

9 Air Quality

9.1 Introduction

- 9.1.1 This Chapter presents the findings of the assessment of the likely significant effects from the Proposed Development (as defined in **Chapter 3**) with respect to air quality. The purpose of this Chapter is to describe and evaluate the likely air quality impacts (during construction and operation) and classify the effects of the Proposed Development considering relevant national, regional and local regulations and guidance.
- 9.1.2 This Chapter of the ES has been prepared by Stantec. In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.4**.
- 9.1.3 This Chapter is supported by the following technical appendices:
- Appendix D.1. IAQM Dust Guidance (2014) Approach
 - Appendix D.2. EPUK IAQM Guidance (2017) Screening Criteria
 - Appendix D.3 Model Inputs and Results Processing
 - Appendix D.4 Model Verification
 - Appendix D.5 Modelling Results
 - Appendix D.6 Figures
- 9.1.4 The Energy Statement for the Proposed Development (Ramboll, 2022) investigates three energy scenarios. One of these scenarios (Scenario 2) includes biogas Combined Heat and Power (CHP) plant forming part of the energy strategy for the Proposed Development. Further technical feasibility studies are required to confirm which energy scenario would be the most appropriate and the energy strategy for the Proposed Development has not been confirmed at this stage. Therefore, an assessment of impacts from onsite heating plant emissions has been scoped out of this chapter, and it is recommended that an assessment is undertaken at the detailed design stage of the Proposed Development should combustion-based onsite heating plant be proposed. Detailed design measures such as limiting emission concentrations and the provision of a suitable stack height to disperse emissions are readily available and will be used to ensure that no significant effects would arise from onsite heating plant emissions.

9.2 Policy Context, Legislation, Guidance and Standards

Air Quality Regulations

- 9.2.1 The Air Quality (England) Regulations 2000 (AQR) defined National Air Quality Objectives (NAQOs, a combination of concentration-based thresholds, averaging periods and compliance dates) for a limited range of pollutants. Subsequent amendments were made to the AQR in 2001 and 2002 to incorporate 'limit values' and 'target values' for a wider range of pollutants as defined in European Union (EU) Directives.
- 9.2.2 These amendments were consolidated by the Air Quality Standards Regulations 2010 (AQSR), which transposed the EU's Directive on ambient air quality and cleaner air for Europe (2008/50/EC).

9.2.3 Following the transition period after the UK's departure from the EU in January 2020, the Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 have amended the Air Quality Standards Regulations 2010 to reflect the fact that the UK has left the EU. The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 amended the PM_{2.5} limit value in the AQSR to 20 µg/m³.

9.2.4 The relevant NAQOs and limit values for this assessment are shown in **Table 9-1**.

Table 9-1 Relevant Air Quality Objectives / Limit Values

Pollutant	Time Period	Objectives	Source
NO ₂	1-hour mean	200 µg/m ³ not to be exceeded more than 18 times a year	NAQO and AQSR limit value
	Annual mean	40 µg/m ³	NAQO and AQSR limit value
PM ₁₀	24-hour mean	50 µg/m ³ not to be exceeded more than 35 times a year	NAQO and AQSR limit value
	Annual mean	40 µg/m ³	NAQO and AQSR limit value
PM _{2.5}	Annual mean	20 µg/m ³	AQSR limit value

9.2.5 The NAQOs for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004 respectively, but also continue to apply in all future years thereafter.

9.2.6 The 2019 Clean Air Strategy includes a commitment to set a "*new, ambitious, long-term target to reduce people's exposure to PM_{2.5}*" which the Environment Act 2021 commits the Secretary of State to setting.

National Air Pollution Plan for NO₂ on the UK

9.2.7 The National Air Quality Plan for NO₂ (DEFRA, 2018) sets out how the Government plans to deliver reductions in NO₂ throughout the UK, with a focus on reducing concentrations to below the EU Limit Values throughout the UK within the 'shortest possible time'.

9.2.8 The plan requires all local authorities in England which DEFRA identified as having exceedances of the Limit Values in their areas past 2020 to develop local plans to improve air quality and identify measures to deliver reduced emissions, with the aim of meeting the Limit Values within their area within "the shortest time possible". Potential measures include changing road layouts, encouraging public and private ultra-low emission vehicle (ULEV) uptake, the use of retrofitting technologies and new fuels and encouraging public transport. In cases where these measures are not sufficient to bring about the required change within 'the shortest time possible' then local authorities may consider implementing access restrictions on more polluting vehicles (e.g. Clean Air Zones (CAZs)). A CAZ is defined within the plan as being "*an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in a way that delivers improved health benefits and supports economic growth*" and may be charging or non-charging.

Air Quality Management

Air Quality Strategy

- 9.2.9 Part IV of the Environment Act 1995 required the Secretary of State to prepare and publish and 'strategy' regarding air quality.
- 9.2.10 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK (DEFRA, 2007). The primary objective of the Air Quality Strategy is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Air Quality Strategy sets out the NAQOs and Government policy on achieving these.
- 9.2.11 The Clean Air Strategy (2019) aims to lower national emissions of pollutants, thereby reducing background pollution and minimising human exposure to harmful concentrations of pollution. The Strategy aims to create a stronger and more coherent framework for action to tackle air pollution (DEFRA, 2019a).

Local Air Quality Management

- 9.2.12 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM) which requires local authorities to regularly and systematically review and assess air quality within their boundary and appraise development and transport plans against these assessments.
- 9.2.13 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the NAQOs within its AQMA.
- 9.2.14 The Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16); DEFRA, 2021a), issued by the Department for Environment, Food and Rural Affairs (DEFRA) for local authorities provides advice on where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year) as summarised in **Table 9-2**.

Table 9-2 Relevant Public Exposure

Averaging Period	NAQOs should apply at:	NAQOs don't apply at:
Annual mean	All locations where members of the public might be regularly exposed For example: Building façades of residential properties, schools, hospitals, care homes etc	Façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residences Kerbside sites Any other location where public exposure is expected to be short term
24-hour and 8-hour mean	All locations where the annual mean NAQO would apply, together with hotels and gardens of residences	Kerbside sites Any other location where public exposure is expected to be

Averaging Period	NAQOs should apply at:	NAQOs don't apply at:
		short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean NAQOs apply as well as: Kerbside sites Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside locations where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be regularly exposed for a period of 15 minutes or longer.	

Planning Policy

National Planning Policy

9.2.15 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied (Ministry of Housing, Communities & Local Government, 2021). The following paragraphs are considered relevant from an air quality perspective.

9.2.16 Paragraph 104 on promoting sustainable transport states:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: ...

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; ..."

9.2.17 Paragraph 105 goes on to state:

"Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health."

9.2.18 Paragraph 174 on conserving and enhancing the natural environment states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: ...

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land stability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans..."

9.2.19 Paragraph 185 within ground conditions and pollution states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on

health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

9.2.20 Paragraph 186 states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

9.2.21 Paragraph 187 states that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed".

National Planning Practice Guidance

9.2.22 Paragraph 005, Reference 32-005-20191101 (revision date 01.11.2019), of the PPG provides guidance on how considerations regarding air quality can be relevant to the development management process as follows:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.

Where air quality is a relevant consideration the local planning authority may need to establish:

- *The 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *Whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *Whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*

9.2.23 Paragraph 006, Reference 32-006-20191101 (revision date 01.11.2019), of the PPG identifies what specific air quality issues need to be considered in determining a planning application:

"Considerations that may be relevant to determining a planning application include whether the development would:

- *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; and significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations; and*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*

9.2.24 Paragraph 007, Reference 32-007-20191101 (revision date 01.11.2019), of the PPG provides guidance on how detailed an assessment needs to be:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

9.2.25 and

"The following could form part of assessments:

- *A description of baseline conditions and any air quality concerns affecting the area, and how these could change both with and without the proposed development;*
- *Sensitive habitats (including designated sites of importance for biodiversity);*
- *The assessment methods to be adopted and any requirements for the verification of modelling air quality;*
- *The basis for assessing impacts and determining the significance of an impact;*
- *Where relevant, the cumulative or in-combination effects arising from several developments;*
- *Construction phase impacts;*
- *Acceptable mitigation measures to reduce or remove adverse effects; and*

- *Measures that could deliver improved air quality even when legally binding limits for concentrations of major air pollutants are not being breached."*

9.2.26 Paragraph 008, Reference 32-008-20140306 (revision date 01.11.2019), of the PPG provides guidance on how an impact on air quality can be mitigated:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- *Maintaining adequate separation distances between sources of air pollution and receptors;*
- *Using green infrastructure, trees, where this can create a barrier or maintain separation between sources of pollution and receptors;*
- *Appropriate means of filtration and ventilation;*
- *Including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);*
- *Controlling dust and emissions from construction, operation and demolition; and*
- *Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."*

Local Planning Policy

South Gloucestershire Core Strategy 2006 - 2027

9.2.27 South Gloucestershire adopted their Core Strategy on 11th December 2013. Policy CS25 of the Core Strategy sets out South Gloucestershire Council's aspirations for development in the North Fringe of Bristol and includes the following policy relating to air quality:

"Development plan documents and development proposals will take account of the vision and partnership priorities for the communities of the North Fringe of Bristol urban area, and will:

...15. provide convenient and safe routes across the locality for pedestrians and cyclists as part of an integrated transport network, with safe crossings to break the barriers of major roads and rail corridors, contributing to the improvement of air quality..."

9.2.28 In addition, Policy CS9 states:

"The natural and historic environment is a finite and irreplaceable resource. In order to protect and manage South Gloucestershire's environment and its resources in a sustainable way, new development will be expected to:

...11. protect land, air and aqueous environments, building and people from pollution..."

SGC Policies, Sites and Places Plan

- 9.2.29 The Policies, Sites and Places Plan (PSP) forms part of the Local Plan. The PSP was adopted on 8th November 2017. The document is split into two parts, with section one covering policies for managing new development, and part two covering the allocation and protection of Sites and places within South Gloucestershire.
- 9.2.30 The following policy is of relevance to air quality:

Policy PSP21 – Environmental Pollution and Impacts

“Development proposals will be acceptable where they clearly demonstrate that development is sited and designed to prevent unacceptable risks and avoid unacceptable levels of pollution adversely impacting, by way of; fumes, dust, noise, vibration, odour, light or other forms of air, land, water pollution, exposure to contaminated land or land instability, directly or cumulatively, on:

- *environmental amenity; and*
- *the health, safety and amenity of users of the site or the surrounding area...*

Air Quality

Development that, on its own or cumulatively, has the potential for significant emissions to the detriment of air quality, particularly in or adjacent to air quality management areas, will be acceptable where potential adverse effects are mitigated to an acceptable level, by an appropriate scheme of mitigation.

Development that would introduce new receptors into designated air quality management areas and other potential areas of poor air quality, should take account of existing air pollution and include measures to mitigate the impact on future receptors to an acceptable level. Development outside Air Quality Management Areas (AQMA) should not cause new AQMA to be designated.”

South Gloucestershire Emerging Local Plan 2020

- 9.2.31 SGC is currently in the process of preparing a new Local Plan. This is currently at a very early stage and is known as the South Gloucestershire Local Plan 2020. SGC has provided a list of the range of policies it intends to include in the Local Plan, including proposed strategic policy ‘Environment and Heritage’ which will replace policy CS9 of the existing Core Strategy, and proposed non-strategic policy ‘pollution and mitigation’ which will replace policy PSP21 of the Policies, Sites and Places Plan, once adopted.

South Gloucestershire Air Quality Action Plan

- 9.2.32 The South Gloucestershire Air Quality Action Plan (AQAP) adopted in March 2012 sets out local measures aimed at improving air quality within South Gloucestershire, especially within the declared AQMA. It describes the actions that SGC will take to pursue improvements in air quality including encouraging sustainable travel, reduce car usage, improve access by bicycle and restricting traffic where necessary.

Guidance

DEFRA ‘Local Air Quality Management Technical Guidance (LAQM.TG(16))’

- 9.2.33 DEFRA LAQM.TG(16) was published for use by local authorities in their LAQM review and assessment work (DEFRA, 2021a). The document provides key guidance on aspects of air

quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

EPUK / IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'

- 9.2.34 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance to help ensure that air quality is properly accounted for in the development control process (EPUK / IAQM 2017). It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

IAQM 'Guidance on the Assessment of Dust from Demolition and Construction'

- 9.2.35 Guidance on the assessment of dust from demolition and construction has been published by the IAQM (IAQM, 2014). The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities in order to identify appropriate mitigation measures that are defined within further IAQM guidance.

9.3 Consultation

- 9.3.1 The Scoping Opinion received from South Gloucestershire Council (SGC) received in February 2022 included comments from the Environmental Protection Team. The Environmental Protection Team generally agreed with the air quality assessment methodology. As recommended in the Scoping Opinion, the Emission Factor Toolkit v11.0 (DEFRA, 2021b) has been used and street canyons within the Proposed Development have been assessed.
- 9.3.2 Further telephone consultation was undertaken with an SGC Environmental Protection Officer and Bristol City Council (BCC) Air Quality Officer in February 2022 to discuss any particular concerns relating to air quality in South Gloucestershire and the City of Bristol, and to agree detailed aspects of the air quality assessment methodology including:
- the use of a 2025 emission factor year and background concentration year for the 2036 full development assessment; and
 - the use of 2019 monitoring data to verify the air quality model as the latest years of data (2020 and 2021) are not considered to be representative due to Covid-19 restrictions.
- 9.3.3 The Scoping Opinion by SGC requested that an assessment of the impacts of the Development against the current state of the environment be undertaken. Further consultation with the SGC Environmental Protection Officer clarified that the 'current state of the environment' for the purposes of this assessment would be the 2036 baseline without the extant permission. However, the Project's Transport consultants have stated that a comparison between the traffic flows presented at the time of the planning application for the extant planning consent and the traffic flows presented as part of this application would not be appropriate.
- 9.3.4 This is because the extant planning consent was modelled using a previous version of the Greater Bristol Area Transport Study (GBATS3) traffic assignment model, while the Proposed Development has been modelling with GBATS4. The primary change is that GBATS4 uses far more recent traffic flow data, which in turn affects traffic distribution across the highway network. Other modelling assumptions have also been updated from GBATS3 to GBATS4, including changes to the highway network and further segmentation of user classes in GBATS4 compared to GBATS3, which would affect the modelled traffic flows and render such a comparison of limited value in understanding the impacts resulting from the Site.

9.4 Methodology

Study Area

9.4.1 The study area adopted for this assessment is as follows:

- for the construction dust risk assessment, the study area (based on IAQM, 2014 guidance) is defined as comprising the area up to 350 m from the site boundary and 50 m from the route used by construction vehicles (up to 500 m from the site entrances);
- for the operational phase road traffic emissions assessment, the study area (based on EPUK / IAQM, 2017 guidance) includes the Site, all roads (and adjacent properties) within 250 m of the site boundary and, subject to the limitations of the traffic model (discussed below), other relevant roads (and adjacent properties) predicted (as a result of the Proposed Development) to exceed the screening criteria outlined in and **Appendix D.2**.

9.4.2 By achieving progressive modal shift away from car use over the Transport Phases, it is envisaged that the car trips generated by this revised OPA will not exceed the quantum that has been consented as part of the Cribbs Patchway New Neighbourhood (CPNN) Supplementary Planning Document (SPD). However, the relocation of 1,000 homes consented on the Patchway Trading Estate to the Site will result in local redistribution of vehicle trips associated with these 1,000 homes. Therefore, redistribution will be local to the Filton / Patchway area and changes in vehicles flows on the wider highway network or Strategic Road Network are not expected.

9.4.3 Whilst the traffic data indicates that there are roads outside of the Filton / Patchway area that exceed the EPUK / IAQM criteria, these changes in traffic flows have been confirmed by the Project's Transport Consultant to be the result of differences in the GBATS transport model between the 2036 baseline and 2036 'with development' scenarios and are not expected to occur as a result of the Proposed Development.

9.4.4 Therefore, the EPUK / IAQM screening criteria has been applied to the Filton / Patchway area only, where changes in traffic flow attributable to the Proposed Development are reliably expected to occur.

Baseline Data Collection

9.4.5 Any exceedances of the Limit Values along roads within the study area have been identified using the 2021 NO₂ and PM Projections Data published by DEFRA (DEFRA, 2020a). Information on baseline air quality in the study area has been obtained by collating the results of monitoring carried out by SGC and their LAQM reports to identify potential AQMAs.

9.4.6 Background concentrations for the study area have been defined using the national pollution maps published by DEFRA which cover the whole country on a 1x1 km grid (DEFRA, 2020b).

Assessment

Construction Dust Impacts

9.4.7 During demolition and construction, dust from on-site activities and off-site trackout by construction vehicles has the potential to impact on sensitive human receptors within the study area; the main potential impacts are loss of amenity (as a result of dust soiling) and deterioration of human health (as a result of concentrations of PM₁₀).

9.4.8 The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating

activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source(s).

- 9.4.9 Separation distance is also an important factor. Large dust particles (greater than 30µm), which can be potentially responsible for most dust annoyance, will largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10 µm), which are the predominant fraction that can be potentially responsible for human health impacts largely remain airborne. However, the impact on the short-term concentrations of PM₁₀ occurs over a shorter distance due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 9.4.10 The assessment of the risk of potential construction dust impacts has been undertaken with reference to relevant guidance (IAQM, 2014).

Screening Assessment

- 9.4.11 The first stage of the assessment involves screening to determine if there are sensitive receptors within threshold distances of the activities associated with the construction phase of the scheme; defined as the study area. No further assessment is required if there are no receptors within the study area.
- 9.4.12 The IAQM guidance outlines that an assessment is only required in cases where:
- A 'human receptor' is located within:
 - 350 m of the boundary of the Site; or
 - 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the site entrances.
 - An 'ecological receptor' is located within:
 - 50 m of the boundary of the Site; or
 - 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the Site entrances.

Further Assessment

- 9.4.13 The risk of impacts associated with dust soiling and PM₁₀ caused by the Proposed Development has been determined (following the IAQM (2014) guidance) based on the dust emission class (or magnitude) for each activity arising from four activities in the absence of mitigation (demolition, earthworks, construction and trackout), the sensitivity of nearby receptors and the overall sensitivity of the area. The dust emission class, receptor sensitivity and the overall sensitivity of the area are determined using the criteria outlined in **Table D-1-1 – Table D-1-5 of Appendix D.1** (based on the IAQM (2014) guidance), indicative thresholds and professional judgement. The risk of dust impacts arising is a product of the relationship between the dust emission magnitude and the area sensitivity and is based on the criteria outlined in **Table D-1-6, Appendix D.1** (based on the IAQM guidance). The risk of impact is then used to determine the mitigation requirements.
- 9.4.14 The IAQM guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations. This approach accords with that adopted across the EIA, with the CEMP being treated as embedded mitigation.

- 9.4.15 With appropriate mitigation in place, the IAQM guidance indicates that the residual effect dust emissions associated with the demolition and construction can be classified as being 'not significant'.

Demolition and Construction Road Traffic Impacts

- 9.4.16 The potential for a significant overall effect on existing sensitive receptors within the Study Area as a result of emissions from demolition and construction traffic generated by the Proposed Development has been determined qualitatively, taking into consideration the screening criteria outlined in the EPUK / IAQM guidance (EPUK / IAQM, 2017) (see **Appendix D.2**), the anticipated routing of the generated traffic and the anticipated duration of impacts associated with the generated traffic.

Operational Road Traffic and Railway Emission Impacts

Screening Assessment

Impacts of Development-Generated Traffic on Existing Sensitive Human Receptors

- 9.4.17 The potential for significant impacts on existing sensitive receptors within the study area as a result of emissions from traffic generated by the Proposed Development is determined based on the screening criteria outlined in the EPUK / IAQM guidance (see **Appendix D.2** which includes consideration of the volume and composition of traffic generated by the Proposed Development and existing local air quality conditions (i.e. the presence of any declared AQMAs)).
- 9.4.18 If it is not possible to screen out the potential for significant impacts, then a detailed assessment will be undertaken, which is the case in this chapter of the ES.

Site Suitability

- 9.4.19 Initially a qualitative assessment to determine whether there is a potential for exceedances of the relevant NAQOs at sensitive locations within the Proposed Development has been undertaken, taking into account future baseline air quality conditions within and in close proximity to the Site, and the proximity of sensitive locations within the development to nearby sources of emissions. If it is not possible to screen out the potential for significant impacts, then a detailed assessment will be undertaken, which is the case for this chapter of the ES.
- 9.4.20 There is also potential for emissions from stationary and moving locomotives using the Henbury Loop line and the North Filton station (proposed as part of MetroWest Phase 2 and anticipated to open in 2023) to impact on proposed sensitive locations within the Site. The impact of emissions from moving and stationary trains has been determined using the screening criteria provided in DEFRA's LAQM TG.16 (DEFRA, 2021a) as follows:
- Stationary diesel or steam locomotives:
 - identify locations where diesel or steam locomotives are regularly stationary (at least three times a day) for periods of 15-minute or more; and
 - determine relevant exposure within 15 m of the locomotives.
 - Moving diesel locomotives:
 - determine relevant exposure within 30 m of the relevant railway tracks (Table 7.2 of LAQM TG.16 provides information on which lines should be considered); and
 - identify whether the background annual mean NO₂ concentrations is above 25 µg/m³ in these areas.

Detailed Assessment

- 9.4.21 Concentrations of pollutants (NO₂, PM₁₀ and PM_{2.5}) have been predicted for a range of worst-case locations of relevant human receptor exposure both at sensitive existing properties and within the Proposed Development itself to allow comparison with the NAQOs and (for existing receptors only) determination of the significance of impacts at each receptor.
- 9.4.22 Emissions from road vehicles and their resultant impact at receptor locations have been predicted using the ADMS-Roads dispersion model (v5.0.0.1). The model requires the user to provide various input data, including traffic flows (in AADT format), vehicle composition (i.e. the proportion of Heavy Duty Vehicles (HDVs)), road characteristics (including road width, gradient and street canyon dimensions, where applicable), and average vehicle speed. AADT flows and the proportions of HDVs, for roads within the study area have been provided by the Project's transport consultants, Momentum. Traffic data used in this assessment are summarised in **Table D-3-3**, **Appendix D.3** and the modelled roads are shown in **Figure D-6-1**, **Figure D.6**. The following traffic scenarios have been modelled:
- 2019 'existing'¹ baseline (for model verification);
 - 2036 without the Proposed Development (with the extant permission);
 - 2036 with the Proposed Development (without access from Concorde Roundabout and the combination junction); and
 - 2036 with the Proposed Development (with access from Concorde Roundabout and the combination junction).
- 9.4.23 This chapter assesses a scenario with the use of the Concorde Roundabout and combination junction accesses as the 'core assessment' followed by a scenario without the use of these accesses as a sensitivity test which is consistent with **Chapter 8 – Transport and Access**.
- 9.4.24 It should be noted that the 2036 traffic data scenarios, as defined by the GBATS4 transport model, takes into account committed developments and therefore these developments are not reported separately in a cumulative effects assessment and are included in the 2036 Core and Sensitivity Test assessments. A list of these cumulative developments is presented in **Table 5.3** in **Chapter 5** of the ES. However, GBATS4 does not include YTL Arena as a cumulative development. Therefore, the traffic/air assessment reflects a typical day, rather than a day when there is an event on at YTL Arena. Although there will be regular smaller sized events at YTL Arena, large events will be infrequent (estimated at 26 per annum). The air quality impacts of the YTL Arena are reported in Chapter 10 of the ES for the Arena (planning reference 19/05500/P) and were concluded to be 'not significant'.
- 9.4.25 The model also requires meteorological data and has been run using 2019 meteorological data from the Almondsbury meteorological station, which are considered suitable for this area due to the proximity of the Almondsbury meteorological station to the Site (approximately 3.5 km northeast). **Appendix D.3** provides further details on the model inputs.
- 9.4.26 Traffic emissions have been calculated using the Emission Factor Toolkit (EFT) v11.0 (DEFRA, 2021b), which utilises NO_x emission factors taken from the European Environment Agency (EEA) COPERT 5.3 emission tool. The traffic data were entered into the EFT to provide emission rates for each of the road links entered into the model. Road vehicular emissions are primarily associated with the exhaust emissions but also include particles generated from abrasion (of tyres, brakes and road). The EFT allows users to calculate road

¹ 2019 has been used as the 'existing' year as this is the latest year for which representative local monitoring data is available.

vehicle pollutant emission rates for NO_x, PM₁₀ and PM_{2.5} (exhaust and brake, tyre and road wear) for a specified year, road type, vehicle speed and vehicle fleet composition.

9.4.27 The EFT provides pollutant emission rates for 2018 through to 2050. 2031-2050 emission rates are provided to support climate assessments and appraisals only and emission rates after 2030 are not recommended for use in air quality assessments. The EFT emission rates takes into consideration bespoke vehicle fleet information as well as the following information available from the National Atmospheric Emissions Inventory (NAEI):

- fleet composition data for motorways, urban and rural roads in the UK (excluding London);
- fleet composition based on European emission standards from pre-Euro I to Euro6/VI (including Euro 6 subcategories);
- scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting; and
- technology conversions in the national fleet.

9.4.28 Road vehicle exhaust emissions of NO_x are projected to decrease year-on-year due to technological advances and improvements to the fleet mix² i.e. penetration of Euro VI HDVs, which recent research suggests are performing well. Whilst there has been uncertainty over NO_x emissions from vehicle exhausts (particularly from Euro 5 and 6 LDVs it is important to note the EFT is not based on the Euro emission standards.

9.4.29 Generally, concentrations of air pollutants in the UK are anticipated to decrease in the coming years²; as such, in most cases, the earlier the year that is assessed, the more worst-case the assessment is. In order to take account of uncertainties relating to future year vehicle emissions and background pollutant concentrations to provide a conservative assessment, the assessment has been carried out utilising 2025 emission factors and background concentrations combined with traffic data from 2036 (which includes committed development and growth up to this year and completed development flows).

Air Quality Impacts Significance Criteria

9.4.30 The relevant NAQOs are set out in **Table 9-1**. The predicted pollutant concentrations in the full development scenario (and sensitivity) at each identified sensitive receptor have been compared to the relevant NAQOs and any exceedances identified.

9.4.31 Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the 1-hour mean NO₂ NAQO is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment this concentration has been used to screen whether the one-hour mean objective is likely to be achieved (DEFRA, 2018a). Analysis of long-term monitoring data also suggests that if the annual mean PM₁₀ concentration is less than 32 µg/m³ then the 24-hour mean PM₁₀ NAQO is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment this concentration has been used to screen whether the 24-hour mean NAQO is likely to be achieved

9.4.32 There is no official guidance in the UK on how to assess the significance of the air quality impacts of existing air quality on a new development. The assessment of proposed receptors within the Site has therefore been limited to predicting pollutant concentrations at worst-case receptors within the Site and comparing these predicted concentrations to the relevant

² NO_x emissions from transport are projected to decrease from 288.19 kilotonnes (kt) in 2020 to 253.59 kt in 2025, and 249.90 kt in 2030 (AEA, 2012).

NAQOs, with the overall significance being based on whether the NAQOs for each pollutant are exceeded or not.

- 9.4.33 There is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development on existing receptors. The approach developed by EPUK and the IAQM (EPUK / IAQM, 2017), which considers the change in air quality as a result of a Proposed Development on existing receptors in combination with baseline concentrations at the receptors (i.e. the sensitivity of the receptor), has therefore been used. The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective and is shown in **Table 9-3**.

Table 9-3 Impact Description Criteria

Long term average Concentration at receptor in assessment year	% Changes in Concentration with development in relation to NAQO / Limit Value			
	1*	2-5	6-10	>10
> 110 % ^a	Moderate	Substantial	Substantial	Substantial
>102% - ≤110% ^b	Moderate	Moderate	Substantial	Substantial
>95% - ≤102% ^c	Slight	Moderate	Moderate	Substantial
>75% - ≤95% ^d	Negligible	Slight	Moderate	Moderate
≤75% ^e	Negligible	Negligible	Slight	Moderate

Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.

% change rounded to nearest whole number. Where the % change is 0 (i.e. Less than 0.5%) the impact will be Negligible.

a NO₂ or PM₁₀: > 44 µg/m³ annual mean; PM_{2.5} >27.5 µg/m³ annual mean; PM₁₀ >35.2 µg/m³ annual mean (days).

b NO₂ or PM₁₀: > 40.8 – ≤ 44 µg/m³ annual mean; PM_{2.5} > 20.4 – ≤22 µg/m³ annual mean; PM₁₀ >32.64 – ≤35.2 µg/m³ annual mean (days).

c NO₂ or PM₁₀: > 38 – ≤40.8 µg/m³ annual mean; PM_{2.5} >19 – ≤20.4µg/m³ of annual mean; PM₁₀ >30.4 – ≤32.64 µg/m³ annual mean (days).

d NO₂ or PM₁₀: >30 – ≤38 µg/m³ annual mean; PM_{2.5} >15 – ≤19 µg/m³ annual mean; or <24 – ≤ 30.4 µg/m³ annual mean (days).

e NO₂ or PM₁₀: ≤30 µg/m³ annual mean; PM_{2.5} ≤15 µg/m³ annual mean; PM₁₀ ≤24 µg/m³ annual mean (days).

- 9.4.34 The guidance states that the overall assessment of significance should be based on professional judgement, taking into account factors including:
- the number of properties affected by 'slight', 'moderate' or 'substantial' adverse air quality impacts and a judgement on the overall balance;
 - the magnitude of the changes and the descriptions of the impacts at the receptors;
 - whether or not an exceedance of an NAQO or limit value is predicted to arise in the operational study area (where there are significant changes in traffic) where none existed before or an exceedance area is substantially increased;
 - the uncertainty, comprising the extent to which worst-case assumptions have been made; and
 - the extent to which an NAQO or limit value is exceeded.
- 9.4.35 Therefore, where impacts at an individual receptor are classified as 'negligible' or 'slight', effects would typically be considered 'not significant'. However, where 'moderate' or 'substantial' adverse impacts are identified at individual receptors, the overall effect needs to be considered in the round taking into account the changes at all of the modelled receptor

locations, with a judgement made as to whether the overall air quality effect of the development is 'significant' or not.

Limitations

- 9.4.36 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic and data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 9.4.37 As noted previously (see **Paragraphs 9.3.3 and 9.3.4**), a comparison between the traffic flows presented at the time of the planning application for the extant planning consent and the traffic flows presented as part of this application would not be appropriate.
- 9.4.38 There has been an acknowledged disparity between national road transport emissions projections and measured annual mean concentrations of nitrogen oxides (NO_x) and NO₂ for many years. Recent monitoring has shown that reductions in concentrations are now being measured in many parts of the country (Air Quality Consultants Ltd., 2020), however, there is still some uncertainty regarding the rate at which emissions will reduce in the future and therefore some consideration must be given to the accuracy of any projection and to appropriately respond to this.
- 9.4.39 The complete development modelling has been based on 2025 emission factors and background concentrations, whilst utilising traffic flows for 2036. The model has been verified against 2019 monitoring data. This is considered to provide an appropriately conservative assessment taking into account the uncertainties regarding future vehicle emission factors.
- 9.4.40 The default fleet projections in the DEFRA's EFT v11.0 and 2018-based background maps are based on fleet growth assumptions which were current before the Covid-19 outbreak in the UK. As a result, default outputs from these tools do not reflect short- or longer-term impacts on emissions in 2020 and potentially beyond resulting from behavioural change during lockdowns. As stated in **Chapter 8 – Transport and Access**, traffic levels have generally returned to pre-pandemic levels. Therefore, the implications of the use of pre-pandemic fleet projections in DEFRA's EFT v11.0 and 2018-based background maps are considered to be limited.

9.5 Baseline Conditions

Sensitive Receptor Locations

- 9.5.1 Relevant sensitive human receptor locations are places where members of the public might be expected to be regularly present over the averaging period of the NAQOs. The NO₂, PM₁₀ and PM_{2.5} annual mean and one-hour mean NO₂ NAQO sensitive locations include existing and proposed residences and an existing nursery. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, traffic lights and roundabouts where traffic may become congested, where there is a combined effect of several road links and routes along which substantial volumes of traffic generated by the Proposed Development will travel.
- 9.5.2 Based on these criteria, 39 existing residential properties within the study area and 21 proposed sensitive locations (residential properties and potential school locations) within the development itself have been identified as worst-case receptors for the assessment. The locations of these receptors have been chosen to represent locations where impacts from road traffic generated by the Proposed Development are likely to be the greatest i.e. as a result of development traffic at junctions. These locations are described in **Appendix D.3** and shown in **Figure D-6-2, Appendix D.6**.

- 9.5.3 Concentrations have also been predicted at seven of SGC's diffusion tube monitoring sites (see **Table 9-4**) in order to verify the modelled results. **Appendix D.4** provides further details on the verification method.

Ambient Air Quality

Limit Values

- 9.5.4 The study area does not contain any predicted or measured exceedances of the Limit Values. The study area is not within a zone where DEFRA have reported an exceedance of a Limit Value either in the 'existing' baseline year (2019) or in future years.

LAQM

- 9.5.5 SGC has investigated air quality within its area as part of its responsibilities under the LAQM regime. SGC currently has two AQMAs declared due to exceedances of the annual NO₂ NAQO, both of which are located more than 5 km away from the Site. The Cribbs Causeway AQMA, which incorporated a single property (Hollywood Cottage) on Blackhorse Hill, was revoked in July 2020 due to continued compliance with the NAQOs.
- 9.5.6 The neighbouring local authority, Bristol City Council (BCC), has also declared an AQMA which encompasses Bristol City-centre and parts of the main radial roads. BCC will also implement a Class D CAZ (applying to all vehicles which do not meet the minimum emissions standards of Euro 6 for diesel and Euro 4 for petrol) in Summer 2022. The CAZ covers the central part of Bristol City up to St James Barton Roundabout in the north, the A3029 Ashton Gate Underpass in the south, the A4 Hotwell Road to the west and A420 West Street to the east. The Site is not located within an AQMA, the closest AQMA to the Site is the Bristol AQMA, approximately 2.3 km away at its closest point on Gloucester Road.

Local Monitoring Data

NO₂

- 9.5.7 SGC carries out monitoring at one automatic monitoring station on Station Road, Yate, however this monitoring location is more than 10 km from the Site. SGC also deploys NO₂ diffusion tubes at 101 locations, including 15 locations located within the study area (see **Figure D-6-3, Appendix D.6**). 2015 - 2019 bias adjusted monitoring results for the most representative and closest monitoring locations to the Site are provided in **Table 9-4**. 2020 monitoring results have not been included in **Table 9-4**, as they are not considered to be representative of 'normal' long-term conditions due to Covid-19 restrictions in place during 2020.

Table 9-4 Measured Annual Mean NO₂ Concentrations 2015 – 2019

Site ID	Site Type	Within AQMA	Annual Mean (µg/m ³)				
			2015	2016	2017	2018	2019
DT10 – 152, Gloucester Road North Pizza Bello Façade, Filton*	Roadside	No	33.2	34.1	34.7	34.7	35.9
DT12 – Church Road rear of Aviva, Stoke Gifford	Roadside	No	28.6	29.7	28.4	27.7	25.1
DT13 – MOD Roundabout, Filton	Roadside	No	32.1	34.6	30.1	31.7	30.5
DT44 – Hatchet Road, Stoke Gifford	Roadside	No	29.8	31.9	30.1	30.6	30.4
DT63 – 28, Leaze Park, Patchway	Roadside	No	23.1	25.9	24.8	22.2	19.0

Site ID	Site Type	Within AQMA	Annual Mean ($\mu\text{g}/\text{m}^3$)				
			2015	2016	2017	2018	2019
DT87A – Blackhorse Hill, Hollywood Cottage façade, Cribbs Causeway	Roadside	No (within revoked Cribbs Causeway AQMA)	28.4	28.3	26.6	24.7	25.0
DT87B - Blackhorse Hill, Hollywood Cottage façade, Cribbs Causeway	Roadside	No (within revoked Cribbs Causeway AQMA)	28.7	29.9	27.2	25.4	25.6
DT87C - Blackhorse Hill, Hollywood Cottage façade, Cribbs Causeway	Roadside	No (within revoked Cribbs Causeway AQMA)	29.5	29.3	27.2	25.5	25.4
DT113 – 5, Falcon Close façade, Patchway	Roadside	No	32.4	31.9	30.3	27.2	24.7
DT119 – 137, Gloucester Road North, Rowe Vets, Filton Northville*	Roadside	No	33.6	34.6	30.2	30.1	29.1
DT124 – 702a, Filton Avenue, Filton	Roadside	No	32.1	34.4	29.7	32.0	30.7
DT125 – 71, Station Road, Filton	Roadside	No	25.8	26.7	29.1	26.8	27.3
DT129 – 2, Holly Cottages rear façade, Cribbs Causeway	Roadside	No	29.5	33.4	29.2	28.6	23.9
DT130 – 2, Mayfield Cottages façade, Cribbs Causeway*	Roadside	No	26.8	28.9	26.5	24.9	22.1
DT136 – 26, Gipsy Patch Lane façade, Little Stoke	Roadside	No	22.1	22.9	22.5	21.4	20.8
DT148 – 109, Gloucester Road North façade, Filton*	Roadside	No	34.0	34.2	24.2	23.9	22.1
DT149 – 707, Southmead Road façade, Filton*	Roadside	No	29.4	31.3	26.9	27.8	25.1
DT152 – 188, Oaktree Crescent, Ip49, Bradley Stoke*	Roadside	No	30.9	30.1	30.5	27.4	26.9
DT170 – 204, Gloucester Road front façade, Patchway*	Roadside	No	-	-	24.3	24.1	22.7
NAQO			40				

Exceedances of the NAQO are highlighted in bold.

2015 – 2019 data taken from the SGC 2020 Air Quality Annual Status Report (SGC, 2021).

* Used for model verification.

- 9.5.8 Measured concentrations have been below the annual mean NAQO between 2015 – 2019, including at the closest monitoring location to the Site, DT130 on Cribbs Causeway. Furthermore, measures concentrations at all diffusion tube monitoring sites are below $60 \mu\text{g}/\text{m}^3$, indicating that it is unlikely that any exceedances of the one-hour mean NAQO have occurred. NO_2 concentrations at the majority of monitoring locations have decreased between 2015 – 2019, with the exception of DT10 and DT125.

PM₁₀ and PM_{2.5}

- 9.5.9 SGC measures PM₁₀ concentrations at the Yate automatic monitoring station, however this monitoring location is more than 10 km from the Proposed Development. SGC does not undertake monitoring of PM_{2.5} concentrations.

Predicted Background Concentrations

- 9.5.10 Estimated background concentrations for the Site have been obtained from the latest 2018-based national maps provided by DEFRA (DEFRA, 2020b). The DEFRA background concentrations for the study area/identified receptors area are provided in **Table 9-5**.
- 9.5.11 The background concentrations are all well below the relevant NAQOs both in the 'existing' and future years.

Table 9-5 Estimated Annual Mean Background Concentrations

Year	Location (x,y)	Annual Mean ($\mu\text{g}/\text{m}^3$)		
		NO ₂	PM ₁₀	PM _{2.5}
2019	356,180 ^a	18.5	15.3	9.6
	357,180 ^b	14.9	14.5	9.2
	357,181 ^c	16.8*	15.0	9.5
	358,180 ^d	12.9	13.7	8.8
	359,180 ^e	12.6	13.8	8.9
	360,178 ^f	15.0	14.6	10.0
	360,179 ^g	15.5	14.9	9.8
	360,180 ^h	15.4	14.8	9.5
	360,181 ⁱ	21.6	15.7	10.3
	360,182 ^j	18.4	15.3	9.9
2025	356,180 ^a	13.4	14.4	8.9
	357,180 ^b	11.1	13.6	8.5
	357,181 ^c	12.3	14.1	8.8
	358,180 ^d	10.1	12.8	8.0
	359,180 ^e	10.0	12.9	8.2
	360,178 ^f	11.9	13.6	9.2
	360,179 ^g	12.1	14.0	9.1
	360,180 ^h	12.3	13.8	8.7
	360,181 ⁱ	17.7	14.7	9.6
	360,182 ^j	14.4	14.3	9.2
NAQOs		40	40	20

^a Existing receptor R09.

^b Existing receptors R05 - R08.

^c Existing receptors R01 - R04 and monitoring location DT130.

^d Proposed receptors PR14, PR15, PR18, PR19, PR20 and PR20.

^e Existing receptors R11 - R13 and proposed receptors PR04 - PR13, PR16 and PR17.

^f Monitoring location DT148.

^g Existing receptor R10, proposed receptor PR03 and monitoring locations DT149, DT10 and DT119.

^h Existing receptors R14, R16 and R17, and proposed receptors PR01 and PR02.

ⁱ Existing receptors R15, R18 - R32 and monitoring location DT170.

^j Existing receptors R33 - R39 and monitoring location DT152.

* Motorway NOx sector removed using DEFRA's NOx Sector Removal Tool (v8.0).

Note: Projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these tools do not reflect short- or longer-term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

Predicted Baseline Concentrations

- 9.5.12 The ADMS-Roads model has been used to predict baseline NO₂, PM₁₀ and PM_{2.5} concentrations at each of the existing receptor locations identified in **Table D-3-2, Appendix D.3**. The results for the baseline scenarios are presented in **Table D-5-1, Appendix D.5**.
- 9.5.13 The annual mean NO₂, PM₁₀ and PM_{2.5} NAQOs are not predicted to be exceeded at any of the existing receptor locations in 2019 or 2036. Furthermore, predicted concentrations of NO₂ are lower than 60 µg/m³ during 2019 and 2036, indicating that exceedances of the 1-hour mean NAQO are unlikely, and predicted concentrations of PM₁₀ are lower than 32 µg/m³ during 2019 and 2036, indicating that exceedances of the 24-hour mean NAQO are unlikely.

Baseline Evolution

- 9.5.14 Baseline concentrations of the pollutants are predicted to decrease between 2019 and 2036 as vehicle emission factors and background concentrations are expected to improve due to technological advances and national and international regulatory regimes, despite general population growth leading to traffic increases on the road network.

9.6 Embedded Mitigation

- 9.6.1 As discussed in the **Chapter 8 – Transport and Access**, the Proposed Development seeks to encourage sustainable transport modes and the following transport-related embedded mitigation are considered relevant to the air quality impacts discussed in this chapter:
- The Proposed Development includes two major pedestrian boulevards which will connect the key areas within the masterplan to create a network of car-free routes.
 - The Cribbs Patchway Metrobus Extension route has been revised to access the Site via the A38 entrance.
 - Provision of short-stay and long-stay cycle parking for both private cycles and shared mobility operators to encourage the use of cycles, e-bikes and e-scooters and discourage shorter car journeys.
 - Measures to discourage car usage will be central to achieving modal shift and is intended to be achieved by reducing the overall car parking provision at each transport phase, pricing strategies, car clubs and implementing controlled parking zones (CPZs).
 - To encourage the use of sustainable transport options, incentives or subsidies will be offered to residents and staff that live and/or work in the Site. This could take the form of providing subsidised annual bus or rail season tickets for an agreed period of time.
- 9.6.2 In addition to the transport-related measures outlined above, a Construction Environmental Management Plan (CEMP) will be implemented throughout the construction phase of the Proposed Development. This will include standard construction dust mitigation measures outlined below, which have been determined based upon the outcomes of the construction dust risk assessment presented in **Section 9.7**.

Communication

- Develop and implement a stakeholder communications plan.
- Display the name and contact details of persons accountable on the Site boundary.
- Display the head or regional office information on the Site boundary.

Management

- Develop and implement a dust management plan.
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions.
- Record exceptional incidents and action taken to resolve the situation.
- Carry out regular site inspections to monitor compliance with the dust management plan and record results.
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken.
- Agree dust monitoring locations with the local authority and instigate monitoring 3 months in advance of works commencing in the area.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.
- Fully enclose Site or specific operations where there is a high potential for dust production and the Site is active for an extensive period.
- Avoid site run off of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove potentially dusty materials from Site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators where possible.
- Produce a Construction Logistics Plan to manage the delivery of goods and materials.
- Only use cutting, grinding and sawing equipment with dust suppression equipment.
- Ensure an adequate supply of water on-site for dust suppressant.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate.
- Ensure equipment is readily available on-site to clean up spillages of dry materials.
- No on-site bonfires and burning of waste materials on-site.

Demolition

- Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure water suppression is used during demolition operation.
- Avoid explosive blasting, using appropriate manual and mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.
- Earthworks
- Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored silos with suitable emissions control systems.

Trackout

- Use water assisted dust sweepers on the Site access and local roads.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials.
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable.
- Install hard surfaced haul routes which are regularly damped down.
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.
- The Site access gate to be located at least 10m from receptors where possible.

9.7 Assessment of Likely Effects

Construction Dust Impacts

Screening Assessment

- 9.7.1 There are a number of existing sensitive human receptors (including residential properties, a school and a nursery) located within 350 m of the site boundary and within 50 m of the routes that will be used by demolition and construction vehicles. As such, further assessment of the risk of dust soiling and PM₁₀ emissions at human receptor locations is required.
- 9.7.2 Filton Wood Site of Nature Conservation importance (SNCI) is located partially within the northern boundary of the Site off Hayes Way. As such, further assessment of the risk of ecological impacts resulting from dust soiling is required.

Further Assessment

Dust Emission Magnitude

The dust emissions magnitude of demolition, earthworks and construction activities and as a result of trackout have been determined based the criteria shown in **Table D-1-1, Appendix D.1**.

- Given the nature of the previous and existing site uses, demolition will be limited to the excavation, crushing and re-use of the existing runway and other hard surfaces on the Site. Due to the presence of on-site crushing and the volume of material to be demolished being $>100,000 \text{ m}^3$, the dust emission magnitude of demolition activities is judged to be 'large'.
- Proposed earthworks activities comprise clearance of vegetation, soil preparation and landscaping. The Site is $>10,000 \text{ m}^2$ and there are expected to be more than ten earth-moving vehicles active at any one time. The soil at the Site is largely classified as seasonally wet loamy and clayey soils with an argillaceous soil grain size (British Geological Survey, 2022) and are therefore considered to be moderately dusty, particularly during periods of dry weather. Based on this, the dust emission magnitude of earthworks activities is judged to be 'large'.
- Construction activities will be split across four construction phases, all of which will include the construction of building volumes estimated to be $>100,000 \text{ m}^3$. Based on this, the dust emission magnitude of construction activities is judged to be 'large'.
- The number of HDVs that will exit the Site will vary depending upon the processes occurring at any one time. The average number of daily outward HDV movements is expected to be 43, however a worst-case has been assumed that daily outward HDV movements could exceed 50 during peak construction periods. Based on this, the dust emission magnitude of trackout is judged to be 'large'.

Area Sensitivity

- 9.7.3 The area sensitivity to dust soiling and human health impacts has been determined based on the criteria shown in **Table D-1-3 – D-1-5, Appendix D.1**.
- 9.7.4 Residential properties are classed as being 'high sensitivity' receptors to dust soiling, based on the IAQM guidance (IAQM, 2014) (see **Table D-1-3, Appendix D.1**). There are more than ten residential properties located within 20 m of the site boundary and due to the phasing of the Proposed Development, there will also likely be proposed residential properties located within 20 m of ongoing construction activities. As such, the sensitivity of the area surrounding the Site to dust soiling is judged to be 'high'.
- 9.7.5 The IAQM guidance states that trackout may occur for distance of up to 500 m from large sites. Demolition and construction traffic is expected to access the site from Charlton Road, Brabazon Roundabout, Concorde Roundabout, A38, and Fishpool Hill Road. There are more than ten residential properties located within 20 m of roads extending up to 500 m of the Site. Therefore, the sensitivity to dust soiling of the area surrounding roads along which material may be tracked is judged to be 'high'.
- 9.7.6 The IAQM also defines residential properties as being 'high sensitivity' receptors to human health impacts (see **Table D-1-4, Appendix D.1**). PM_{10} concentrations at existing residential properties within the study area are anticipated to be similar to the predicted 2019 PM_{10} concentrations at modelled receptors (i.e. $13.7 - 15.7 \mu\text{g}/\text{m}^3$). Based on the predicted existing PM_{10} concentrations and the number of sensitive receptors within 20 m of the site boundary and roads along which material may be tracked, the sensitivity to human health impacts of the

areas surrounding the Site and the area surrounding roads along which material may be tracked are judged to be 'low'.

- 9.7.7 Locally designated ecological sites with dust sensitive features classed as being 'low sensitivity' receptors to dust deposition, based on the IAQM guidance (IAQM, 2014) (see **Table D-1-5, Appendix D.1**). There is one locally designated site (Filton Wood SNCI) located partially within the northern boundary of the Site and approximately 6 m from Hayes Way along which material could be tracked. Therefore, the sensitivity of the area surrounding the Site to dust soiling is judged to be 'low'.

Risk of Impacts

- 9.7.8 The risk of construction dust impacts, without mitigation, have been defined based on the criteria shown in **Table D-1-6, Appendix D.1** and are presented in **Table 9-6**.

Table 9-6 Risk of Construction Dust Impacts without Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low
Ecology	Low	Low	Low	Low

Impact Significance

- 9.7.9 The IAQM guidance recommends that no judgement of the significance of effects of construction dust without mitigation is made, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations (IAQM, 2014). Following the implementation of appropriate mitigation measures (as described in **Section 9.6**) the residual effects will be 'not significant'.

Construction Road Traffic Impacts

- 9.7.10 Road traffic will be generated during the demolition and construction of the Proposed Development as a result of plant and materials being delivered to the Site, transporting demolition material offsite (all material from the runway will be reused on-site) and construction personnel accessing the Site. The movement of demolition and construction traffic to and from the Site during the construction phase of the Proposed Development would likely enter from Charlton Road, Brabazon Roundabout, Concorde Roundabout, A38 and Fishpool Hill Road and utilise the Site's connections to the strategic highway network.
- 9.7.11 The number of LDVs and HDVs accessing the Site during the demolition and construction phases are not expected to increase from those associated with the consented development (anticipated to be in the order of 810 LDV two-way AADT and 85 HDV two-way AADT). These vehicle movements will be split between the different site accesses described above and therefore vehicle movements associated with the construction of the Proposed Development on the surrounding road network are expected to be distributed such that they are below the IAQM / EPUK screening criteria of 500 LDV and 100 HDV AADT (see **Appendix D-2**) and are therefore considered to be 'not significant'.

Operational Road Traffic Emissions Impacts

Screening Assessment

- 9.7.12 The Proposed Development will generate additional traffic during the operational phase, which will result in an increase of over 500 AADT along several roads in the local road network within the Study Area, therefore exceeding the EPUK / IAQM screening criteria (see **Appendix D-2**). As such, it is not possible to screen out the potential for significant impacts from operational traffic generated by the Proposed Development on existing sensitive properties and, therefore a detailed assessment has been undertaken (see following section).

Detailed Assessment

Core Assessment – with Concorde Roundabout and Combination Junction Accesses

- 9.7.13 Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at existing receptors, both without and with the Proposed Development in place, are presented in **Table D-5-2 – Table D-5-4, Appendix D-5**. The 'without development' scenario predicted concentrations include background concentrations and emissions from future traffic flows (including cumulative schemes) and traffic associated with the extant permission for 2036. The 'with development' scenario predicted concentrations include background concentrations, emissions from future traffic flows (including cumulative schemes) and traffic generated by the Proposed Development (with the Concorde Roundabout and combination junction) for 2036.
- 9.7.14 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations for this scenario (using emission factors and background concentrations for 2025), both without and with the Proposed Development in place, are below the relevant NAQOs at all existing receptors. Furthermore, predicted annual mean NO₂ concentrations are below 60 µg/m³ at all receptors, indicating that exceedances of the 1-hour mean NO₂ NAQO are not likely, and the predicted annual mean PM₁₀ concentrations are below 32 µg/m³ at all receptors, indicating that exceedances of the 24-hour mean PM₁₀ NAQO are not likely.
- 9.7.15 The changes in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations (when rounded to the nearest whole number) range from -2% (beneficial) to 0% at all modelled receptor locations. Using the criteria set out in **Table 9-3**, these impacts are described as being 'negligible' at all modelled receptors.

Sensitivity Test – without Concorde Roundabout and Combination Junction Accesses

- 9.7.16 Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at existing receptors, both without and with the Proposed Development in place, are presented in **Table D-5-6 – Table D-5-8, Appendix D-5**. The 'without development' scenario predicted concentrations include background concentrations and emissions from future traffic flows (including cumulative schemes) and traffic associated with the extant permission for 2036. The 'with development' scenario predicted concentrations include background concentrations, emissions from future traffic flows (including cumulative schemes) and traffic generated by the Proposed Development (without the Concorde Roundabout and combination junction) for 2036.
- 9.7.17 The changes in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations (when rounded to the nearest whole number) range from -1% (beneficial) to 0% at all modelled receptor locations. Using the criteria set out in **Table 9-3**, these impacts are described as being 'negligible' at all modelled receptors.

Impact Significance

- 9.7.18 Overall, taking into account the conservative nature of the assessment, and the criteria set out in **Section 9.4**, the operational air quality effects of the Proposed Development are considered to be 'not significant' on the basis that:
- Emissions associated with the Proposed Development (i.e. from traffic generated by the Proposed Development) will not cause any exceedances of the NAQOs.
 - Impacts as a result of emissions associated with the operation of the Proposed Development will be 'negligible' at all receptors.

Site Suitability

Screening Assessment

- 9.7.19 The Henbury Loop railway line is not currently electrified and therefore diesel locomotives will be stationary at the Filton North Station when stopping there regularly throughout the day (one train per hour during Transport Phase 1 and increasing up to five trains per hour in later transport phases). However, locomotives are not expected to be regularly stationary for more than 15 minutes. In addition, proposed sensitive locations within the Site (i.e. the proposed schools and residential properties) will be located more than 15 m from stationary locomotives at Filton North station. Therefore, no further assessment of the impact of emissions from stationary locomotives is required in accordance with DEFRA's LAQM TG.16 (DEFRA, 2021a).
- 9.7.20 In relation to moving diesel locomotives, there is potential for proposed residential properties to be within 30 m of the Henbury loop railway line. However, this railway line is not one of the relevant lines requiring further assessment in accordance with DEFRA's LAQM TG.16. In addition, background concentrations of annual mean NO₂ within the Site are less than 25 µg/m³.
- 9.7.21 Considering the above, the impact of emissions from stationary and moving locomotives on proposed sensitive locations within the Site are considered to be 'not significant'.
- 9.7.22 The Site is located adjacent to a busy road network; therefore, a more detailed assessment of site suitability in relation to road traffic emissions has been undertaken in the following section.

Detailed Assessment

- 9.7.23 Predicted concentrations at modelled proposed receptor locations are presented in **Table D-5-5, Appendix D.5** (Core Scenario) and **Table D-5-9, Appendix D.5** (Sensitivity Test). Details of the proposed receptors are provided in **Appendix D-3-2** and shown in **Figure D-6-2, Appendix D.6**.
- 9.7.24 Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at worst-case sensitive locations within the Proposed Development will be well below the relevant NAQOs and, therefore, new residents / users of the development are predicted to experience acceptable air quality.

9.8 Further Mitigation and Enhancement

Construction

- 9.8.1 With standard mitigation measures from the IAQM guidance (IAQM, 2014) in place as embedded mitigation (see **Section 9.6**), the impacts of dust and PM₁₀ during the construction phase are considered to be 'not significant' and no further mitigation is required.

Operation

- 9.8.2 The impacts of the Proposed Development on local air quality are considered to be 'not significant' and therefore no further mitigation is considered to be required.

9.9 Residual Effects

Demolition and Construction Dust

- 9.9.1 With embedded mitigation in place and included in a CEMP for the Proposed Development, the risk of demolition and construction related dust effects are 'not significant'.

Demolition and Construction Traffic

- 9.9.2 The residual air quality effects of road traffic on local air quality during the demolition and construction of the Proposed Development are judged to be 'not significant'.

Operational Railway Emissions

- 9.9.3 The residual air quality effects of railway emissions on proposed sensitive locations within the Site are judged to be 'not significant'.

Operational Road Traffic Emissions

- 9.9.4 The residual air quality effects of road traffic on local air quality during the operation of the Proposed Development are judged to be 'not significant'. Furthermore, air quality within the Site will be acceptable for the proposed end-uses.

9.10 Monitoring

- 9.10.1 Monitoring is not considered to be required.

9.11 Summary

- 9.11.1 This Chapter has assessed the likely significant effects of the Proposed Development on air quality.
- 9.11.2 The construction works have the potential to create dust. During construction it is recommended that in accordance with the IAQM guidance a package of mitigation measures is put in place to minimise the risk of elevated PM₁₀ concentrations and dust nuisance in the surrounding area. With mitigation in place the construction impacts are judged as 'not significant'.
- 9.11.3 Road vehicle movements during the demolition and construction phase of the Proposed Development are not expected to increase beyond those associated with the consented development. The vehicle movements associated with the Proposed Development are not expected to exceed the EPUK / IAQM criteria and are considered to be 'not significant'. Therefore, additional mitigation is not considered to be required.
- 9.11.4 The impacts of road traffic associated with the Proposed Development on local air quality during the operation of the Development have been assessed. The detailed modelling of road traffic impacts has been undertaken at discrete human receptor locations in the 2036 (utilising 2025 vehicle emission factors and background concentrations). The air quality effects of road traffic on local air quality during the operational phase of the Proposed Development are judged to be 'not significant'. Therefore, additional mitigation is not considered to be required.

- 9.11.5 The impacts of road traffic and railway emissions on proposed sensitive locations within the Site have been assessed to determine the suitability of the Site for the proposed end-uses. Air quality within the Site is predicted to be acceptable for the proposed end-uses without the need for further mitigation.

9.12 References

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