relating to major accidents and health. Scoped in.  |
|                      | Health effects as a result of fires from major releases of aviation fuel.                                    | Scoped out                       | The Inspectorate agrees with the proposed approach to address this within the major accidents chapter. <b>Scoped out</b> but cross-reference included.   |
| Community well-being | Effects on well-being due to the public perception of effects.   | Scoped out                       | In the absence of detailed mitigation measures, the Inspectorate did not agree that this matter can be scoped out of the ES. Scoped in.  |



- 1.2.10 In addition to the comments in Table 1.1, the Planning Inspectorate requested for the following to be included within the ES or specifically within the assessment of potential effects on human health:
- an assessment of the social determinants of health and well-being including living and working conditions, social and community networks and individual lifestyle factors to be contained within the ES (ID 4.8.21), see paragraph 1.2.12 for more information;
  - a statement of which study area is applied to the assessment of health impacts (ID 4.8.22), see paragraph 1.2.17 for more information;
  - baseline data to cover London Borough of Hounslow and the administrative area of the Greater London Authority (ID 4.8.23), see paragraph 1.3.2 for more information; and
  - air quality effects (including dust) on tourism receptors and communities during construction and operation (ID 4.7.13), see paragraph 1.5.4 to 1.5.9 and 1.5.43 to 1.5.44 for more information.
- 1.2.11 As outlined in paragraph 1.2.7, the National Health Service (NHS) – London Healthy Urban Development Unit’s ‘Rapid Health Impact Assessment Tool’ has been used to inform this Human Health Technical Note, mainly in response to a requirement contained within the Scoping Opinion (Planning Inspectorate, 2018) to ‘ensure that the ES also assesses the social determinants of health and well-being, to include living and working conditions, social and community networks, and individual lifestyle factors’ (ID 4.8.21).
- 1.2.12 As such, Table 1.2 outlines the determinants covered within the Rapid Health Impact Assessment Tool where these were considered and, where appropriate, included as stand-alone elements within the scope of this Human Health Technical Note.

**Table 1.2: Consideration of NHS Rapid Health Impact Assessment Tool Determinants**

| NHS Rapid Health Impact Assessment Tool Determinants          | Included as Part of This Human Health Technical Note? |        | Explanation  |
|---|---|--------|--|
|   | Yes (✓)   | No (✗) |  |
| Housing quality and design                                    |   | ✗      | Not applicable – the nature of the project does not involve the design or development of housing.  |
| Access to healthcare services and other social infrastructure | ✓   |        | Determinant considered within Chapter 13 People and Communities. Where any relevant significant effects are identified, these are given due consideration in the Human Health Technical Note.  |
| Access to open space and nature                               | ✓   |        | Determinant considered within Chapter 12 Land Use and Chapter 13 People and Communities. Where any relevant significant effects are identified, these are given due consideration in the Human Health Technical Note.                        |
| Air quality, noise and neighbourhood amenity                  | ✓   |        | Determinant considered within Chapter 13 People and Communities (with input from Appendix 13.1 Traffic and Transport, Appendix 13.2 Air Quality, Appendix 13.3 Noise and Vibration, and Chapter 10 Landscape and Visual). Where any relevant |





| NHS Rapid Health Impact Assessment Tool Determinants | Included as Part of This Human Health Technical Note? |   | Explanation   |
|--|---|---|---|
|  |   |   | significant effects are identified, these are given due consideration in the Human Health Technical Note.   |
| Accessibility and active travel                      | ✓   |   | Determinant considered within Chapter 13 People and Communities and Appendix 13.1 Traffic and Transport. Where any relevant significant effects are identified, these are given due consideration in the Human Health Technical Note.                           |
| Crime reduction and community safety                 |   | ✘ | Not applicable – issues of crime reduction and community safety have been scoped out as per agreement from the Inspectorate. Please refer to the Scoping Opinion for more information.  |
| Access to healthy food                               |   | ✘ | Not applicable – the nature of the project does not necessitate consideration of access to healthy food.  |
| Access to work and training                          |   | ✘ | Not applicable – the nature of the project does not necessitate consideration of access to work and training, while issues of employment have been scoped out as per agreement from the Inspectorate. Please refer to the Scoping Opinion for more information. |
| Social cohesion and lifetime neighbourhoods          | ✓   |   | Determinant considered within Chapter 13 People and Communities. Where any relevant significant effects are identified, these are given due consideration in the Human Health Technical Note.   |
| Minimising the use of resources                      |   | ✘ | Determinant considered within Chapter 3 Project Description and Chapter 4 Design Evolution (does not form part of the assessment work).   |
| Climate change                                       | ✓   |   | Determinant considered within Appendix 13.2 Air Quality. Where any relevant significant effects are identified, these would be given due consideration in the Human Health Technical Note.  |

1.2.13 Given the overlap between the determinants of the NHS’s ‘Rapid Health Impact Assessment Tool’ and the elements considered within the scope of the other technical chapters and appendices of this ES (paragraph 1.2.5), it is determined that the Scoping Opinion requirement for the ES to address ‘social determinants of health and well-being’ is adequately covered under the scope of this assessment.

1.2.14 Having regard to the assessment scope that was outlined within the Scoping Report (Esso, 2018) but also incorporating the detail and requirements of the Planning Inspectorate’s (2018) Scoping Opinion, the technical scope of this Human Health Technical Note has been determined to be the consideration of how human health may be impacted by the following effects during the construction and operation of the project:

- effects of air pollution;
- effects of noise and vibration;
- effects of land and groundwater contamination;
- effects of flooding;
- effects of changes to landscape and visual amenity;



- effects of community disruption, including issues of access and severance;
- effects related to traffic and transport, including physical injury from accidents; and
- effects related to major accidents.

1.2.15 A high-level, qualitative consideration of the perceived impacts on physical health (i.e. accidents and injuries) and mental health (i.e. stress and anxiety) will also be outlined in respect to the construction and operation of the project.

### Study Area

1.2.16 The study area for the assessment of potential impacts on human health is defined by the biophysical factor under consideration and aligns itself with the reported study area(s) outlined within each of the correlated technical assessments. For example, the study area for potential impacts on human health in respect of land contamination is an area up to 250m from the Order Limits, while the study area for potential impacts on human health from effects relating to noise and vibration is considered to be an area up to 500m from the Order Limits. For ease of reference, these have been outlined in Table 1.3.

**Table 1.3: Study Areas Defined by Each Technical Assessment**

| Technical Assessment                | Study Area   |
|-------------------------------------|--|
| Appendix 13.2 Air Quality           | Appendix 13.2 – ‘For dust emissions during the construction phase, the assessment at human receptors focuses on areas extending up to 350m from the Order Limits.’<br>Appendix 13.2 – ‘The identification of a study area for emissions from road traffic would normally be based on receptors located within 200m of road links that exceed the Land Use Planning and Development Control: Planning for Air Quality guidance (IAQM / Environmental Protection UK (EPUK), 2017) screening criteria.’ |
| Chapter 3 Water                     | Chapter 8 Water – ‘The groundwater study area is defined as the Order Limits with a 1km buffer on either side’.<br>This further states ‘the study area for surface water (which includes water quality, fluvial geomorphology, flood risk and WFD) is defined as the Order Limits with a 500m buffer on either side’.  |
| Chapter 10 Landscape and Visual     | Chapter 10 Landscape and Visual – ‘The study area for the LVIA is 1km from the proposed Order Limits.’<br>For more detailed information in relation to the study area for the Landscape and Visual Impact Assessment, please see Chapter 10 Landscape and Visual, Section 10.2.  |
| Chapter 11 Soils and Geology        | Chapter 11 Soils and Geology – ‘The study area for land contamination is the defined Order Limits, with a 250m buffer zone’.   |
| Appendix 13.3 Noise and Vibration   | For installation activities, the study area comprises all receptors within a corridor of 500m from the Order Limits.<br>For noise and vibration from operation of the pipeline, the assessment has considered receptors within 1km from the Alton Pumping Station.   |
| Chapter 13 People and Communities   | Chapter 13 People and Communities – ‘The study area for the assessment of potential effects on local communities and tourism receptors extends 500m from the Order Limits (inclusive of the Order Limits).’  |
| Appendix 13.1 Traffic and Transport | Appendix 13.4: Traffic and Transport Technical Note - ‘A 2km study area was originally used in the Scoping Report, prior to further development of   |



| Technical Assessment         | Study Area   |
|------------------------------|--|
|                              | <i>the project. Following the release of further project details, the study area was finalised based on available information for logistics hubs and construction compounds and with the traffic management and diversion locations based on the criteria confirmed in Section 1.4 [Appendix 13.4 Traffic and Transport Technical Note].'</i>                                      |
| Chapter 14 Major Accidents ) | Chapter 14 Major Accidents – ‘Consequences of major accidents or disasters could extend beyond the immediate environs of the project, and up to 1km was established for the identification of potentially sensitive land, groundwater or surface water receptors. For surface watercourses within the 1km study area, a wider study area of up to 10km downstream was considered.’ |

### Baseline Conditions

1.2.17 Baseline data and information outlined in Section 1.3 were collated through a combination of desktop research and consultations with statutory consultees and other interested parties as detailed below.

#### Desk-based research

1.2.18 The desk-based research undertaken to inform this Human Health Technical Note has largely expanded on baseline information outlined and presented within the Scoping Report (Esso, 2018) and the Preliminary Environmental Information Report (Esso, 2018). Desk-based information has been collated from sources such as:

- Ordnance Survey mapping;
- aerial photography;
- Office for National Statistics (ONS);
- Official Labour Market Statistics (Nomis);
- Public Health England; and
- county-level data and information (Hampshire and Surrey).

#### Engagement Relevant to the Assessment

1.2.19 No specific consultation or engagement has been undertaken in the development of this appendix.

### Limitations of Assessment

1.2.20 The key limitations and technical assumptions made are as follows:

- There is no definitive guidance on the assessment of human health effects for EIA, and no prescribed method for determining the sensitivity of receptors or the significance of effects on those receptors. Therefore, professional judgement has been applied throughout this assessment, taking into account information presented Chapter 6 Overview of Assessment Process.
- The limitations identified and technical assumptions made in the following technical chapters and appendices on which this assessment relies also apply to this assessment: Air Quality (Appendix 13.2); Noise and Vibration (Appendix



13.3); Traffic and Transport (Appendix 13.1); Landscape and Visual (Chapter 10); Soils and Geology (Chapter 11); and People and Communities (Chapter 13).

- Regional ONS data from 2011 have been used for the baseline data for this Human Health Technical Note. Where such data do not perfectly align with the study area identified, the 'best-fit' or dataset with the closest representation of the study area was used to consider and assess impacts on human health.
- ONS data from 2011 have been used to inform the baseline. However, in some cases data for this year were not available, in which case the most recently published data has been used.

### **Impact Significance**

- 1.2.21 Impacts reported in this ES are adverse unless otherwise stated and are considered 'likely significant effects' in the context of the EIA Regulations when of Moderate significance or above.
- 1.2.22 As explained in Chapter 6 Overview of Assessment Process, significance is determined using a three-step process:
- 1) identify value/sensitivity of a receptor;
  - 2) determine magnitude of potential impact; and
  - 3) assign impact significance.
- 1.2.23 The tables within Chapter 6 (Table 6.2 and 6.3) set out the criteria typically used to assess value/sensitivity and magnitude. Impact significance was then determined taking both these assessments into account, using the matrix approach provided in Section 6.3 of Chapter 6.

### Significance of Effects

- 1.2.24 As this Human Health Technical Note makes use of, and relies heavily on, the findings of the other technical chapters and appendices within this ES, no specific sensitivity or magnitude criteria are outlined beyond those that are identified for each of the technical chapters and appendices specified in paragraph 1.2.6.
- 1.2.25 As a result of this inter-relationship, the assessment of potential impacts on human health draws on the mitigated position (residual effects) of the assessment reported in these other technical chapters and appendices and an overall qualitative conclusion is drawn as to whether effects on human health are potentially significant or not significant.
- 1.2.26 Where the contributing technical assessments report no significant effects, it is assumed that there would be no additional effect on human health. The assessment of effects on health is only triggered when the other technical assessments report the potential for a significant effect.



## 1.3 Baseline Conditions

### Overview

- 1.3.1 The project would be situated within the counties of Hampshire and Surrey, with the exception of a short section (up to 60m) where it would be situated within the London Borough of Hounslow and the administrative area of Greater London Authority (GLA) in which the project is proposed to connect with the Esso West London Terminal storage facility.
- 1.3.2 Given that only 60m (an area encompassing approximately 0.57ha) of the project is situated within the boundary of the GLA administrative area, and the similarities in the socio-economic environment in respect to Hampshire and Surrey, baseline information specific to the GLA area is not outlined in this assessment. This is due to its inclusion having the potential to disproportionately skew relevant baseline information on which the impact assessment relies upon.
- 1.3.3 The baseline information outlined below illustrates the wider societal makeup and socio-economic setting in which the project is situated.

### Demographics

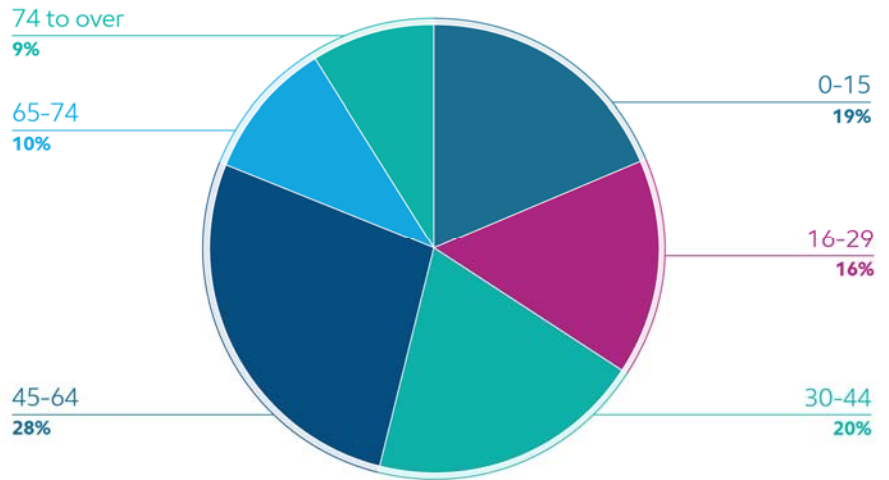
- 1.3.4 Hampshire and Surrey are two of nine counties that comprise the South East region of England.
- 1.3.5 According to the ONS, the South East region was estimated to have a population of just over nine million in 2017, Surrey had a mid-year population of 1,185,321, and Hampshire had a mid-year population of 1,370,728. Together, these two counties make up 28% of the total population for the South East region (ONS, 2018).
- 1.3.6 In 2011, the population density of Surrey was 6.8 persons per hectare, compared to Hampshire which had 3.6 persons per hectare, reflecting a higher level of urbanisation in Surrey. Surrey is also more densely populated (a larger concentration of people per hectare), than the average for the South East (4.5) and the national average for England (4.1) (ONS, 2011).
- 1.3.7 Illustration 1.2 and Illustration 1.3 shows the percentage of people per age group within the counties of Hampshire and Surrey. The cohorts of 30 to 44 and 45 to 64 account for a large portion of the population of both counties, accounting for 48% and 47% of the total population within either county respectively.



**Illustration 1.2: Breakdown of age-groups within the population of Hampshire (Census 2011, ONS)**

**HAMPSHIRE**

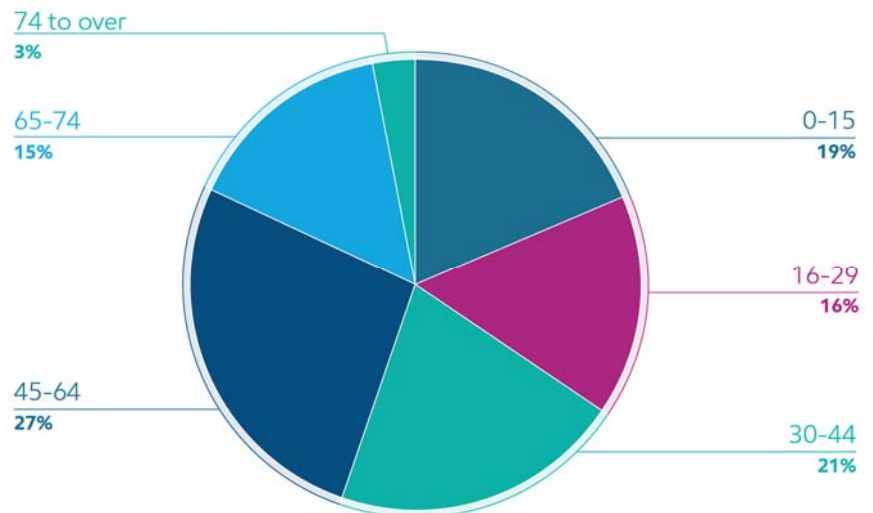
Breakdown  
 of age groups  
 (Census 2011, ONS)



**Illustration 1.3: Breakdown of age-groups within the population of Surrey (Census 2011, ONS)**

**SURREY**

Breakdown  
 of age groups  
 (Census 2011, ONS)



1.3.8 According to census statistics, the largest ethnic minority group within Hampshire is 'Indian' (21%), followed by 'White and Asian' (14%) and 'Chinese' (11%). The largest ethnic minority group within Surrey was also 'Indian' (24%). However, it was followed by 'Pakistani' (13%) and 'White and Asian' and 'Chinese' ethnic groups on 11% (ONS, 2011).



### Indices of Multiple Deprivation

- 1.3.9 The Index of Multiple Deprivation (IMD) is a UK government qualitative study of deprived areas within Local Authority jurisdictions in England (Department for Communities and Local Government, 2016). The approach is based on the concept of measuring distinct dimensions of deprivation separately and then combining these to give an overall score/position in relation to all other local authority areas in England.
- 1.3.10 Seven distinct domains of deprivation are comprised within the latest IMD made up of 38 separate indicators. These domains are:
- income deprivation;
  - employment deprivation;
  - education, skills and training deprivation;
  - health deprivation and disability;
  - crime;
  - barriers to housing and services; and
  - living environment deprivation.
- 1.3.11 Based on data outlined in IMD 2015, Hampshire and Surrey are considered within the 20% least health deprived counties in England, with less than 1% of the Lower Super Output Areas in each county being captured in the 10% most health deprived category.
- 1.3.12 Furthermore, in the IMD 2015, both Hampshire and Surrey were ranked amongst the 10% least deprived Upper Tier Authority areas in England (Department for Communities and Local Government, 2016).

### General Health

- 1.3.13 Overall, the counties of both Hampshire and Surrey are amongst the healthiest local authority areas in England. Both counties were ranked among the top 15 healthiest local authority areas of all local authority areas in the country during the period between 2014 and 2016 (Hampshire was ranked 15<sup>th</sup>, while Surrey was 13<sup>th</sup>) (Department for Communities and Local Government, 2016).
- 1.3.14 As outlined in Table 1.4 below, the vast majority of people within both Hampshire and Surrey considered themselves to be in either 'Very good health' or 'Good health', while a considerably low portion of the population consider themselves to be in 'fair', 'bad' or 'very bad' health.

**Table 1.4: Health Categorisation within Hampshire and Surrey (Census 2011, ONS)**

| Health Categorisation | Hampshire | % of Population | Surrey  | % of Population |
|-----------------------|-----------|-----------------|---------|-----------------|
| 'Very good health'    | 646,983   | 49              | 593,689 | 51              |
| 'Good health'         | 460,937   | 35              | 380,019 | 34              |
| 'Fair health'         | 156,806   | 12              | 119,554 | 11              |



| Health Categorisation | Hampshire | % of Population | Surrey    | % of Population |
|-----------------------|-----------|-----------------|-----------|-----------------|
| 'Bad health'          | 41,411    | 3               | 30,599    | 3               |
| 'Very bad health'     | 11,651    | 1               | 8,529     | 1               |
| Total population      | 1,317,788 | 100             | 1,132,390 | 100             |

- 1.3.15 As shown by these health statistics and informed further by Public Health England, both Hampshire and Surrey possess very active populations, with 78% of their respective 'adult' populations considered to be 'active' in terms of undertaking physical activity every week. Having said this, approximately only 15% of this cohort in either county undertake physical exercise/activities for 30-150 minutes each week. The majority of such exercise/activities are undertaken within indoor environments as approximately only 20% of such people utilise outdoor space to undertake such physical activity (Public Health England, 2018).
- 1.3.16 Life expectancy rates in both Hampshire and Surrey are similar. Men and women are expected to live for 81.1 and 84.3 years respectively in Hampshire, and 81.7 and 84.6 years respectively in Surrey. These rates are higher than the national average of 79.5 years for men and 83.1 years for women and also the regional average of 80.5 years and 84.0 years for men and women respectively (ONS, 2014).
- 1.3.17 In Hampshire, life expectancy is 6.5 years lower for men and 4.9 years lower for women in the most deprived areas than those in the least deprived areas. In Surrey, life expectancy is 5.9 years lower for men and 4.8 years lower for women in the most deprived areas compared to the least deprived areas.
- 1.3.18 According to Nomis, in 2018 there were 21,800 persons in Hampshire and 19,700 in Surrey that were 'Long-term Sick' and economically inactive, accounting for approximately 17% and 14% of the population respectively (Nomis, 2018).
- 1.3.19 The main causes of death in Hampshire are cancer, cardiovascular disease and respiratory disease (Public Health England, 2018). Surrey also reports similar medical conditions as the main causes of death within the county. However, Surrey also cites mental and behavioural disorders as another main contributor to mortality rates (Surrey County Council, 2015).

### **Mental Health and Well-being**

- 1.3.20 According to the Joint Strategic Needs Assessment, one in four adults in Hampshire will experience mental ill-health at some stage in their lifetime. Evidence shows that people with mental ill-health are twice as likely to have serious physical illnesses (Hampshire County Council, 2017).
- 1.3.21 Further to this, a recent survey found that 10.4% of the population of Hampshire reported having experienced anxiety or depression, while approximately 10,339 people were registered as having a serious mental illness at the time the survey was undertaken (Hampshire County Council, 2017).
- 1.3.22 In Surrey, since 2000, approximately one in four adults have been diagnosed with mental ill-health, mirroring that of Hampshire. Between January and March 2016, anxiety was the main reason for referrals to the county's mental health services





(38%). However, overall statistics for such mental ill-health concerns are consistent with the national average (England) (Surrey County Council, 2015).

- 1.3.23 Issues of mental ill-health and well-being can be related to the socio-economic environment in which the community finds itself. Further information on the socio-economic context of the study area is provided in Chapter 13 People and Communities.

## 1.4 Design and Good Practice Measures

- 1.4.1 Chapter 4 Design Evolution provides a summary of the environmental considerations that have influenced the design through this process, with iterative updates and improvements to reach the fixed design submitted for development consent. Such design measures form part of the project as assessed in Section 1.5.
- 1.4.2 All commitments are listed within the Register of Environmental Actions and Commitments (REAC), which is included within Chapter 16 Environmental Management and Mitigation. Commitments include embedded design measures, good practice measures and mitigation required to reduce a significant effect.
- 1.4.3 This appendix contains a number of project commitments to reduce impacts on the environment. These are indicated by a reference number like this (G20). Good practice measures are set out in the REAC and secured through Development Consent Order (DCO) requirements such as the Code of Construction Practice (CoCP) in Appendix 16.1 and will be delivered and secured through DCO requirements.

## 1.5 Potential Impacts

- 1.5.1 This section reports the anticipated potential impacts on human health. Where the ES chapters inputting to the health assessment have identified mitigation, this has been assumed to be in place before assessing the health effects to avoid duplication of effects. This differs from the approach taken in respect to other environmental assessments within this ES, where potential environmental impacts are reported prior to implementing mitigation. This change in reporting position is due to potential effects on human health being informed by the residual position of environmental effects as the significance of potential effects on human health can only be determined once all relevant mitigation has been taken into account.

### Construction

- 1.5.2 The scope of this assessment has been developed in line with the content of the Scoping Report (Esso, 2018) and the detail of the Planning Inspectorate's (2018) Scoping Opinion.
- 1.5.3 Potential effects on human health are considered with respect to the detailed information presented and outlined in Chapter 3 Project Description, while being informed by the findings of other relevant environmental technical assessments.



### Effects of Air Pollution

- 1.5.4 The term 'air pollution' in this appendix refers to poor air quality that could potentially affect health, such as emissions of air pollutants from car exhausts and other sources, such as generators. It also refers to dust, which could affect health as well.
- 1.5.5 The link between air quality and human health effects is well recognised. Poor air quality is known to contribute to health problems such as heart and lung disease over the long term.
- 1.5.6 Construction activities, including construction traffic to and from site, associated with the project have the potential to generate air pollution, particularly fugitive dust and other pollutants from exhaust emissions such as PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>2</sub>. These activities could theoretically give rise to the risk of human health impacts due to the increase in the creation and subsequent exposure to such air pollution during the construction phase of the project.
- 1.5.7 As the project is to be constructed through built up areas in part, there would be sensitive receptors (i.e. residential, commercial and community receptors) reasonably close to the construction activities that could be exposed to air pollution effects during construction.
- 1.5.8 Having said this, and as outlined within Chapter 3 Project Description, construction activities are expected to be largely short term and within a defined area (i.e. the Order Limits), thereby limiting the period of time and extent that communities or sensitive receptors could be exposed to possible effects from air pollution.
- 1.5.9 As outlined within Appendix 13.2 Air Quality Technical Note, no significant residual adverse effects are anticipated in respect of air quality/pollution during the construction phase of the project after the implementation of good practice measures. As such, it is concluded that there are unlikely to be significant effects on human health from air pollution.

### Effects of Noise and Vibration

- 1.5.10 The WHO has highlighted that '*environmental noise is a threat to public health, having negative impacts on human health and well-being*' (WHO, 2009). Noise and vibration caused by traffic and construction activities are also considered detrimental to human health as they can cause annoyance, sleep disturbance and even increased blood pressure or wider cardiovascular diseases over the long term.
- 1.5.11 In addition, noise can have negative effects on mental health. Whilst exposure to noise cannot be considered the sole cause for serious mental health problems, people with underlying mental health problems are more likely to be sensitive to noise impacts than others.
- 1.5.12 There is also an established link between vibration and health. The reaction of the human body to vibration can include general annoyance and discomfort as well as sleep disturbance. Vibrations can also facilitate the perception of noise and make it difficult to ignore. Occupants of buildings where there is perceptible vibration may



have additional concerns of structural damage or a reduction in property value which may induce stress related human health issues.

- 1.5.13 The potential for human health to be affected by significant adverse noise and vibration effects during construction mainly relates to construction activity and vehicle movements along roadways (specifically those with low baseline traffic flows, namely rural routes) near the Order Limits and also from activity within the Order Limits itself.
- 1.5.14 The assessment of potential effects of noise and vibration has been undertaken and is presented in Appendix 13.3 Noise and Vibration Technical Note. The findings of the assessment are that temporary and short term significant residual adverse effects could occur in a limited number of isolated areas along the route of the project.
- 1.5.15 The contractor(s) will be required to produce a Noise and Vibration Management Plan and to submit this as part of the Construction Environment Management Plan (CEMP), for the approval the relevant planning authority. The Noise and Vibration Management Plan will set out detailed measures to reduce noise and vibration during installation.
- 1.5.16 Adverse noise effects give rise to the possibility of effects on human health. However, given the short duration of works in each location, the conclusion is reached that there would not be significant effects on human health.

#### Effects of Land and Groundwater Contamination

- 1.5.17 Human health can be affected from interaction with contaminated materials or sources, particularly on land but also within water bodies. Such interaction could potentially occur during activities that disturb land or water bodies during the construction phase of projects.
- 1.5.18 As outlined in Chapter 11 Soils and Geology, the Order Limits of the project are situated within or near a number of sources of potentially contaminated land, particularly a number of landfill sites. As such, the potential exists for contaminated waste, soils, gas/vapour and shallow groundwater to be exposed during construction, which may pose risks, especially in relation to human health, to construction workers and off-site users if not managed in an appropriate manner.
- 1.5.19 Furthermore, the installation of the pipeline could create a new pathway for the migration of leachate and contaminated groundwater, where trenches and trenchless crossings are constructed through or adjacent to potentially contaminated materials and sites (e.g. landfills). Contaminants could migrate vertically into underlying aquifers, if an impermeable confining layer is breached, and/or they could migrate along the trench and discharge into sensitive surface water receptors.
- 1.5.20 While there is the theoretical potential for such effects to occur, the good practice measures set out in the REAC would reduce the identified risks or potential effects on human health to a level that is considered not significant. As such, there is not



anticipated to be any potential for significant effects on human health as a result of land or groundwater contamination during construction of the project.

#### Effects of Flooding

- 1.5.21 According to WHO, '*floods are the most common natural disaster causing loss of life and economic damage*' (WHO, 2003). Further to this, they state that adverse human health consequences of flooding are complex, far-reaching and often difficult to attribute directly to the flood event itself.
- 1.5.22 The main impacts on human health are deaths, injuries and mental health illnesses (including stress) during the flood event itself, during the restoration process and/or from knock-on effects that are brought on by damage to major infrastructure such as transport and water supply services.
- 1.5.23 As outlined in Chapter 8 Water, there is potential for significant effects of flooding from activities associated with the construction phase of the project, such as:
- reducing floodplain storage due to storage of materials;
  - temporary obstacles redirecting fluvial and surface water flow paths;
  - conveyance of flood water along open excavations;
  - interception and redirection of groundwater flows
  - changes in flood risk to the Order Limits and neighbouring property as a consequence of installing new (temporary) crossings of watercourses; and
  - changes in flood risk to the Order Limits and neighbouring property as a result of changes in runoff movement through introduction of pre-construction and construction phase site drainage;
- 1.5.24 Following the implementation of the good practice measures within the REAC and as outlined in Chapter 8 Water, such potential effects are not expected to be significant. Furthermore, given the nature and duration of the works required to construct the project, as well as the relatively limited area of land subject to such construction activities at any one time, flooding attributable to the project is not likely to have a significant effect on human health.

#### Effects of Changes to Landscape and Visual Amenity

- 1.5.25 Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how it is experienced. This may impact the perceived value accredited to such a landscape. Visual effects relate to the changes that arise in the composition of available views as a result of the project.
- 1.5.26 There is limited evidence explicitly linking landscape and views with improvements in health and well-being, although this is likely to change now that public policy is giving more weight to the importance of green infrastructure (Landscape Institute, 2015). The Barton and Grant's Settlement Health Map (Illustration 1.1) demonstrates how health and well-being is influenced by the character and quality of the places in which people live and work.



- 1.5.27 Loss of pasture fields, woodland and hedgerows, reductions and alterations in field size and/or an increase in the perception of movement in the landscape may change the public's perception of the local environment, resulting in reduced use of green space for physical activity and stress relief.
- 1.5.28 Chapter 10 Landscape and Visual reports that landscape character areas and areas within the South Downs National Park are likely to be significantly impacted by construction. Similarly, viewpoints at isolated locations along the route of the project are also anticipated to be significantly impacted during construction. Design measures and the good practice measures set out in the REAC, such as the commitment to only utilise a 10m width when crossing through boundaries between fields where these include hedgerows, trees or watercourses (O1), are expected to limit the magnitude of change of such impacts. However, significant effects would remain in the short term.
- 1.5.29 In the long term, reinstatement planting is anticipated to become established which would reduce almost all significant landscape and visual effects to a level that is not significant (significant effects are still anticipated in respect to some Tree Preservation Order trees).
- 1.5.30 While significant landscape and visual effects are anticipated in the short term, their impact on the perception of the area, and human health thereafter, is likely to be limited and temporary in duration due to the temporary and mobile nature of construction of the project. This is due to the significant effects being very localised in their occurrence and not widespread across the landscape, therefore not altering the existing environment to a degree that would seriously impact human health.

#### Effects of Community Disruption, Including Issues of Access and Severance

- 1.5.31 Major construction works can disrupt social networks, which can prevent or reduce community interaction and/or change people's perception of an area. Such disruption could impact human health by leading to increases in physical and mental health issues, such as heart disease, strokes and other stress related issues.
- 1.5.32 As outlined in Chapter 3 Project Description, the main method of construction is open cut, be it in flat, open landscape or in urban areas. Issues of community disruption, including issues of access and severance, are only expected within urban areas, where the average rate of pipeline installation (using the street working construction methodology) is approximately 90m per week. At this rate of work, a 1km stretch of pipeline would be installed in 11 weeks.
- 1.5.33 An assessment of potential effects of community disruption, including issues of access and severance, has been undertaken in Chapter 13 People and Communities. The assessment determined no significant adverse residual effects are expected for community disruption. Therefore, significant adverse effects on human health are not anticipated.
- 1.5.34 Given that no significant adverse residual effects are anticipated during construction in respect to community disruption, including issues of access and severance, there is also no potential for significant adverse effects on community cohesion.



### Effects Related to Traffic and Transport, Including Physical Injury from Accidents

- 1.5.35 Changes to the transport network can result in changes in traffic speeds and driver behaviours, as well as increased or decreased congestion. These changes can result in increased collisions which can cause serious physical injury and fatalities.
- 1.5.36 An assessment of potential collision impacts was provided within Appendix 13.4 Traffic and Transport Technical Note. The assessment considered the change in the number of collisions before and after the project would be in place, with the increase in collisions determining the level of safety on each route. No residual impacts from the collision and safety assessment were identified and therefore no significant adverse effects on human health are anticipated.

### Major Accidents

- 1.5.37 Human health could be impacted by the occurrence of a major accident or disaster, which in the context of this project is considered to be an undesirable extreme event resulting in damage or harm, such as a major pollution incident, or an extreme natural occurrence, such as a major flood event or earthquake.
- 1.5.38 An assessment of potential effects related to major accidents and disasters has been undertaken and is presented in Chapter 14 Major Accidents. This assessment concluded that the majority of major accident sources or natural disasters have very limited potential to affect the project, and no risk to human health was anticipated.
- 1.5.39 As such, there is not anticipated to be any potential for significant adverse effects on human health as a result of a major accident or event that is directly attributable to the project.

### Construction – Summary

- 1.5.40 There is a public perception that large infrastructure projects can bring about large-scale and widespread disruption and change to the areas in which they are situated. This perception of large-scale disruption and change can lead to members of the public experiencing induced stress, anxiety and sometimes even fear (i.e. fear of accidents or injuries, public safety or of disruption more generally) in respect to the nature, scale and duration of construction activities and processes associated with infrastructure projects, and the impact they might have on their livelihoods.
- 1.5.41 Perceptions of large-scale and widespread disruption and change are greater depending on the scale of urbanisation in an area. This is due to the increased opportunity for interaction between the project and local communities.
- 1.5.42 As outlined above and summarised in Table 1.5, no significant adverse physical or mental health effects are expected during the construction of the project given the scale and duration of construction (as set out in Chapter 3 Project Description) and the mitigation measures proposed for potentially significant environmental effects.
- 1.5.43 Furthermore, the cumulative effect of a number of different types of non-significant environmental effects is also unlikely to have a significant effect on human health,



particularly given the relatively small scale and short duration of construction activities in any one location.

**Table 1.5: Summary of Potential Effects on Human Health during the Construction of the Project**

| Matter  | Potential Effects   | Location in ES                                   | Residual Effect from Chapter                      | Residual Effect on Health  |
|---|---|--|---|--|
| Effects of air pollution  | Potential effects on human health from air pollution (air pollutant emissions as well as dust) associated with construction activities.     | Appendix 13.2 Air Quality Technical Note         | No significant adverse residual effects expected. | No potential for significant adverse effects on human health.  |
| Effects of noise and vibration  | Potential effects on human health from noise and vibration impacts during construction (mainly from construction processes and activities). | Appendix 13.3 Noise and Vibration Technical Note | No significant adverse residual effects expected. | No potential for significant adverse effects on human health.  |
| Effects of land and groundwater contamination                             | Potential effects on human health from interaction with contaminated materials or sources during construction.                              | Chapter 11 Soils and Geology                     | No significant adverse residual effects expected. | No potential for significant adverse effects on human health.  |
| Effects of flooding   | Potential effects on human health from flooding (predominantly changes in flood risk as a result of the project).                           | Chapter 8 Water                                  | No significant adverse residual effects expected. | No potential for significant adverse effects on human health.  |
| Effects of changes to landscape and visual amenity                        | Potential effects on human health from changes in landscape and visual amenity.   | Chapter 10 Landscape and Visual                  | Significant adverse residual effects anticipated. | Given the scale and nature of construction as well as the resultant potential effects (before replacement planting takes effect) being largely localised, the landscape and visual effects (i.e. disruption to green space and nature) of the construction phase of the project are not expected to have a significant effect on human health. |
| Effects of community disruption, including issues of access and severance | Potential effects on human health from disruption, including issues of access and severance, to community/populated areas.                  | Chapter 13 People and Communities                | No significant adverse residual effects expected. | No potential for significant adverse effects on human health.  |



| Matter   | Potential Effects  | Location in ES                                     | Residual Effect from Chapter                      | Residual Effect on Health                                     |
|--|--|--|---|---|
| Effects related to traffic and transport, including physical injury from accidents | Potential effects on human health from traffic and transport related effects, including physical injury from accidents.                              | Appendix 13.1 Traffic and Transport Technical Note | No significant adverse residual effects expected. | No potential for significant adverse effects on human health. |
| Effects related to major accidents and disasters                                   | Potential effects on human health from adverse effects associated with a major accident or event attributable to the project during its construction | Chapter 14 Major Accidents                         | No significant adverse residual effects expected. | No potential for significant adverse effects on human health. |

### Operation

- 1.5.44 Given the nature of the project (i.e. a controlled aviation fuel pipeline situated underground), no significant adverse residual environmental effects are expected during operation. As such, there is no potential for any consequent adverse effects on human health.
- 1.5.45 Moreover, there is not likely to be an adverse perception of the operation of the project given the absence of anticipated significant adverse residual effects.

### Major Accidents

- 1.5.46 The assessment of major accidents in Chapter 14 Major Accidents indicates that the majority of major accident sources or natural disasters have very limited potential to affect the project.
- 1.5.47 The design of the project has sought to avoid or minimise the risk of an accident occurring as a consequence of the project. The project is also designed to minimise the potential for an external source to affect the integrity of the project. The pipeline would be buried for its entire length, and above ground installations have been carefully located and designed to provide reliable structural integrity and safety in operation.
- 1.5.48 If the pipeline were to be damaged whilst operational, the volume of fuel release would be limited, even in the worst case scenario of a complete break, due to the inclusion of in-line valves which would shut down the pipeline to limit fuel loss. Aviation fuel is non-toxic, degrades/breaks down in the environment and would not form an explosive atmosphere under UK ambient conditions. Additionally, historical data supports the conclusion that aviation fuel does not present a risk of major accident to population and human health.





- 1.5.49 As such, there is not anticipated to be any potential for significant adverse effects on human health as a result of the occurrence of a major accident or event that is directly attributable to the project.

## 1.6 Mitigation

- 1.6.1 As there are no significant adverse effects reported in respect to impacts on human health as a result of the construction or operation of the project, mitigation is not required.

## 1.7 Residual Impacts (With Mitigation)

- 1.7.1 No potential impacts are considered significant in respect to human health during the construction or operation of the project. Therefore, no residual significant impacts are reported.

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