

Appendix 16A

Evidence supporting the assessment of Human Health effects

Types of data and evidence

16.1.1 Data sources relating to Human Health are presented in the following ES chapters:

- **Chapter 6: Traffic and Transport;**
- **Chapter 7: Noise and Vibration;**
- **Chapter 8: Air Quality;**
- **Chapter 9: Landscape and Visual;**
- **Chapter 15: Socio-Economics; and**
- **Chapter 17: Carbon and Other Greenhouse Gas Emissions.**

16.1.2 The Human Health chapter is also informed by the following evidence sources, relevant data for which is summarised in the sections below:

- Scientific literature: An evidence base of publicly available information has been used to support the scoping and assessment conclusions of this chapter. Evidence statements have been extracted from a review of abstracts and full articles focusing on those published in English on PubMed from the past five years. The review is not exhaustive and aims to provide a summary only of the key issues relevant to the scope of this chapter;
- Baseline conditions: Office of National Statistics and Nomis official labour market statistics¹ have informed the baseline. Whilst more recent statistics have been collected for some socio-economic variables, the 2011 census is considered an appropriate baseline for use in this report as it provides consistent comparative data across the population groups used in the assessment. Health Profiles², Health Assets Profiles³ from Public Health England (PHE) and Wider Determinants of Health⁴ from PHE have also informed the local, regional and national baseline for this Health Impact Assessment (HIA). The Index of Multiple Deprivation 2015 has been consulted and referenced as appropriate, including sub-domains⁵;

¹ Office of National Statistics and Nomis official labour market statistics, [online]. Available at: <https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?theme=75> [Checked 20/10/2018].

² Public Health England Health Profiles 2018. District and County level, [online]. Available at: <http://fingertips.phe.org.uk/profile/health-profiles> [Checked 20/10/2018].

³ Public Health England Health Assets Profiles. County level, [online]. Available at: <https://fingertips.phe.org.uk/profile/comm-assets> [Checked 20/10/2018].

⁴ Public Health England Wider Determinants of Health Profiles. District level, [online]. Available at: <https://fingertips.phe.org.uk/profile/wider-determinants> [Checked 20/10/2018].

⁵ English indices of deprivation 2015. File 10: local authority district summaries, [online]. Available at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015> [Checked 20/10/2018].

- Health priorities: Health priorities from the North Somerset health and wellbeing strategies^{6,7} and North Somerset Joint Strategic Needs Assessment⁸ have informed the determination of significance. These publications by the North Somerset People and Communities Board bring together a range of partners from across public and voluntary services who are working together to reduce inequalities and improve the safety, health and wellbeing of local residents;
- Consultation responses: Consultation is a key driver of the Environmental Impact Assessment (EIA) process and is ongoing throughout the lifecycle of the project, from the initial stages through to consent and post-consent. To date, consultation regarding Human Health has been conducted through the Scoping Report. Consultation responses relating to Human Health are summarised in **Table 16.2** Reference source not found.;
- Regulatory standards: Where national statutory limit values or other regulatory standards are prescribed these are set out. Such levels are a good measure of benchmark of acceptability for the United Kingdom (UK) context (which may differ from the international context); and
- Policy context: Where national or local government sets out a published position statement on an issue this is noted and taken into account in the determination of significance.

16.1.3 The review of evidence sources has been structured using the following seven topic areas that cut across the scope of construction and operational effects of the Proposed Development:

- Air quality;
- Noise and vibration;
- Travel;
- Community identity;
- Economic effects;
- Health services; and
- Climate change.

16.1.4 The evidence presented in this section has been used to inform the professional judgements on sensitivity, magnitude and significance set out in **Section 16.11**

Air quality

Scientific literature

16.1.5 Air pollution is a heterogeneous and a complex mixture of dust, particulate matter (PM), fumes, gases, carbon monoxide, nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃). Environmental air pollution is associated with increased risk of cardiovascular diseases⁹ and with moderate or severe asthma exacerbation.¹⁰ Environmental pollution exerts its detrimental effects on

⁶ North Somerset Partnership. People and Communities Strategy 2017-2020, [online]. Available at: <http://www.northsomersetpartnership.org.uk/whoweare/people+and+communities+board/healthandwellbeing/index1.asp> [Checked 20/10/2018].

⁷ North Somerset Partnership. Sustainable Community Strategy. 2008 – 2026, [online]. Available at: <http://www.northsomersetpartnership.org.uk/whatwedo/sustainablecommunitystrategy/index1.asp> [Checked 20/10/2018].

⁸ North Somerset Council Joint Strategic Needs Assessment, [online]. Available at: <https://www.n-somerset.gov.uk/my-council/statistics-data/jsna/joint-strategic-needs-assessment/> [Checked 20/10/2018].

⁹ Meo, S.A. and Suraya, F. (2015). Effect of environmental air pollution on cardiovascular diseases. *Eur Rev Med Pharmacol Sci*, 19, 4890-7.

¹⁰ Orellano, P., Quaranta, N., Reynoso, J., Balbi, B. and Vasquez, J. (2017). Effect of outdoor air pollution on asthma exacerbations in children and adults: Systematic review and multilevel meta-analysis. *PLoS One*, 12, e0174050.

the heart by developing pulmonary inflammation, systemic inflammation, oxidative stress, endothelial dysfunction and prothrombotic changes.⁹

- 16.1.6 The main anthropogenic sources of PM are traffic and transportation, and combustion processes. NO₂ and carbon monoxide (CO) are principally emitted from fossil fuel combustion in urban environments. O₃ is a secondary pollutant formed by photochemical reactions between sunlight and pollutant precursors, such as nitrogen oxides (NO_x) and volatile organic compounds.¹⁰
- 16.1.7 Increased pollution exposures have been associated with increased numbers of hospital admissions and emergency-room visits, mainly due to exacerbations of chronic obstructive pulmonary disease and asthma.¹⁰
- 16.1.8 In the atmosphere, different PM sizes can be found. The coarse fraction (PM₁₀–PM_{2.5}) can penetrate into the upper airways, but the fine fraction (PM_{2.5}–PM₁) can be deposited in the lung, especially in the alveoli, and may pass to the systemic circulation. Besides the size of PM, the chemical composition is important to understand the health effects.¹⁰
- 16.1.9 The coarse fraction (PM₁₀–PM_{2.5}) is primarily produced by mechanical processes such as construction activities, road dust re-suspension and wind, whereas the fine fraction (PM_{2.5}–PM₁) originates primarily from combustion sources.¹¹
- 16.1.10 Purely mechanical processes such as quarrying can create fragments of rock small enough to become suspended in the atmosphere and the action of the wind can suspend particles of soil and dust from land surfaces into the atmosphere. Construction and demolition activity can therefore be a source of coarser particles.¹¹ This point is also made in relevant guidance documents, for example the Institute of Air Quality Management (IAQM) note that for quarries most of this suspended dust will be in the coarse sub-fraction (PM_{2.5-10}), rather than in the fine (PM_{2.5}) fraction.¹² Similar conclusions are drawn by the IAQM for construction activities, including reference to research suggesting that 85% to 90% by weight of the fugitive dust emissions of PM₁₀ from construction sites are PM_{2.5-10}, and 10% to 15% are in the PM_{2.5} fraction.¹³ It is noted that due to the common source of PM₁₀ and PM_{2.5} from mechanical processes, action to manage PM₁₀ would be expected to also reduce levels of PM_{2.5}. Typically, only PM₁₀ is therefore assessed in this context.
- 16.1.11 For both fine particulate matter (PM_{2.5}) and NO₂ there is no identifiable threshold below which there is no risk to health^{14,15}. Long term exposure to particulate matter is associated with incidence of coronary events, and this association persists at levels of exposure below the current European limit values.¹⁶ There is evidence of a long-term effect of NO₂ on mortality which is as great as that of PM_{2.5}. The effect of NO₂ appears to be independent of PM_{2.5}.¹⁷
- 16.1.12 In addition to dust originating locally, atmospheric aerosols (gaseous dispersion of either fine liquid droplets or fine solid particles) are emitted by other natural and anthropogenic sources. The main natural sources of atmospheric aerosols influencing air quality across Europe are African dust, sea

¹¹ World Health Organization (2006). Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Global update 2005. Summary of risk assessment 2006. WHO/SDE/PHE/OEH/06.02

¹² Institute of Air Quality Management (2016). *Guidance on the Assessment of Mineral Dust Impacts for Planning*. Institute of Air Quality Management, London.

¹³ Holman *et al.* (2014). *IAQM Guidance on the assessment of dust from demolition and construction*, Institute of Air Quality Management, London, [online]. Available at: www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf [Checked 20/11/2018].

¹⁴ World Health Organization Regional Office for Europe (2013). *Review of evidence on health aspects of air pollution - REVIHAAP project: final technical report*. Copenhagen, Denmark.

¹⁵ COMEAP (2011). *Review of the UK Air Quality Index*. Department of Health.

¹⁶ Cesaroni G. *et al.* (2014). Long term exposure to ambient air pollution and incidence of acute coronary events: prospective cohort study and meta-analysis in 11 European cohorts from the ESCAPE Project. *Bmj* 2014; 348: f7412.

¹⁷ Faustini A. *et al.* (2014). Nitrogen dioxide and mortality: review and meta-analysis of long-term studies. *The European respiratory journal* 2014; 44(3): 744-53.

spray and wildfires. Contributions from natural sources to mean annual PM₁₀ levels in 2008 and 2009 were 5µg/m³ in the UK.¹⁸

- 16.1.13 For completeness the following occupational exposures are noted for potential effects to the workforce, however occupational health and safety regimes would be expected to prevent these from being significant issues. In the context of community exposure concentrations, these effects would not be applicable.
- 16.1.14 In occupational settings (i.e. effects not applicable to community settings or community population groups) low exposure to mineral dust, and high exposure to gases or fumes are associated with an increased risk of chronic obstructive pulmonary disease. Both low and high exposure to biological dust and mineral dust are also associated with increased risk of chronic bronchitis.¹⁹
- 16.1.15 Crystalline silica is one of the commonest minerals on earth and a major ingredient in sand, granite, soil and glass. Crystalline silica is a common and serious occupational hazard to workers' health. Silica is associated with lung cancer, with the risk more pronounced at higher levels of exposure. Silica exposure is also associated with many other adverse health effects including silicosis, cardiovascular diseases, tuberculosis, malignancies, autoimmune diseases and renal disorders, and increased mortality, making it a high-priority public health concern.²⁰ Workers may be exposed to crystalline silica in a large variety of industries and occupations. Relevant activities involve: the movement of earth (e.g. mining, farming, construction, quarrying); disturbance of silica-containing products (e.g. demolition of masonry and concrete); and handling or use of sand- and other silica-containing products (e.g. foundry processes, abrasive blasting or production of glass, ceramics, abrasives, cement.). Findings demonstrate that in certain occupational settings crystalline silica in the form of quartz dust can cause cancer of the lung.²¹
- 16.1.16 Occupational exposure to poorly soluble low-toxicity dust particles (bio persistent granular dust, e.g. Portland cement) is associated with airway obstruction consistent with chronic obstructive pulmonary disease. (This finding is distinct from the known adverse effects of mineral dust exposure e.g. quartz dust and asbestos fibres).¹⁹

Baseline conditions

- 16.1.17 Construction air quality effects are expected at the site-specific level, operational air quality effects may also extend to the local level (see paragraph 16.5.2 for how representative populations for these areas are defined). Baseline data is discussed accordingly, including reference to indicators and comparators as appropriate.
- 16.1.18 The health baseline relevant to this topic from **Appendix 16B** in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18**, can be summarised as follows:
- 16.1.19 Data from 2016 at the local level indicates a baseline annual mean concentration of human-made fine particulate matter (PM_{2.5}) of 7.7µg/m³ in North Somerset (compared to an annual mean of 9.3µg/m³ in England). In comparison to target thresholds these baselines are well below the UK Air Quality Objectives (AQO) threshold of 25µg/m³, but close to the World Health Organisation (WHO) guide value of 10µg/m³.

¹⁸ Viana M, Pey J, Querol X, Alastuey A, de LF, Lukewille A. (2013). Natural sources of atmospheric aerosols influencing air quality across Europe. *SciTotal Environ* 2013; 472: 825-33. 10.1016/j.scitotenv.2013.11.140.

¹⁹ Bruske I, et al. (2013). Biopersistent granular dust and chronic obstructive pulmonary disease: a systematic review and meta-analysis. *PLoS One* 2013; 8(11): e80977.

²⁰ Poinen-Rughooputh S. et al. (2016). Occupational exposure to silica dust and risk of lung cancer: an updated meta-analysis of epidemiological studies. *BMC Public Health* 2016; 16(1): 1137.

²¹ International Agency for Research on Cancer (2012). Silica dust, crystalline, in the form of quartz or cristobalite. *Arsenic, metals, fibres and dusts*; 2012: 355-406.

16.1.20 People who spend extended periods at home may experience greater air pollutant exposure durations than those who are absent during normal working hours.

- In North Somerset 013D Lower Layer Super Output Area (LSOA) (representative of the majority of the community likely to experience effects during construction, including the closest dwellings to the north of the Proposed Development), 30% of households have no adults in employment (compared to an average of 34% for England and Wales); 25% of households include dependent children (compared to an average of 29% for England and Wales); and 22% of households include a person with a long-term health problem or disability (compared to an average of 26% for England and Wales). These proportions are all below average for England and Wales suggesting a lower than average proportion of people who are likely to be particularly sensitive. However, in North Somerset 013D LSOA, approximately 24% of people report working mainly at or from home (compared to an average of 10% for England and Wales) and 20% report being retired (compared to 14% for England and Wales) suggesting a higher than average proportion of people who are likely to be more sensitive to extended periods of exposure for these reasons; and
- In North Somerset 013B LSOA (representative of a more deprived minority of the community that are likely to experience effects, including to the east of the airport), 30% of households have no adults in employment (compared to an average of 34% for England and Wales); 28% of households include dependent children (compared to an average of 29% for England and Wales); and 23% of households include a person with a long-term health problem or disability (compared to an average of 26% for England and Wales). These proportions are all also below the national averages. In North Somerset 013B LSOA, approximately 18% of people report working mainly at or from home (compared to an average of 10% for England and Wales) and 17% report being retired (compared to 14% for England and Wales). Similar sensitivity trends to North Somerset 013D LSOA are therefore likely to apply in relation to people who spend extended periods at home.

16.1.21 Deprivation can increase sensitivity to change:

- For overall deprivation, North Somerset 013D LSOA is ranked 23,619 out of 32,844 LSOAs in England; where one is the most deprived LSOA. This is amongst the 70% to 80% least deprived neighbourhoods in the country; and
- For overall deprivation, North Somerset 013B LSOA is ranked 20,391 out of 32,844 LSOAs in England; where one is the most deprived LSOA. This is amongst the 60% to 70% least deprived neighbourhoods in the country.

Health priorities

16.1.22 North Somerset Partnership, People and Communities Strategy 2017-2020²²: Enabling the best start in life – enabling children and young people to thrive and develop skills to lead healthy lives and achieve their full potential. Children who thrive in the early years are more likely to develop positive relationships and better emotional and physical health throughout their lives.

16.1.23 North Somerset Partnership, People and Communities Strategy 2017-2020²²: Enabling communities to thrive – Enabling people to live safe, healthy and independent lives. Increasing community resilience. North Somerset's population is expected to grow faster than the national or regional average with more elderly people and children than at present. Aims include: communities have greater influence over how their physical and social environment develops.

²² North Somerset Partnership. People and Communities Strategy 2017-2020, [online]. Available at: <http://www.northsomersetpartnership.org.uk/whoware/people+and+communities+board/healthandwellbeing/index1.asp> [Checked 20/10/2018].

- 16.1.24 Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group health priorities²³: Improving the care that people receive for conditions such as Chronic Obstructive Pulmonary Disease (COPD), ensuring there is access for all and improve the breadth and depth of pulmonary rehabilitation. Managing preventable risk factors to reduce the number strokes in our area, improving urgent care services and providing support close to home for people living with the effects of stroke.
- 16.1.25 North Somerset Partnership Sustainable Community Strategy²⁴, Living within environmental limits: Aims include enhanced local environmental quality in both new and existing developments.

Consultation responses

- 16.1.26 See **Table 16.2** No specific issues raised for this topic.

Regulatory standards

- 16.1.27 The assessment is based on UK statutory standards for air quality^{25,26}, but has also been informed by WHO targets²⁷. WHO guide values can be local aspirational targets, but there is no legislative requirement to meet them as they are not part of UK air quality policy or legislation.
- 16.1.28 Part III of the *Environmental Protection Act 1990*²⁸ regulates control of emissions (including dust) that may be prejudicial to health or a nuisance.
- 16.1.29 The *Control of Substances Hazardous to Health Regulations 2002* (COSHH)²⁹ creates obligations on employers for control of hazardous substances in the workplace, including the effects of dust. The duty extends as far as is reasonably practicable, to any other person, whether at work or not, who may be affected by the work carried out by the employer. Dust can become a substance hazardous to health under COSHH due to toxicity or when it is present at concentrations in the air equal to or greater than 10mg/m³ (as a time-weighted average over an eight-hour period) of inhalable dust; or 4mg/m³ (as a time-weighted average over an eight-hour period) of respirable dust.
- 16.1.30 IAQM guidance on construction dust impacts notes that the most common impacts are dust soiling and increased ambient PM₁₀ concentrations due to dust arising from activities on the site. Dust soiling would arise from the deposition of PM in all size fractions but would be associated mostly with particulate matter greater than 10µm.³⁰
- 16.1.31 The amount of dust that might cause complaint or nuisance in a particular circumstance is very difficult to determine and there are no statutory limits such as those applicable to suspended particulates or gaseous pollutants. The literature is unclear on the origin of studies that have been used by industry and environmental assessments as a basis for determining the likelihood of dust deposition nuisance. The Quality of Urban Air Review Group³¹ is perhaps the most authoritative

²³ Health priorities for the local population. Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group. Health priorities for the local population, [online]. Available at: <https://bnssgccg.nhs.uk/about-us/what-we-do/our-priorities/health-priorities-local-population/> [Checked 20/10/2018].

²⁴ North Somerset Partnership. Sustainable Community Strategy. 2008 – 2026, [online]. Available at: <http://www.northsomersetpartnership.org.uk/whatwedo/sustainablecommunitystrategy/index1.asp> [Checked 20/10/2018].

²⁵ HM Government of Great Britain & Northern Ireland (2010). The Air Quality Standards Regulations. London.

²⁶ HM Government of Great Britain & Northern Ireland (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

²⁷ World Health Organization Regional Office for Europe (2006). Air quality guidelines. Global update 2005. Particulate matter, ozone, nitrogen dioxide and sulfur dioxide.

²⁸ HM Government of Great Britain & Northern Ireland, 1990. Environmental Protection Act. [Checked 20/10/2018].

²⁹ HM Government of Great Britain & Northern Ireland. The Control of Substances Hazardous to Health Regulations 2002.

³⁰ Institute of Air Quality Management (2011). Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance.

³¹ Quality of Urban Air Research Group (1996). *Airborne Particulate Matter in the United Kingdom: Third Report of the Quality of Urban Air Review Group*. Birmingham: Prepared at the request of the Department of the Environment by the University of Birmingham 1996.

source. The report notes that reference is frequently made to an annual deposition rate of 200mg/m²/day, although the basis of this figure has never been adequately traced. This value is said to represent the threshold for serious nuisance. The report references Bate and Coppin³² who note the unreliability of the 200mg/m²/day criterion and that the literature contains a range of criteria from 133 to 350mg/m²/day. Given this uncertainty, Bate and Coppin suggest it may be more appropriate to set a criterion for nuisance of two to three times the existing background deposition rate. The Quality of Urban Air Review Group report notes the limitation of this approach is that there is no reliable published database of existing deposition rates to act as a baseline³². Bate and Coppin also state that as the nature of dust plays an important role in determining its nuisance impact, for example for coal dust a deposition rate of 80mg/m²/day (rather than 200mg/m²/day) is likely to give rise to complaints.

- 16.1.32 The uncertainty in the literature underpinning the thresholds commonly applied to determine dust nuisance suggests the need for caution. In addition to quantified deposition measures, consideration of background dust levels, the nature of the dust (e.g. colour or staining properties) and the duration of effect (daily and weekly as well as annual deposition rates) may all be important.

Policy context

- 16.1.33 *North Somerset Council Core Strategy*³³, Policy CS3: Development that, on its own or cumulatively, would result in air, water or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other control regimes, or by measures included in the proposals, by the imposition of planning conditions or through a planning obligation.
- 16.1.34 *North Somerset Council Core Strategy*³³, Policy CS23: Proposals for the development of Bristol Airport will be required to demonstrate the satisfactory resolution of environmental issues, including the impact of growth on surrounding communities and surface access infrastructure.

Noise and vibration

Scientific literature

- 16.1.35 Noise is pervasive in everyday life and can cause both auditory and non-auditory health effects. Although people tend to habituate to noise exposure, degree of habituation differs for individuals and is rarely complete. If exposure to noise is chronic and exceeds certain levels, then negative health outcomes can be seen³⁴.
- 16.1.36 Transportation noise affects objectively measured sleep physiology and subjectively assessed sleep disturbance in adults (including sleep quality, problems falling asleep, and awakenings during the night). For other outcome measures and noise sources there is conflicting or only emerging evidence. The quality of the evidence is moderate for cortical awakenings and self-reported sleep disturbance (for questions that referred to noise) induced by traffic noise, low for motility measures of traffic noise induced sleep disturbance, and very low for all other noise sources and investigated sleep outcomes.³⁵

³² Bate K.J. and Coppin N.J. (1990). *Impact of dust from mineral workings*: Loughborough University 1990.

³³ North Somerset Council. Core Strategy. January 2017, [online]. Available at: <http://www.n-somerset.gov.uk/my-services/planning-building-control/planningpolicy/core-strategy/corestrategy/> [Checked 20/10/2018].

³⁴ Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S. and Stansfeld, S. (2014). Auditory and non-auditory effects of noise on health. *Lancet*, 383, 1325-1332.

³⁵ Basner, M., McGuire, S. (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. *Int. J. Environ. Res. Public Health* 2018, 15, 519; doi:10.3390/ijerph15030519.

- 16.1.37 Environmental noise (e.g. noise from road, rail, and air traffic, and industrial construction) has been linked to a range of non-auditory health effects including annoyance, sleep disturbance, cardiovascular disease, and impairment of cognitive performance in children.³⁴
- 16.1.38 Annoyance is the most prevalent community response in a population exposed to environmental noise. Noise annoyance can result from noise interfering with daily activities, feelings, thoughts, sleep, or rest, and might be accompanied by negative responses, such as anger, displeasure, exhaustion, and by stress-related symptoms. In severe forms, it could be thought to affect wellbeing and health, and because of the high number of people affected, annoyance substantially contributes to the burden of disease from environmental noise. Although the overall community response depends on societal values, several personal (e.g. age and noise sensitivity) and situational characteristics (e.g. dwelling insulation) might affect the individual degree of annoyance.³⁴
- 16.1.39 Sleep disturbance is thought to be the most deleterious non-auditory effect of environmental noise exposure, because undisturbed sleep of a sufficient length is needed for daytime alertness and performance, quality of life, and health. Human beings perceive, evaluate, and react to environmental sounds, even while asleep. Elderly people, children, shift-workers, and people with a pre-existing sleep disorder, are thought of as at-risk groups for noise-induced sleep disturbance.³⁴
- 16.1.40 Regarding noise and health, *"groups at risk most often mentioned in the literature are children, the elderly, the chronically ill and people with a hearing impairment. The other categories encountered are those of sensitive persons, shift-workers, people with mental illness (e.g. schizophrenia or autism), people suffering from tinnitus, and fetuses and neonates."*³⁶
- 16.1.41 The available evidence shows that children are less vulnerable for annoyance than adults, but more vulnerable for cognitive effects of noise. They are not per se more vulnerable as a group, but more at risk because of less-developed coping strategies, and they are in a sensitive developmental period. This is indicative of a life phase effect rather than an age effect. Children seem to be less vulnerable for awakenings due to noise but more vulnerable for physiological effects during sleep and related motility.³⁶
- 16.1.42 Evidence does not indicate that the elderly are more vulnerable to noise in terms of annoyance and sleep disturbance. Age-specific comparisons rather show an inverted U-shaped relation and indicate that both young and older people are less at risk, as far as annoyance and disturbance are concerned. But, it is possible that the elderly are more vulnerable regarding cardiovascular effects, and this may be a combined effect of air pollution and noise.³⁶

Baseline conditions

- 16.1.43 Construction noise effects are expected at the site-specific level, operational noise effects may also extend to the local level (see paragraph 16.4.2 for how representative populations for these areas are defined). Baseline data is discussed accordingly, including reference to indicators and comparators as appropriate.
- 16.1.44 The health baseline relevant to this topic from **Appendix 16B** in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18** can be summarised as follows.
- 16.1.45 Baseline exposure to transport related noise at the local (North Somerset) level (the indicator not reporting on smaller area statistics) indicates that 2% of people are exposure to road, rail and air transport noise of 65dB(A) or more during the daytime (compared to an average of 5% for England). Most recent data for 2011.
- 16.1.46 During the night-time transport related noise at the local (North Somerset) level (the indicator not reporting on smaller area statistics) indicates that 4% of people are exposure to road, rail and air

³⁶ Van Kamp, I. and Davies, H. (2013). Noise and health in vulnerable groups: a review. *Noise Health*, 15, 153-9.

transport noise of 55dB(A) or more during the night-time (compared to an average of 8% for England). Most recent data for 2011.

16.1.47 Data from 2015/16 at the local level indicates a baseline of approximately 14 complaints about noise per year per thousand population in North Somerset (compared to an estimated value of 6 per thousand population in England).

16.1.48 As with potential air quality, people who spend extended periods at home may experience greater noise exposure durations than those who are absent during normal working hours. Refer to paragraph 16.19.18.

Health priorities

16.1.49 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Enabling communities to thrive – Enabling people to live safe, healthy and independent lives. Increasing community resilience. North Somerset's population is expected to grow faster than the national or regional average with more elderly people and children than at present. Aims include:

- Communities have greater influence over how their physical and social environment develops;
- Accelerated delivery of homes in sustainable locations;
- Improved housing conditions;
- Better regulation of housing conditions in the private rented sector; and
- Improved housing options for vulnerable households.

16.1.50 North Somerset Partnership Sustainable Community Strategy²⁴: Living within environmental limits. Aims include enhanced local environmental quality in both new and existing developments.

Consultation responses

16.1.51 Refer to **Table 16.2** where North Somerset Council (NSC) noted the subjective nature of responses to noise and the effects these may have on sleep disturbance, mental health and wellbeing. They also note the potential impacts of a redistribution of night-flights on sleep disturbance.

Regulatory standards

16.1.52 The assessment is based on UK regulatory standards for noise,^{37,38} but has also been informed by WHO targets.^{39,40}

Policy context

16.1.53 *North Somerset Council Core Strategy*³³. Policy CS3: Development that, on its own or cumulatively, would result in air, water or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other control regimes, or by measures included in the proposals, by the imposition of planning conditions or through a planning obligation.

³⁷ British Standards Institution (2008). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise, [online]. Available at: <https://shop.bsigroup.com/ProductDetail/?pid=000000000030258086> [Checked 24/08/2018].

³⁸ British Standards Institution (2008). BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration, [online]. Available at: <https://shop.bsigroup.com/ProductDetail/?pid=000000000030258089> [Checked 2/10/2018].

³⁹ World Health Organization (2018). Environmental Noise Guidelines for the European Region. WHO Regional Office for Europe. ISBN 978 92 890 5356 3. [Checked 20/10/2018].

⁴⁰ World Health Organization Regional Office for Europe (2009). Night noise guidelines for Europe. Copenhagen, Denmark.

- 16.1.54 *North Somerset Council Core Strategy*³³. Policy CS23: Proposals for the development of Bristol Airport will be required to demonstrate the satisfactory resolution of environmental issues, including the impact of growth on surrounding communities and surface access infrastructure.

Travel

Scientific literature

- 16.1.55 Transport allows the movement of people and goods between places, enabling access to employment, economic and social opportunities as well as to essential services.⁴¹ Physical injury and death are the most direct health effects of motorised transport.⁴¹ Children⁴², pregnant women⁴³ and cyclists (particularly older cyclists)⁴⁴ are generally more vulnerable.
- 16.1.56 The benefits of increased physical activity during active travel strongly outweighed detrimental effects of injury from exposure to motorized traffic and their emissions (i.e. air pollution).⁴⁵ Active transport to work or school is significantly associated with improved cardiovascular health and lower body weight. The strength of the evidence varies from weak (mental health and cancer), moderate (body weight), to strong (cardiovascular health).⁴⁶
- 16.1.57 Traffic calming and presence of playgrounds and recreation areas are consistently associated with more walking and less child pedestrian injury.⁴⁷ For older adults, traffic safety is one of the most prominent influences of decisions about mobility. This is the case both on subjective measures (e.g. perceptions) and objective measures (e.g. speed limits, numbers of lanes of traffic and condition of pavements).⁴⁸
- 16.1.58 Lower socioeconomic status, riding on the road, riding in rural compared with urban areas and riding on the pavement are associated with bicycling injury. Cycling injuries related to a motor vehicle collision are more severe than other bicycling injuries.⁴⁹ As vehicle-to-bicyclist crashes occur mostly in good lighting conditions and visibility, and ground impacts cause almost four times as many injuries as impacts with the car involved, crash avoidance systems as well as separating bicyclists from motor traffic, may contribute to mitigate these injuries.⁵⁰
- 16.1.59 There is strong evidence that active travel can result in substantial health benefits.⁵¹ Engagement in leisure activities is also associated with increased subjective well-being⁵² and decreased risk of type 2 diabetes.⁵³ Natural environments such as green or open spaces, but also attractive views of nature

⁴¹ Thomson H., *et al.* (2008). Assessing the unintended health impacts of road transport policies and interventions: translating research evidence for use in policy and practice. *BMCPublic Health* 2008; 8: 339.

⁴² National Institute for Health & Clinical Excellence (2010). Preventing unintentional road injuries among the under-15s. London: National Institute for Health and Clinical Excellence.

⁴³ Mendez-Figueroa H., *et al.* (2013). Trauma in pregnancy: an updated systematic review. *AmJObstetGynecol* 2013; 209(1): 1-10.

⁴⁴ Lustenberger T., *et al.* (2010). Bicyclists injured by automobiles: relationship of age to injury type and severity--a national trauma databank analysis. *JTrauma* 2010; 69(5): 1120-5.

⁴⁵ Mueller N., *et al.* (2015). Health impact assessment of active transportation: A systematic review. *Prev Med* 2015; 76: 103-14.

⁴⁶ Xu H., *et al.* (2013). The relationships between active transport to work or school and cardiovascular health or body weight: a systematic review. *Asia Pac J Public Health* 2013; 25(4): 298-315.

⁴⁷ Rothman L., *et al.* (2014). Walking and child pedestrian injury: a systematic review of built environment correlates of safe walking. *Inj Prev* 2014; 20(1): 41-9.

⁴⁸ Yen I.H., *et al.* (2014). How Design of Places Promotes or Inhibits Mobility of Older Adults: Realist Synthesis of 20 Years of Research. *Journal of aging and health* 2014; 26(8): 1340-72.

⁴⁹ Embree T.E., *et al.* (2016). Risk Factors for Bicycling Injuries in Children and Adolescents: A Systematic Review. *Pediatrics* 2016; 138(5).

⁵⁰ Oman M., *et al.* (2016). Analysis of the mechanism of injury in non-fatal vehicle-to-pedestrian and vehicle-to-bicyclist frontal crashes in Sweden. *International journal of injury control and safety promotion* 2016; 23(4): 405-12.

⁵¹ Winters, M., Buehler, R. and Gotschi, T. (2017). Policies to Promote Active Travel: Evidence from Reviews of the Literature. *Curr Environ Health Rep*, 4, 278-285.

⁵² Kuykendall, L., Tay, L. and Ng, V. (2015). Leisure engagement and subjective well-being: A meta-analysis. *Psychol Bull*, 141, 364-403.

⁵³ Huai, P., Han, H., Reilly, K. H., Guo, X., Zhang, J. and Xu, A. (2016). Leisure-time physical activity and risk of type 2 diabetes: a meta-analysis of prospective cohort studies. *Endocrine*, 52, 226-30.

integrated within the urban landscape, are important environmental factors sustaining physical activity in the population.⁵⁴ An activity friendly neighbourhood that is walkable, dense, accessible, equipped with walk/cycle facilities and safe from traffic is associated with more active transportation to school in children.⁵⁵

- 16.1.60 Physical activity can improve mental health, the strongest evidence indicates that this is through improvements in physical self-perceptions that accompanied enhanced self-esteem.⁵⁶ Anxiety symptoms (below the threshold of anxiety disorders) are common in older adults. Regular physical activity may be effective for improving anxiety symptoms in older adults.⁵⁷
- 16.1.61 Nearly half of people aged over 60 years are inactive. Access difficulties (environmental barriers or affordability) are one of the barriers to physical activity participation amongst older people.⁵⁸
- 16.1.62 Areas with greater access to primary health care have lower hospitalization rates for ambulatory care sensitive conditions (conditions which are potentially avoidable by well-functioning primary care).⁵⁹
- 16.1.63 Transportation barriers are often cited as barriers to healthcare access. Transportation barriers lead to rescheduled or missed appointments, delayed care, and missed or delayed medication use. These consequences may lead to poorer management of chronic illness and thus poorer health outcomes.⁶⁰
- 16.1.64 Transportation barriers to health care access are common, and greater for vulnerable populations. Patients with a lower socio-economic status have higher rates of transportation barriers to ongoing health care access than those with a higher socio-economic status. Transportation barriers can also affect access to pharmacies and thus medication adherence.⁶⁰
- 16.1.65 When patients cannot get to their health care provider, they miss the opportunity for evaluation and treatment of chronic disease states, changes to treatment regimens, escalation or de-escalation of care and, as a result, delay interventions that may reduce or prevent disease complications.⁶⁰
- 16.1.66 Lack of access to transport can mean the difference between care delivered in a timely manner that has a greater chance of improved health outcomes and an inefficient utilisation of health care services. This may be late or non-presentation at primary health care and a higher level of treatment in accident and emergency departments.⁶⁰
- 16.1.67 Shortages of sufficient health care in rural areas relate to staff shortages, uneven distribution of resources, quality deficiencies, access limitations and the inefficient utilisation of health care services. The reasons for such shortages include physical or infrastructural, professional, educational, social-cultural, economic and political issues.⁶¹

⁵⁴ Calogiuri, G. and Chroni, S. (2014). The impact of the natural environment on the promotion of active living: An integrative systematic review. *BMC Public Health*, 14, 873.

⁵⁵ D'haese, S., Vanwolleghem, G., Hinckson, E., De Bourdeaudhuij, I., Deforche, B., Van Dyck, D. and Cardon, G. (2015). Cross-continental comparison of the association between the physical environment and active transportation in children: a systematic review. *The International Journal of Behavioural Nutrition and Physical Activity*, 12, 145.

⁵⁶ Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Kelly, P., Smith, J., Raine, L. and Biddle, S. (2016). Physical Activity for Cognitive and Mental Health in Youth: A Systematic Review of Mechanisms. *Pediatrics*, 138.

⁵⁷ Mochcovitch, M. D., Deslandes, A. C., Freire, R. C., Garcia, R. F. and Nardi, A. E. (2016). The effects of regular physical activity on anxiety symptoms in healthy older adults: a systematic review. *Rev Bras Psiquiatr*, 38, 255-61.

⁵⁸ Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z. and Ferreira, M. L. (2015). Older people's perspectives on participation in physical activity: a systematic review and thematic synthesis of qualitative literature. *Br J Sports Med*, 49, 1268-76.

⁵⁹ Rosano, A., Loha, C. A., Falvo, R., van der Zee, J., Ricciardi, W., Guasticchi, G. and de Belvis, A. G. (2013). The relationship between avoidable hospitalization and accessibility to primary care: a systematic review. *Eur J Public Health*, 23, 356-60.

⁶⁰ Syed, S. T., Gerber, B. S. and Sharp, L. K. (2013). Traveling towards disease: transportation barriers to health care access. *J Community Health*, 38, 976-93.

⁶¹ Weinhold, I. and Gurtner, S. (2014). Understanding shortages of sufficient health care in rural areas. *Health Policy*, 118, 201-14.

Baseline conditions

- 16.1.68 Changes in road traffic and road works during construction and operation that may affect journey times, access and levels of active travel are expected at the local level (refer to paragraph 16.4.2 for how the representative population for this area is defined).
- 16.1.69 The health baseline relevant to this topic from **Appendix 16B**, in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18** can be summarised as follows.
- 16.1.70 At the local level the average distance travelled to work in North Somerset is 18km, above the 15km average for England.
- 16.1.71 Data from 2014 to 2016 indicates that the baseline rate of people killed or seriously injured on the roads in North Somerset is 23.2 per 100,000 resident population, lower than the average of 39.7 for England.
- 16.1.72 At the local level (North Somerset) the percentage of people aged 16+ with sports club membership is 24% (higher than the average of 22% in England, 2015/16 data). The percentage of the adult population that is also active (61%) is higher than the average for England (57%).
- 16.1.73 Access to a car (or van) is indicative of being able to access alternative physical activity opportunities. In North Somerset 013D LSOA (representative of the majority of the community likely to experience localised effects near Bristol Airport, including the closest dwellings to the north of the airport) the baseline indicates 94% of households have a car or van (compared to an average of 74% for England). The trend is the same for North Somerset 013B LSOA (representative of a more deprived minority of the community that are likely to experience effects, including to the east of the airport).
- 16.1.74 Access deprivation can increase sensitivity to change. For the barriers to housing and services domain of deprivation, North Somerset 013D LSOA is ranked 2,344 out of 32,844 LSOAs in England; where one is the most deprived area. This places it in the 10% most deprived LSOAs in England on this measure. Reviewing the sub-domains for this indicator shows that the ranking relates to the physical proximity of local services, rather than to issues relating to access to housing such as affordability. This is suggestive of particular sensitivity to changes that affect journey times to services that are already difficult to access. North Somerset 013B LSOA shows the same trends and is also in the 10% most deprived LSOAs in England for geographical barriers to services. North Somerset overall has average deprivation relating to barriers to housing and services (with an average rank of 13,832, which would place it in the fifth decile). Sensitivity is therefore at the site-specific level close to the airport rather than more generally across the wider local area.
- 16.1.75 Self-reported health and health deprivation can increase sensitivity to change, particularly where opportunities for physical activity associated with active or sustainable travel may be affected:
- In North Somerset 013D LSOA the proportion of people reporting their health to be very good or good (87%) is above the average for England and Wales (81%). The proportion reporting fair health (11%) is below the average for England and Wales (13%). The proportion of people reporting bad or very bad health (3%) is also below the average for England and Wales (6%). This is consistent with a similar percentage of people reporting that their day-to-day activities are not limited (86%) compared to the average for England and Wales (82%). Self-reported health is therefore above average suggesting a lower than average proportion of people who are likely to be sensitive to changes that affect health related journeys;
 - In North Somerset 013B LSOA the self-reported health trends are similar, although the proportion of people reporting bad or very bad health (5%) is only slightly below the average for England and Wales (6%). At the local level, trends in health deprivation for North Somerset are similar to the averages for England and Wales, indicating that the generally lower levels of

self-reported health are associated with the site-specific level close to the airport, with the local level as a whole having more average levels self-reported health;

- For the health deprivation and disability domain of deprivation, North Somerset 013D LSOA is ranked 29,352 out of 32,844 LSOAs in England; where one is the most deprived LSOA. This is amongst the 20% least deprived neighbourhoods in the country;
- For the health deprivation and disability domain of deprivation, North Somerset 013B LSOA is ranked 21,971 out of 32,844 LSOAs in England; where one is the most deprived LSOA. This is amongst the 40% least deprived neighbourhoods in the country; and
- North Somerset overall has average health deprivation (with an average rank of 13,296, which would place it in the fifth decile). This is consistent with there being pockets of higher deprivation in other areas more distant from Bristol Airport (such as Weston-Super-Mare approximately 12km to the south-west). It is noted that the neighbouring local authority area of Bristol approximately 6km to the north-east has high levels of deprivation, including health related deprivation, which should be a consideration in relation to traffic flows through though those wider areas, for example on the A38.

Health priorities

- 16.1.76 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Adding life to years and years to life – creating the right conditions to facilitate healthy lifestyles, enabling good quality lives to be enjoyed for longer. Overweight, obesity and being active have wide ranging impacts on people's physical health and well-being, including increased risk of cardiovascular diseases, type 2 diabetes, cancer and musculoskeletal problems. Aims include:
- Reduce overweight and obese rates in adults and reduce Reception year obesity rates and year six obesity rates;
 - Reduce diabetes rates in adults; and
 - Decrease the proportion of physically inactive people in North Somerset.
- 16.1.77 Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group health priorities²³: Improving prevention of type-two-diabetes, while giving people with the condition care that is focused on their own individual needs.
- 16.1.78 North Somerset Partnership Sustainable Community Strategy²⁴: Improving health and wellbeing. Aims include:
- Road safety for pedestrians, cyclists and motorists improved;
 - Better access to quality green spaces to encourage people to become more active and to take regular exercise;
 - Well promoted sustainable and accessible transport options; and
 - Reduction in childhood obesity by increasing activity levels.
- 16.1.79 North Somerset Partnership Sustainable Community Strategy²⁴: Living within environmental limits. Aims include:
- Reduce the need to travel through a range of options including use of innovative approaches and joined up development planning processes;
 - Realistic alternatives to travel by car by improving public transport networks and encouraging walking and cycling; and

- Work with businesses and other organisations to promote sustainable transport options that respond to work or school travel patterns.

Consultation responses

- 16.1.80 Refer to **Table 16.2** where NSC noted the issue of hazardous loads on the local road network. Natural England noted the importance of tranquil active travel routes.

Regulatory standards

- 16.1.81 None applicable.

Policy context

- 16.1.82 *North Somerset Council Core Strategy*³³. Policy CS10: Travel management policies and development proposals that encourage an improved and integrated transport network and allow for a wide choice of modes of transport as a means of access to jobs, homes, services and facilities will be encouraged and supported.
- 16.1.83 *North Somerset Council Core Strategy*³³. Policy CS23: Proposals for the development of Bristol Airport will be required to demonstrate the satisfactory resolution of environmental issues, including the impact of growth on surrounding communities and surface access infrastructure.

Community identity

Scientific literature

- 16.1.84 Places and locations hold meanings and memories for people. The ways in which people are able to relate to, access and enjoy these places and locations are important for mental health and well-being.⁶²
- 16.1.85 Cognitive social capital (shared norms, values, attitudes, and beliefs, predisposes people towards mutually beneficial collective action) is protective, at the individual and community level, against developing common mental illnesses.⁶³ Cognitive social capital improves prevention and control of chronic non-communicable disease (e.g. cardiovascular diseases, cancers and diabetes).⁶⁴
- 16.1.86 Neighbourhood context contributes to help-seeking intentions for mental illness. Living in a neighbourhood with a communicative atmosphere and having adequate health literacy facilitate informal and formal help-seeking for mental illness.⁶⁵
- 16.1.87 Community engagement can reduce health inequalities, empower community members, improve health behaviours, improve public health planning and build social capital.⁶⁶
- 16.1.88 Favourable psychosocial environments go hand in hand with better health. Poor psychosocial environments may be health damaging and contribute to health inequalities. Children and young people from neighbourhood environments that are considered to have fewer psychosocial

⁶² Baldwin C. (2015). Assessing impacts on people's relationships to place and community in health impact assessment: an anthropological approach. *Impact Assessment and Project Appraisal* 2015; 33(2): 154-9.

⁶³ Ehsan A.M. and De Silva M.J. (2015). Social capital and common mental disorder: a systematic review. *J Epidemiol Community Health* 2015; 69(10): 1021-8.

⁶⁴ Hu F. *et al.* (2014). A systematic review of social capital and chronic non-communicable diseases. *Biosci Trends* 2014; 8(6): 290-6.

⁶⁵ Suka M. *et al.* (2015). Relationship between individual characteristics, neighbourhood contexts and help-seeking intentions for mental illness. *BMJ Open* 2015; 5(8): e008261.

⁶⁶ Cyril S. *et al.* (2015). Exploring the role of community engagement in improving the health of disadvantaged populations: a systematic review. *Glob Health Action* 2015; 8: 29842.

advantages (such as low social capital, social resources and social cohesion) may shoulder a disproportionately high burden of physical and psychological ill health.⁶⁷

- 16.1.89 Social networks provide a powerful approach for health behaviour change. Social networks can be conceptualized as the specific sources of social support. The exchange of social support is the major basis of developing and maintaining social relationships. Types of social support include emotional, financial or material, informational, instrumental and socialization. Social support may include communications about health issues, including perceived risk and coping assistance.⁶⁸

Baseline conditions

- 16.1.90 Construction related community identity effects associated with land take are expected at the site-specific level, operational community identity effects from the airport affecting the environmental and economic landscape may also extend to the local level (see paragraph 16.4.2 for how representative populations for these areas are defined). Baseline data is discussed accordingly, including reference to indicators and comparators as appropriate.
- 16.1.91 The health baseline relevant to this topic from **Appendix 16B** in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18** can be summarised as follows.
- 16.1.92 The Access to Health Assets & Hazards (AHAH) index measures the percentage of the population who live in LSOAs which score in the poorest performing 20% of domains for access to retail services, access to health services, and physical environment. The AHAH index provides information on how conducive to good health an area is relative to other areas. In North Somerset 2.5% of the population live in LSOAs which score in the poorest performing 20% on the AHAH index (well below the average of 21.2% for England).
- 16.1.93 With regard to social connections, the percentage of adult social care users in North Somerset who have as much social contact as they would like (small area data not being available) was 50%, above the 45% average for England (2016/17 data).
- 16.1.94 The proportion of people who use adult social care services in North Somerset who report having control over their daily life (small area data not being available) was 83%, above the 77% average for England (2015/16 data).
- 16.1.95 For self-reported well-being, the percentage of respondents to the Annual Population Survey in North Somerset with a high happiness score (small area data not being available) was 78%, higher than the 75% average for England (2015/16 data).
- 16.1.96 For self-reported well-being, the percentage of respondents to the Annual Population Survey in North Somerset with a high satisfaction score (small area data not being available) was 84%, above the 81% average for England (2015/16 data).
- 16.1.97 Deprivation can increase sensitivity to change:
- For the living environment domain of deprivation, North Somerset 013D LSOA is ranked 10,614 out of 32,844 LSOAs in England; where 1 is the most deprived LSOA. This is amongst the 40% most deprived neighbourhoods in the country. Reviewing the sub-domains for this indicator shows that the ranking relates to the indoor environment, with measures relating to quality of housing. On this indoor living environment sub-domain North Somerset 013D LSOA is amongst the 20% most deprived neighbourhoods in the country. By contrast the outdoor environment sub-domain, with measures relating to air quality or road traffic accidents, places North

⁶⁷ Egan M. *et al.* (2008). Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. *BMC Public Health* 2008; 8: 239.

⁶⁸ Latkin CA. and Knowlton AR. (2015). Social Network Assessments and Interventions for Health Behavior Change: A Critical Review. *Behavioral medicine* (Washington, DC) 2015; 41(3): 90-7.

Somerset 013D LSOA amongst the 20% least deprived neighbourhoods in the country. This is suggestive of the outdoor environment being of generally good quality close to the airport; and

- North Somerset 013B LSOA shows the same general trend of the living environment domain of deprivation being dominated by indoor measures. However, both overall and at the sub-domain level there is lower living environment deprivation (being in the 40% least deprived neighbourhoods in the country on the overall measure).

16.1.98 North Somerset overall has below average deprivation relating to living environments (with an average rank of 9,722, which would place it in the third decile, or 30% least deprived category).

Health priorities

16.1.99 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Enabling communities to thrive – Enabling people to live safe, healthy and independent lives. Increasing community resilience. North Somerset has lower than average unemployment overall. In some communities, people are disadvantaged by a range of circumstances that prevent them entering employment. Aims include:

- Communities have greater influence over how their physical and social environment develops;
- Successful implementation of one team action plan;
- Effective operation of partners and communities together and community speedwatch groups;
- Increased awareness and uptake of voluntary sector and community-led initiatives across north Somerset;
- Increased number of people experiencing disadvantage engaged and supported into work;
- North Somerset police and crime plan being implemented; and
- Increased recruitment and retention of a local workforce.

16.1.100 North Somerset Partnership Sustainable Community Strategy²⁴: Developing strong inclusive communities. Aims include:

- Good access to key services and facilities through effective land use and transport planning;
- Development of a wide range of cultural, arts and leisure events and facilities within our urban and rural neighbourhoods, aimed at residents and visitors;
- Promoting the distinctiveness of North Somerset in design, local employment, local markets, produce, events and cultural experiences;
- Improved access to voluntary and community services;
- Increased participation in volunteering opportunities and promotion of volunteering opportunities for young people;
- Helping people to participate in their communities, with opportunities to influence decision making and shape services and facilities where possible;
- Timely delivery of appropriate infrastructure and facilities to meet the range of social and cultural needs within new developments;

- Positive relationships developed between people from different backgrounds or of different life stages in workplaces, schools and neighbourhoods where people's diversity is appreciated and valued;
- Celebration of diversity and communities' achievements;
- Community information and advice in appropriate formats to reflect the diversity of our communities;
- Support for vulnerable people of all ages, and those with specific needs, to play a full and active part within the community; and
- Initiatives to tackle social isolation.

Consultation responses

- 16.1.101 Refer to **Table 16.2** where Backwell Parish Council noted issues relating to visual impacts, including lighting from new buildings and structures associated with the Proposed Development.

Regulatory standards

- 16.1.102 None applicable.

Policy context

- 16.1.103 *North Somerset Council Core Strategy*³³. Policy CS5: The character, distinctiveness, diversity and quality of North Somerset's landscape and townscape will be protected and enhanced by the careful, sensitive management and design of development.
- 16.1.104 *North Somerset Council Core Strategy*³³. Policy CS9: The existing network of green infrastructure will be safeguarded, improved and enhanced by further provision, linking in to existing provision where appropriate, ensuring it is a multi-functional, accessible network which promotes healthy lifestyles, maintains and improves biodiversity and landscape character and contributes to climate change objectives.
- 16.1.105 *North Somerset Council Core Strategy*³³. Policy CS19: The council will protect strategic gaps to help retain the separate identity, character and/or landscape setting of settlements and distinct parts of settlements.
- 16.1.106 *North Somerset Council Core Strategy*³³. Policy CS23: Proposals for the development of Bristol Airport will be required to demonstrate the satisfactory resolution of environmental issues, including the impact of growth on surrounding communities and surface access infrastructure.

Economic effects

Scientific literature

- 16.1.107 Employment is beneficial for health, particularly in having a protective effect on depression and general mental health.⁶⁹
- 16.1.108 Unemployment is not only an effect of illness, but also a cause of it. The long-term unemployed carry a markedly higher burden of disease, particularly mental illness, compared to employed

⁶⁹ Van der Noordt, M., H. I. J., Droomers, M. and Proper, K. I. (2014). Health effects of employment: a systematic review of prospective studies. *Occup Environ Med*, 71, 730-6.

persons and those who are unemployed only for a short time.⁷⁰ Negative health effects are associated with unemployment linked to socioeconomic status (manual workers suffer more) and being unemployed due to health reasons.⁷¹

- 16.1.109 Job insecurity can pose as great a threat to health and mental health as unemployment. Job insecurity constitutes a chronic stressor which does not immediately affect health, but its impact intensifies over the period that jobs are perceived to be at risk.⁷²
- 16.1.110 Low socio-economic status is associated with higher risk factors for non-communicable diseases, such as increased risk of mortality from lung cancer, chronic obstructive pulmonary disease, and reduced breast cancer survival.⁷³

Baseline conditions

- 16.1.111 Operational employment and economic benefits of the expanded airport are expected at the local level, they may also extend to the regional level (see paragraph 16.4.2 for how representative populations for these areas are defined). Baseline data is discussed accordingly, including reference to indicators and comparators as appropriate.
- 16.1.112 The health baseline relevant to this topic from **Appendix 16B** in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18** can be summarised as follows.
- 16.1.113 2016-17 employment estimates at the local level in North Somerset, indicate that 81% of working age people are in employment (compared to an average of 74% for England).
- 16.1.114 Income deprivation in North Somerset was 12% in 2015 (below average compared to 15% for England). The percentage of older people affected by income deprivation (12%) is below the average for England (16%). Similarly, the percentage of children affected by income deprivation (15%) is also below the average for England (20%).
- 16.1.115 In terms of gender pay equality, the ratio between the gross median hourly earnings for women and the gross median hourly earnings for men is 75% (below the average of 79% for England).
- 16.1.116 Skills levels in North Somerset and South West England (as measured by highest level of qualification obtained) are slightly above average compared to England and Wales. Equivalent measures for South East Wales show slightly below average proportions of qualification obtainment. Similar trends are evident on measures of approximate social grade. In relation to economic activity, North Somerset has above average proportions of people who are economically active (74%) compared to 70% for England and Wales. The South West England region has the same levels as nationally (70%). South East Wales however has below average proportions, with 65% of people economically active. This is despite similar proportions of the population being of working age. These indicators suggest that South East Wales may be particularly sensitive to changes in employment and economic opportunities from the project.

Health priorities

- 16.1.117 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Enabling the best start in life – enabling children and young people to thrive and develop skills to lead healthy lives and

⁷⁰ Herbig, B., Dragano, N. and Angerer, P. (2013). Health in the long-term unemployed. *Dtsch Arztebl Int*, 110, 413-9.

⁷¹ Norstrom, F., Virtanen, P., Hammarstrom, A., Gustafsson, P. E. and Janlert, U. (2014). How does unemployment affect self-assessed health? A systematic review focusing on subgroup effects. *BMC Public Health*, 14, 1310.

⁷² KimT. J. and Von Dem Knesebeck, O (2015). Is an insecure job better for health than having no job at all? A systematic review of studies investigating the health-related risks of both job insecurity and unemployment. *BMC Public Health*, 15, 985.

⁷³ Sommer, I., Griebler, U., Mahlke, P., Thaler, K., Bouskill, K., Gartlehner, G. and Mendis, S. (2015). Socioeconomic inequalities in non-communicable diseases and their risk factors: an overview of systematic reviews. *BMC Public Health*, 15, 914.

achieve their full potential. Good health in children contributes to positive educational outcomes which in turn result in better health and opportunities throughout adult life. Aims include:

- Increased educational attainment at Key Stage 1 and 2;
- Continued improvement in GCSE outcomes, especially for the most vulnerable groups (including those receiving Free School Meals and Children Looked After);
- Reduced levels of childhood obesity. (See priority theme 2 action 2.1 'healthy weight, being active & eating well'); and
- Maintained downward trends in poor health outcomes from use of alcohol, substance misuse, unsafe sexual health, and teenage pregnancy.

16.1.118 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Promoting opportunities for young people at risk of long-term unemployment. Certain groups of young people experience higher unemployment rates than the general population and face additional barriers in accessing work. Aims include:

- Increased work experience and employment;
- Reduced barriers to finding work and achieving independence; and
- Increased self-confidence, skills and employment.

16.1.119 North Somerset Partnership Sustainable Community Strategy²⁴: Developing a prosperous economy and enterprising community. Aims include:

- Business investment and increased supply of land and appropriately sized premises and business units and better industrial estates with improved security and environmental enhancement;
- Local purchasing of products and services and local supply chains in all organisations and local communities;
- Encourage sustainable tourism in towns and rural areas, including maximising the impact and range of quality local attractions with improved visitor experience increasing visitor spend;
- Programmes that combine increased transport investment with measures to manage travel demand to support sustainable growth;
- Improve skills in the workforce and staff development in existing employers and key growth sectors;
- Better access to vocational training opportunities;
- Ensure that young people are encouraged to achieve their full potential through support initiatives;
- Enterprise in schools and further education establishments promoted, with strong links to employers;
- Access to free information and advice about all forms of learning and those educational opportunities to be available to individuals at all ages;
- Learning and skills programmes to respond to sustainable development challenges; and
- Encourage employers to improve access to employment opportunities for people from the local area, particularly in areas of disadvantage.

Consultation responses

16.1.120 Refer to **Table 16.2.** this highlights that no specific issues raised for this topic.

Regulatory standards

16.1.121 No regulatory standards are applicable.

Policy context

16.1.122 *North Somerset Council Core Strategy*³³. Policy CS20: The policy aims for an employment-led approach in order to achieve a more sustainable alignment between jobs and the economically active population across towns and villages in North Somerset.

Healthcare services

Scientific literature

- 16.1.123 Adequate primary care doctor supply and long-term relationships between primary care doctors and patients reduces hospitalisations for chronic ambulatory care sensitive conditions (conditions which are potentially avoidable by well-functioning primary care).⁷⁴ The use of unplanned health care by rural populations can be reduced by increasing preventative medicine, use of telemedicine and targeting chronic illnesses.⁷⁵
- 16.1.124 Healthcare professionals' wellbeing plays an important role in patient safety, with burnout and poor wellbeing (depression, anxiety, poor quality of life and stress) being associated with increased medical errors.⁷⁶ Hospitals are constantly being challenged to provide high-quality care despite ageing populations, diminishing resources, and financial constraints.⁷⁷ As demand outstrips resources in the UK, the volume and appropriateness of referrals from primary care to specialist services has become a key concern in the National Health Service (NHS). To tackle demand management of primary care services, the focus cannot be on primary care alone; a whole-systems approach is needed because the introduction of interventions in primary care is often just the starting point of the referral process.⁷⁸
- 16.1.125 In the UK patients' access to and experience of primary care services differs across age groups. Young adults access primary care services less frequently than other age groups. Aspects of primary care that are importance to young adults include the accessibility and availability of services, the confidentiality of health-related information and continuity of care.⁷⁹ Ethnic minority patients in the UK may experience some additional barriers in accessing healthcare services. Cultural, language and healthcare service knowledge factors may contribute.⁸⁰
- 16.1.126 International airport passengers seeking local healthcare may do so after experiencing new or exacerbated symptoms during travel. Most physicians and general practitioners will encounter

⁷⁴ van Loenen T. *et al.* (2014). Organizational aspects of primary care related to avoidable hospitalization: a systematic review. *Fam Pract* 2014; 31(5): 502-16.

⁷⁵ Brainard JS. *et al.* (2016). A systematic review of health service interventions to reduce use of unplanned health care in rural areas. *J Eval Clin Pract* 2016; 22(2): 145-55.

⁷⁶ Hall LH. *et al.* (2016). Healthcare Staff Wellbeing, Burnout, and Patient Safety: A Systematic Review. *PLoS One* 2016; 11(7): e0159015.

⁷⁷ van Oostveen CJ. *et al.* (2014). Factors and models associated with the amount of hospital care services as demanded by hospitalized patients: a systematic review. *PLoS One* 2014; 9(5): e98102.

⁷⁸ Blank L. *et al.* (2014). Referral interventions from primary to specialist care: a systematic review of international evidence. *Br J Gen Pract* 2014; 64(629): e765-74.

⁷⁹ Davey A. *et al.* (2013). Priorities for young adults when accessing UK primary care: literature review. *Prim Health Care Res Dev* 2013; 14(4): 341-9.

⁸⁰ Alhomoud F. *et al.* (2013). Medicine use and medicine-related problems experienced by ethnic minority patients in the United Kingdom: a review. *The International journal of pharmacy practice* 2013; 21(5): 277-87.

returned travellers with fever and the majority of travel-related infection is associated with travel to the tropics. Empirical treatment may have to be started based on epidemiological probability of infection whilst waiting for results to return. With early diagnosis and treatment, the majority of patients make a rapid and full recovery.⁸¹

Baseline conditions

- 16.1.127 Any additional operational demands on the NHS associated with an expanded non-permanent UK population in the area due to the expanded airport would be expected at the local level (see paragraph 16.4.2 for how representative populations for these areas are defined). Baseline data is discussed accordingly, including reference to indicators and comparators as appropriate.
- 16.1.128 The health baseline relevant to this topic from **Appendix 16B** in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18** can be summarised as follows.
- 16.1.129 The percentage of General Practitioner (GP) patient survey respondents in North Somerset who said they had a good experience of making an appointment was 74%, slightly above the average for England (73%, 2015/16 data). The high proportions suggest that the population are likely to make use of primary care services and view them as assets, which improves the potential use of the GP as a place to deliver a wider range of community services.
- 16.1.130 The percentage of people who successfully obtained an NHS dental appointment in North Somerset in the last two years was 96%, slightly above the average for England (95%, 2015/16 data). This high proportion suggest that the availability of services is appropriate to the needs within the area.
- 16.1.131 In North Somerset the healthy life expectancy at birth for women was 67.4 years (above the average of 63.9 years for England. For men the equivalent healthy life expectancy at birth was 66.2 years, again above the average for England of 63.3 years (both 2014-16 data).
- 16.1.132 The Bristol, North Somerset, Somerset and South Gloucestershire NHS area covers a population of 1,423,539 people (2011 census data). Of these approximately 8% have a long-term health problem or disability that limits their day-to-day activities a lot. Of these only 3% are within the 16 to 64 age range. 82% of people covered by this NHS area self-report good or very good health (slightly above the 81% average for England).
- 16.1.133 The Bristol, North Somerset and South Gloucestershire Clinical Commissioning Groups (CCGs) (operating collectively, having merged from 1 April 2018) have a number of current challenges.⁸²
- Growing demand for urgent care is outstripping capacity with potential impact on patient safety;
 - The CCGs were collectively in financial deficit in 2017-18, including a significant cumulative deficit from previous years;
 - North Somerset and South Gloucestershire CCGs were both subject to legal directions and special measures during 2017-18; and
 - Primary care and hospital services in Weston (at Weston-Super-Mare south west of the airport) faces challenges. Weston General Hospital Emergency Department no longer offers night-time Emergency Department services. Additional wider area capacity for ambulance and hospital

⁸¹ Johnston, V., Stockley, J. M., Dockrell, D. *et al.* (2009). Fever in returned travellers presenting in the United Kingdom: recommendations for investigation and initial management. *J Infect*, 59, 1-18.

⁸² NHS Bristol, North Somerset and South Gloucestershire Clinical Commissioning Groups (2018). Annual Report and Accounts 2017/18, [online]. Available at: <https://bnssgccc.nhs.uk/library/annual-report-and-accounts-201718/> [Checked 21/11/2018].

services and out of hospital services was commissioned and is subject to performance review and ongoing monitoring.

- 16.1.134 These challenges indicate that local healthcare services (including both primary care and hospital care) are likely to be particularly sensitive to any increase in demand by an expanded non-permanent UK population in the area due to the expanded airport.

Health priorities

- 16.1.135 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Mental health. 1 in 4 people will encounter mental health problems at some point in their lives. The national strategy 'No Health without Mental Health' sets out approaches to improve population mental health and well-being and to provide high quality services that are widely accessible. Aims include: improvements in a range of public mental health measures.
- 16.1.136 North Somerset Partnership. People and Communities Strategy 2017-2020²²: Ageing well – Enabling people to maintain independence, live longer, good quality lives, with access to appropriate care and support when needed. By 2030 it is projected 9% of the over 75 population will live in a care home, with associated increases in the number of those living with co-morbidities, disability and dementia. Aims include:
- Living for longer and with more years of life in good health (increased life expectancy, increased 'disability free life years' & able to live independently for longer);
 - New models of care that improve community-based services in order to reduce the demand on hospital-based services;
 - Reduced delayed transfers of care between providers to avoid people staying longer in hospital than is necessary; and
 - Reduced repeat admissions to hospital where this could be avoided by having more efficient, integrated health and social, primary and community care.
- 16.1.137 Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group health priorities²³:
- Ensuring patients are referred at the right time, to the right place, first time;
 - Ensuring a resilient and thriving primary and community care service at the heart of an integrated health and social care system;
 - Developing high quality, affordable, out of hospital care. This includes providing an alternative to emergency departments, supporting discharges from hospital and keeping people well once they return home;
 - Creating a consistent approach to 'Continuing Healthcare' across the area, developing ways to ensure all people receive the care they need, closer to home;
 - Providing individuals with more control in prevention and self-care; ensuring patients are seen and treated in the community; improving self-care services, the accessibility of screenings and efficiency of referrals; and
 - Ensuring patients wait no longer than four hours to receive urgent and emergency care with seven-day services available for the whole population and primary care at the forefront of urgent care provision.
- 16.1.138 North Somerset Partnership Sustainable Community Strategy²⁴. Improving health and wellbeing. Aims include:

- Better access to health and community services within our rural and urban communities;
- Appropriate services and facilities developed to respond to the needs of people within future developments, with a particular emphasis on built environments that promote healthy lifestyles; and
- Full response to fluctuations in pressures on services at particular times, for example during seasonal population increases.

Consultation responses

16.1.139 Refer to **Table 16.2** which highlights that no specific issues raised for this topic.

Regulatory standards

16.1.140 No regulatory standards are applicable.

Policy context

- 16.1.141 *North Somerset Council Core Strategy*³³. Priority Objectives: Ensure that major development proposals are delivered in tandem with the necessary improvements in physical and social infrastructure including, healthcare facilities and access improvements to Bristol Airport, and that appropriate delivery mechanisms including effective tariffs and developer contributions are in place.
- 16.1.142 *North Somerset Council Core Strategy*³³. Policy CS26: The planning process will support programmes and strategies which increase and improve health services throughout the district, promote healthier lifestyles and aim to reduce health inequalities. Including, encouraging development that promotes active living through creating places that are easily accessible, attractive and safe to move around by walking or cycling.

Climate change

Scientific literature

- 16.1.143 There is consensus that climate change is affecting Human Health. Health impacts of climate change are highly dependent on location, economic status, infrastructure, health services (to name just a few). The main climate sensitive diseases are West Nile fever, dengue fever, Chikungunya fever, malaria, leishmaniasis, tick-borne encephalitis, Lyme borreliosis, Crimean-Congo haemorrhagic fever, spotted fever rickettsioses, Yellow fever, Rift Valley fever, cholera, waterborne diseases, floods, droughts, cyanobacteria, and heat stress.⁸³
- 16.1.144 General regulations on air quality control, road traffic emission control, energy generation emission control and climate change greenhouse gas emission control are all associated with improvements in air quality and public health.⁸⁴
- 16.1.145 Climate change is likely to affect the infectious disease burden from exposure to pathogens in water used for drinking and recreation.⁸⁵

⁸³ Bouzid M. *et al.* (2013). The effectiveness of public health interventions to reduce the health impact of climate change: a systematic review of systematic reviews. *PLoS One* 2013; 8(4): e62041.

⁸⁴ Wang L. *et al.* (2016). Air Quality Strategies on Public Health and Health Equity in Europe-A Systematic Review. *Int J Environ Res Public Health* 2016; 13(12).

⁸⁵ Sterk A. *et al.* (2013). Direct and indirect effects of climate change on the risk of infection by water-transmitted pathogens. *Environ Sci Technol* 2013; 47(22): 12648-60.

- 16.1.146 Global climate change is expected to affect the frequency, intensity and duration of extreme water-related weather events such as excessive precipitation, floods, and drought. Extreme water-related weather events represent a risk to public health in both developed and developing countries, but impact will be disproportionate and likely to compound existing health disparities. Children and the elderly, who are more likely to be based in and around the home, are more likely to be affected by flooding events with a rapid onset. In both developing and developed countries the most common cause of illness outbreaks following extreme water-related weather events is contamination of the water source through run-off or inundation. In developed countries this is usually contamination of a treated water source.⁸⁶
- 16.1.147 Health care professionals have an important role in understanding and communicating the health concerns and the co-benefits from policies to reduce GHG. The adverse health aspects related to climate change may include: heat-related disorders, such as heat stress and economic consequences of reduced work capacity; respiratory disorders, including those exacerbated by air pollution and aeroallergens, such as asthma; infectious diseases, including vector-borne diseases and waterborne diseases, such as childhood gastrointestinal diseases; food insecurity, including reduced crop yields and an increase in plant diseases; and mental health disorders, such as posttraumatic stress disorder and depression, that are associated with natural disasters. Substantial health and economic co-benefits could be associated with reductions in fossil fuel combustion. For example, greenhouse gas emission policies may yield net economic benefit, with health benefits from air quality improvements potentially offsetting the cost of international carbon policies.⁸⁷

Baseline conditions

- 16.1.148 Not applicable (indicators are not available at the global level).

Health priorities

- 16.1.149 North Somerset Partnership Sustainable Community Strategy²⁴: Living within environmental limits. Aims include:
- Planning policies to ensure new developments are low carbon;
 - Improve the energy efficiency of North Somerset's existing building stock across all tenures;
 - Likely effects of climate change are taken into account in all policies and services and in the design of all new developments;
 - Support the local economy to take full advantage of new technologies and other business opportunities, and by helping businesses to adapt to rising energy costs and effects of changing climate; and
 - Limit the more damaging effects of climate change.
- 16.1.150 North Somerset Partnership Sustainable Community Strategy²⁴: Developing a prosperous economy and enterprising community. Aims include:
- Initiatives to reduce the carbon footprint of businesses and help tackle and adapt to climate change undertaken;
 - Reduced energy and other resource usage, better travel planning, and better waste management and effective environmental management systems;

⁸⁶ Cann KF. *et al.* (2013). Extreme water-related weather events and waterborne disease. *Epidemiol Infect* 2013; 141(4): 671-86.

⁸⁷ Patz J.A. *et al.* (2014). Climate change: challenges and opportunities for global health. *Jama* 2014; 312(15): 1565-80.

- Continue to promote and encourage tourism businesses to sign up for the Green Tourism Business Scheme.

Consultation responses

16.1.151 Refer to **Table 16.2** which highlights that there are no specific issues raised for this topic.

Regulatory standards

16.1.152 No regulatory standards are applicable.

Policy context

16.1.153 *North Somerset Council Core Strategy*³³. Policy CS1: NSC is committed to reducing carbon emissions and tackling climate change, mitigating further impacts and supporting adaptation to its effects.

Appendix 16B

Human Health baseline data

16.1.1 Health baseline data relevant to the scope of the assessment is set out in **Table 16.15**, **Table 16.16**, **Table 16.17** and **Table 16.18**. Summaries based on these tables are provided in the assessment:

- **Table 16.15** sets out relevant baseline census statistics 2011¹;
- **Table 16.16** sets out a Public Health England (PHE) Health assets profile²;
- **Table 16.17** sets out PHE Wider Determinants of Health profile⁵; and
- **Table 16.18** sets out deprivation¹⁰.

Table 16.15 Baseline census statistics 2011¹

Variable	Geographic area		Site-specific				Local		NHS area team		Regional				National	
			North Somerset 013D LSOA		North Somerset 013B LSOA		North Somerset Unitary Authority		Bristol, North Somerset, Somerset & South Gloucestershire		South West England		South East Wales		England and Wales	
	number	%	number	%	number	%	number	%	number	%	number	%	number	%	number	%
KS101EW - Usual resident population																
All usual residents	1,348	100	1,269	100	202,566	100	1,423,539	100	5,288,935	100	1,860,405	100	56,075,912	100		
Density (number of persons per hectare)	0.5	-	1.2	-	5.4	-	3.2	-	2.2	-	6	-	3.7	-		
QS418EW - Dwellings																
Number of dwellings	583	-	558	-	91,694	-	629,836	-	2,401,289	-	822,285	-	24,359,880	-		
KS102EW - Age structure																
Age 0 to 15 – children and young people	227	17	187	15	36,652	18	259,753	18	929,678	18	343,729	18	10,579,132	19		
Aged 16 to 64 – working age people	789	59	811	64	123,281	61	909,212	64	3,323,813	63	1,203,277	65	36,273,707	65		
Aged 65 and over – older people	332	25	271	21	42,633	21	254,574	18	1,035,444	20	313,399	17	9,223,073	16		
KS301EW - Health and provision of unpaid care																
All categories: Long-term health problem or disability	1,348	100	1,269	100	202,566	100	1,423,539	100	5,288,935	100	1,860,405	100	56,075,912	100		
Day-to-day activities limited a lot	70	5.2	88	6.9	17,335	8.6	113,735	8.0	436,733	8.3	231,062	12.5	4,769,712	8.5		

¹ Office of National Statistics and Nomis official labour market statistics, [online]. Available at: <https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?theme=75> [Checked 20/10/2018].

Variable	Geographic area		Site-specific		Local		NHS area team		Regional				National	
			North Somerset 013D LSOA	North Somerset 013B LSOA	North Somerset Unitary Authority	Bristol, North Somerset, Somerset & South Gloucestershire		South West England		South East Wales		England and Wales		
	number	%	number	%	number	%	number	%	number	%	number	%	number	%
Day-to-day activities limited a little	125	9.3	102	8.0	21,405	10.6	137,307	9.6	536,963	10.2	197,501	10.6	5,278,729	9.4
Day-to-day activities not limited	1,153	85.5	1,079	85.0	163,826	80.9	1,172,497	82.4	4,315,239	81.6	1,431,842	76.8	46,027,471	82.1
Day-to-day activities limited a lot: Age 16 to 64	17	1.3	39	3.1	6,670	3.3	46,146	3.2	173,355	3.3	107,708	5.9	2,086,236	3.7
Day-to-day activities limited a little: Age 16 to 64	43	3.2	38	3.0	9,380	4.6	64,665	4.5	243,108	4.6	104,644	5.7	2,619,966	4.7
Day-to-day activities not limited: Age 16 to 64	729	54.1	734	57.8	107,231	52.9	798,401	56.1	2,907,350	55.0	990,925	53.1	31,567,505	56.3
Very good health	664	49.3	623	49.1	93,803	46.3	673,468	47.3	2,478,081	46.9	866,446	46.5	26,434,409	47.1
Good health	504	37.4	454	35.8	70,435	34.8	492,494	34.6	1,828,026	34.6	569,628	30.5	19,094,820	34.1
Fair health	142	10.5	134	10.6	27,670	13.7	185,482	13.0	710,356	13.4	270,390	14.6	7,401,881	13.2
Bad health	25	1.9	45	3.5	8,276	4.1	56,115	3.9	212,080	4.0	117,035	6.3	2,428,668	4.3
Very bad health	13	1.0	13	1.0	2,382	1.2	15,980	1.1	60,392	1.1	36,906	2.0	716,134	1.3
Provides no unpaid care	1,171	86.9	1,106	87.2	180,253	89.0	1,275,067	89.6	4,718,637	89.2	1,632,628	87.7	50,275,666	89.7
Provides 1 to 19 hours unpaid care a week	135	10.0	114	9.0	15,172	7.5	99,513	7.0	376,909	7.1	128,797	6.9	3,665,072	6.5
Provides 20 to 49 hours unpaid care a week	15	1.1	21	1.7	2,577	1.3	17,522	1.2	68,164	1.3	34,032	1.8	775,189	1.4
Provides 50 or more hours unpaid care a week	27	2.0	28	2.2	4,564	2.3	31,437	2.2	125,225	2.4	64,948	3.5	1,359,985	2.4

Geographic area	Site-specific				Local		NHS area team		Regional		National			
	North Somerset 013D LSOA		North Somerset 013B LSOA		North Somerset Unitary Authority		Bristol, North Somerset, Somerset & South Gloucestershire		South West England		South East Wales		England and Wales	
Variable	number	%	number	%	number	%	number	%	number	%	number	%	number	%
QS119EW - Households by deprivation dimensions														
Household is not deprived in any dimension	309	56	254	49	41,762	47	274,608	45	1,013,722	45	300,448	38	9,893,773	42
Household is deprived in 1 dimension	163	30	180	34	28,397	32	197,257	33	751,243	33	243,939	31	7,620,164	33
Household is deprived in 2 dimensions	70	13	71	14	14,492	16	106,077	18	398,302	18	180,044	23	4,512,853	19
Household is deprived in 3 dimensions	6	1	16	3	3,212	4	24,917	4	91,503	4	56,627	7	1,217,061	5
Household is deprived in 4 dimensions	1	0	1	0	364	0	2,642	0	9,871	0	4,160	1	122,193	1
KS106EW - Adults not in employment and dependent children and persons with long-term health problems or disability for all households														
No adults in employment in household	166	30.2	156	29.9	31,190	35.4	200,098	33.0	779,671	34.4	299,328	38.2	7,844,358	33.6
Dependent children in household: All ages	136	24.8	146	28.0	23,916	27.1	165,087	27.3	598,672	26.4	228,557	29.0	6,792,627	29.1
One person in household with a long-term health problem or disability	123	22.4	119	22.8	23,372	26.5	153,767	25.4	591,316	26.1	241,179	30.8	6,055,489	25.9
QS601EW - Economic activity														
Economically active: Total	712	72	730	74	102,607	71	742,692	71	2,710,787	70	893,899	65	28,659,869	70
Economically inactive: Total	279	28	251	26	42,745	29	297,819	29	1,145,928	30	476,485	35	12,466,671	30
Economically inactive: Retired	197	20	169	17	25,366	17	149,262	14	611,204	16	206,868	15	5,682,192	14

Variable	Geographic area		Site-specific		Local		NHS area team		Regional				National	
			North Somerset 013D LSOA	North Somerset 013B LSOA	North Somerset Unitary Authority		Bristol, North Somerset, Somerset & South Gloucestershire		South West England		South East Wales		England and Wales	
	number	%	number	%	number	%	number	%	number	%	number	%	number	%
Economically inactive: Looking after home or family	31	3	25	3	5,082	3	37,817	4	143,005	4	55,369	4	1,781,530	4
Economically inactive: Long-term sick or disabled	11	1	19	2	5,607	4	37,769	4	138,532	4	95,557	7	1,714,894	4
Economically active: Unemployed	25	3	29	3	4,350	3	34,871	3	126,208	3	63,539	5	1,799,536	4
QS702EW - Distance travelled to work														
Work mainly at or from home	165	24	129	18	11734	12	79179	11	323789	13	64400	8	2724010	10
Average distance (km)	16.6	-	14.1		17.9	-	14.9	-	16.3	-	15.23333	-	15	-
QS416EW - Car or van availability														
No cars or vans in household	31	6	31	6	15,151	17	118,101	20	428,093	19	199,766	25	5,989,770	26
One or more cars or vans in household	518	94	491	94	73076	83	487400	80	1836548	81	585,452	75	17376274	74
QS606EW - Occupation (Minor Groups)														
Health Professionals	14	-	6	-	1,155	-	9,979	-	34,968	-	12,965	-	371,136	-
Health and social care associate professionals	3	-	8	-	1,082	-	7,775	-	28,491	-	11,148	-	312,484	-
Skilled metal, electrical and electronic trades	22	-	35	-	3,924	-	29,720	-	108,529	-	35,974	-	1,050,533	-
Skilled construction and building trades	33	-	57	-	3,789	-	29,427	-	116,932	-	32,486	-	1,036,024	-

Variable	Geographic area		Site-specific		Local		NHS area team		Regional				National	
			North Somerset 013D LSOA	North Somerset 013B LSOA	North Somerset Unitary Authority	Bristol, North Somerset, Somerset & South Gloucestershire		South West England		South East Wales		England and Wales		
	number	%	number	%	number	%	number	%	number	%	number	%	number	%
Elementary Construction Occupations	2	-	1	-	360	-	3,330	-	13,624	-	5,385	-	136,339	-
QS501EW - Highest level of qualification														
No qualifications	183	16	233	22	32,539	20	240,225	21	902,561	21	405,735	27	10,307,327	23
Level 1 qualifications	130	12	150	14	22,752	14	155,703	13	592,963	14	202,126	13	6,047,384	13
Level 2 qualifications	176	16	177	16	28,542	17	183,445	16	713,983	16	231,511	15	6,938,433	15
Apprenticeship	43	4	80	7	7,247	4	48,350	4	186,398	4	58,129	4	1,631,777	4
Level 3 qualifications	129	12	129	12	21,012	13	153,667	13	575,085	13	185,579	12	5,617,802	12
Level 4 qualifications and above	430	38	271	25	47,041	28	330,005	28	1,193,337	27	368,675	24	12,383,477	27
QS613EW - Approximated social grade														
AB Higher and intermediate managerial/administrative/professional occupations	266	34	197	24	31,800	26	213,721	24	747,144	23	216,054	18	8,081,619	23
C1 Supervisory, clerical and junior managerial/administrative/professional occupations	270	34	216	27	38,594	32	273,026	31	996,087	31	357,937	30	10,796,044	30
C2 Skilled manual occupations	181	23	271	33	27,479	22	208,391	23	795,829	24	265,752	22	7,865,976	22
DE Semi-skilled and unskilled manual occupations; unemployed and lowest grade occupations	72	9	126	16	24,390	20	196,482	22	718,012	22	344,292	29	8,903,873	25

Table 16.16 PHE Health Assets Profile²

Health assets indicators	Period	North Somerset Unitary Authority		England
		Count	Value	Value
Gender pay equality	2015	-	74.9%	79.4%
Housing affordability ratio	2016	-	8.2	7.2
Percentage of people aged 16-64 in employment	2016/17	99,300	81.2%	74.4%
Income deprivation	2015	-	11.6%	14.7%
Income deprivation in older people (IDAOPI)	2015	-	12.4%	16.2%
Income deprivation in children (IDACI)	2015	5,465	14.8%	19.9%
GCSEs achieved (5A*-C including English & Maths)	2015/16	1,226	57.0%	57.8%
School Readiness: the percentage of Year 1 pupils achieving the expected level in the phonics screening check	2016/17	2,081	82.2%	81.1%
School Readiness: the percentage of children achieving a good level of development at the end of reception	2016/17	1,852	74.9%	70.7%
Healthy life expectancy at birth (Male)	2014 - 16	-	66.2	63.3
Healthy life expectancy at birth (Female)	2014 - 16	-	67.4	63.9
People's access to woodland	2015	31,911	15.2%	16.8%
Access to NHS dental services - successfully obtained a dental appointment ³	2015/16	867	96.0%	94.7%

² Public Health England Health Assets Profiles. County level, [online]. Available at: <https://fingertips.phe.org.uk/profile/comm-assets> [Checked 20/10/2018].

³ Percentage of people who successfully obtained an NHS dental appointment in the last two years. High proportions suggest that the availability of services is appropriate to the needs within the area. Dental health is linked to other factors including socio-economic status and there are significant inequalities in care.

Health assets indicators	Period	North Somerset Unitary Authority		England
		Count	Value	Value
Percentage of people who said they had good experience when making a GP appointment ⁴	2015/16	2,207	74.1%	73.4%
Social connection: percentage of adult social care users who have as much social contact as they would like	2016/17	-	50.4%	45.4%
Social connection: percentage of adult carers who have as much social contact as they would like	2015/16	-	33.5	35.5
Proportion of people who use services who have control over their daily life	2015/16	-	83.0%	76.6%
Self-reported well-being: % of respondents with a high happiness score	2015/16	-	77.8%	74.7%
Self-reported well-being: % of respondents with a high satisfaction score	2015/16	-	83.5%	81.2%
Percentage of people aged 16+ with sports club membership	2015	-	24.0%	22.0%
Percentage of physically active adults	Mar 2015 - Feb 2016	-	60.9%	57.0%
Utilisation of outdoor space for exercise/health reasons	2015	-	*	17.9%

*value missing due to small sample size.

Table 16.17 PHE Wider Determinants of Health⁵

Wider Determinants of Health Indicator	Period	North Somerset Unitary Authority		South West England	England
		Count	Value	Value	Value
Rate of complaints about noise ⁶	2015/16	3,019	14.4	4.5	6.3

⁴ The weighted percentage of General Practitioner (GP) patient survey respondents who said they had a good experience of making an appointment. Communities are likely to make use of primary care services and view them as assets if they have a good experience in making an appointment. If people view these services as an asset then that improves the potential use of the GP as a place to deliver a wider range of community services.

⁵ Public Health England Wider Determinants of Health Profiles. District level, [online]. Available at: <https://fingertips.phe.org.uk/profile/wider-determinants> [Checked 20/10/2018].

⁶ Number of complaints per year per local authority about noise per thousand population (according to statistics collected by the Chartered Institute of Environmental Health).

Wider Determinants of Health Indicator	Period	North Somerset Unitary Authority		South West England	England
		Count	Value	Value	Value
Exposure to road, rail and air transport noise of 65 dB(A) or more during the daytime	2011	4,520	2.2%	3.50%	5.0%
Exposure to road, rail and air transport noise of 55 dB(A) or more during the night-time	2011	8,750	4.3%	5.10%	8.0%
Killed and seriously injured (KSI) casualties on the roads ⁷	2014 - 16	146	23.2	39.7	39.7
Air pollution: fine particulate matter ⁸	2016	-	7.7	7.9	9.3
Access to Healthy Assets & Hazards Index ⁹	2016	5,325	2.5%	7.50%	21.2%
Overcrowded households	2011	1,663	1.9%	2.90%	4.8%
Affordability of home ownership	2016	225,000	7.5	8.4	7.7
Fuel poverty	2015	8,382	9.1%	11.40%	11.0%
Injuries due to falls in people aged 65 and over	2016/17	894	1,736	2009	2114
Excess winter deaths index	Aug 2015 - Jul 2016	145	19.3%	15.90%	15.1%

⁷ Rate of people killed or seriously injured (KSI) on the roads, all ages, per 100,000 resident population.

⁸ Annual concentration of human-made fine particulate matter (PM) at an area level, adjusted to account for population exposure. Fine particulate matter is also known as PM_{2.5} and has a metric of micrograms per cubic metre (µg/m³).

⁹ Percentage of the population who live in Lower Layer Super Output Areas (LSOAs) which score in the poorest performing 20% on the Access to Healthy Assets & Hazards (AHAH) index. The AHAH index is comprised of three domains: access to retail services, access to health services, and physical environment. The AHAH index provides information on how conducive to good health an area is relative to other areas.

Table 16.18 English indices of deprivation 2015¹⁰

Deprivation Indicator	North Somerset 013D		North Somerset 013B		North Somerset
	Rank ¹¹	Decile ¹²	Rank	Decile	Average rank
Index of Multiple Deprivation (IMD)¹³	23,619	8	20,391	7	11,851
Income	29,639	10	24,882	8	13,319
Employment	29,877	10	23,575	8	14,255
Education, Skills and Training	24,530	8	17,717	6	13,633
Health Deprivation and Disability	29,352	9	21,971	7	13,296
Crime	24,999	8	19,877	7	11,775
Barriers to Housing and Services	2,344	1	2,821	1	13,832
Living Environment	10,614	4	20,201	7	9,722
Income Deprivation Affecting Children Index (IDACI)	26,697	9	25,023	8	13,444
Income Deprivation Affecting Older People (IDAOPI)	29,462	9	25,005	8	11,478
Education, Skills and Training Children and Young People Sub-domain measures the attainment of qualifications and associated measures	21,932	7	16,730	6	-
Education, Skills and Training Adult Skills Sub-domain measures the lack of qualifications in the resident working-age adult population	25,379	8	17,640	6	-

¹⁰ English indices of deprivation 2015. File 10: local authority district summaries, [online]. Available at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015> [Checked 20/10/2018].

¹¹ Where 1 is most deprived, ranked out of 32,844 LSOAs in England.

¹² Where 1 is most deprived 10% of LSOAs.

¹³ The index of multiple deprivation is comprised of domains for: income; employment; education, skills and training; health deprivation and disability; crime; barriers to housing and services; and living environment.

Deprivation Indicator	North Somerset 013D		North Somerset 013B		North Somerset
	Rank ¹¹	Decile ¹²	Rank	Decile	Average rank
Barriers to Housing and Services Geographical Barriers Sub-domain relates to the physical proximity of local services	954	1	1,408	1	-
Barriers to Housing and Services Wider Barriers Sub-domain includes issues relating to access to housing such as affordability	26,043	8	22,015	7	-
Living Environment Indoors Sub-domain measures the quality of housing	6,051	2	14,885	5	-
Living Environment Outdoors Sub-domain contains measures of air quality and road traffic accidents	27,804	9	27,638	9	-