9. Air Quality

Purpose of the Assessment

9.1 This air quality assessment evaluates the effects on sensitive receptors from fugitive dust and exhaust emissions associated with construction activities and traffic associated with the Proposed Development. It also evaluates the significance of potential air quality effects resulting from changes in traffic flow characteristics on the local road and rail network during the future operation of the Proposed Development, including employee traffic. Appropriate mitigation measures are recommended where required.

9.2 This chapter of the Preliminary Environmental Information Report (PEIR) identifies the legislative and policy context for the assessment; summarises the extent of the Study Area; summarises relevant consultation; describes the baseline surveys and data, and baseline conditions; describes the methods used to assess the effects of the Proposed Development; identifies relevant embedded mitigation; provides an assessment of likely significant effects during construction, operation and decommissioning, and provides a cumulative assessment (inter and intra project). The chapter also identifies the mitigation measures required to prevent, reduce or offset any significant adverse effects and the likely residual effects after these measures have been adopted. Monitoring is identified where necessary, and a summary of the assumptions and limitations of the assessment is also provided.

9.3 There are four appendices that provide more detail of this assessment:

Appendix 9.1 – Results of Diffusion Tube Monitoring

Appendix 9.2 – Construction Dust Assessment Methodology

Appendix 9.3 – Detailed Operational Assessment Methodology

Appendix 9.4 – Model Verification

9.4 This chapter should be read alongside **Chapter 19: Highways and Transportation, Chapter 16: Biodiversity** and **Chapter 23: Climate Change Mitigation & Adaptation** (for an assessment of greenhouse gas implications of a shift from road freight to rail).

9.5 The chapter assesses the Proposed Development within the Order Limits; including the Main SRFI Site; J15a works and minor highway works, as described within **Chapter 5: The Proposed Development**. In addition to consideration of the individual aspects of the Proposed Development, the assessment addresses environmental impact arising from all development within the Order Limits as a whole.

9.6 There are, however, three aspects of the 'minor highway works' described in Chapter 5 that have not been included in this assessment, due to their late identification as appropriate mitigation for the Proposed Development. These are:

- PL29 – A43/St John's Road (signage and road surfacing scheme on the A43),
- PL 31 – A43 Northampton Road (signage scheme); and,
- Pedestrian/Cycle Way along Northampton Road and between Barn Lane to the junction of Collingtree Road (widening of existing footpaths, provision of new footpath and dropped kerbs, and realignment of the carriageway).

9.7 The first two elements listed above require no physical works to alter the footprint of the road. The pedestrian/cycle way is located within Highways land and will involve minimal disturbance of existing verges. Assessment of all three aspects will be included in the assessment undertaken for the final DCO submission.

9.8 The Main SRFI Site is in South Northamptonshire Council (SNC) area, with J15a spanning into neighbouring Northampton Borough Council (NBC). The closest Air Quality Management Area (AQMA) is within Northampton. NBC has designated seven AQMAs, all of which are within 8km of the Main SRFI Site as shown in **Figure 9.1**. The closest of these is Northampton AQMA No.1, approximately 1 km to the north-east of the Main SRFI site which comprises "*the area of land which runs alongside the southbound carriageway of the M1 motorway within the boundaries of Northampton Borough Council. The area varies in depth from between 40 and 54 metres when measured from the central reservation on the M1*" (Ref 9.1). The edge of the M1 is approximately 15 m from the central reservation so the M1 AQMA extends between 25 to 39 m from the edge of the motorway.

9.9 SNC has also designated an AQMA which encompasses the A5 Watling Street, from the Saracens Head crossroads to Silverstone Brook adjacent to 131 Watling Street, due to high levels of nitrogen dioxide (NO_2) attributable to road traffic emissions (Ref 9.2). This AQMA is 5km to the south-west of the main SRFI site.

9.10 During the construction and operational phases, arrivals at and departures from the Proposed Development may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are the most important consideration in terms of air quality during these phases of the development.

Legislation, Policy and Best Practice

9.11 The table below provides a summary of the legislation, policy and guidance used in the chapter.

Table 9.1: Relevant legislation and policy and guidance

Legislation / policy / guidance	Key provisions	Relevant section of chapter where key provisions are addressed
The Ambient Air	The 2008 Ambient Air Quality Directive	Addressed

Quality Directive and Air Quality Standards Regulations (Ref 9.3)	(2008/50/EC) aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards (England) Regulations 2010.	throughout chapter – a consideration of PM_{10} and $PM_{2.5}$ and NO_2 arising from the Proposed Development is provided in the Assessment of Effects section. These pollutants are justified in the Method of Assessment - Summary of Key Pollutants Considered section.
UK Air Quality Strategy (Ref 9.4)	The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality. The Strategy sets UK air quality standards♦ and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives. The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), this requires local authorities to go through a process of review and assessment of air quality, identifying places where objectives are not likely to be met, and then declaring Air Quality Management Areas (AQMAs) before putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at a local level, to the achievement of EU limit values.	Addressed throughout chapter The limit values and objectives relevant to this assessment are summarised in **Table 9.2.**
National Networks National Policy Statement (Ref 9.5)	The NN NPS includes guidance for an Applicant's assessment of "Air Quality and Emissions". This states that: *"Where the*	Addressed throughout chapter – existing air quality

♦ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

	project is likely to have significant air quality impacts (both on and off-scheme) the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES)…. *The ES should describe:* • *existing air quality levels;* • *a forecast of air quality at the time of opening, assuming that the scheme is not built (the 'future baseline') and taking account of the impact of the scheme; and* • *any significant air quality effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project.* *In addition to information on the likely significant effects of a project, the Secretary of State should be provided with a judgement on the risk as to whether the project would affect the UK's ability to comply with the Air Quality Directive."* This NN NPS refers to assessment of impacts on protected species and habitats as well as human health.	levels are described in the Baseline Conditions section, forecast of air quality in the Assessment of Operational Phase Effects and mitigation and residual effects in the relevant sections. A statement on compliance with the Air Quality Directive will be provided when all data from ongoing modelling is compiled and assessed. Effects on protected species and habitats are addressed in **Chapter 16: Biodiversity**.
National Planning Policy Framework (Ref 9.6)	The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should "*contribute to conserving and enhancing the natural environment and reducing pollution*". (Paragraph 17) Section 11 of the NPPF deals with Conserving and Enhancing the Natural Environment. With specific regard to air quality, the NPPF states, *"planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure*	Addressed throughout chapter – compliance with EU emission limits values and national objectives is considered in the Assessment of Effects section

	that any new development in Air Quality Management Areas is consistent with the local air quality action plan". *"The planning system should contribute to and enhance the natural and local environment by:* • *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability… (Paragraph 109)*	
National Planning Practice Guidance (Ref 9.7)	The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment. The NPPG advises that whether or not 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 generate an air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). The NPPG provides advice on how air quality impacts can be mitigated and notes: *"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the 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*	Addressed within *Embedded Mitigation* and *Adaptive Mitigation* sections

	met."	
South Northamptonshire Local Plan (Ref 9,8)	The following saved policy within the South Northamptonshire Local Plan (1997) is relevant to the Air Quality Assessment: *"Policy G3 Planning permission will normally be granted where the development:..* *E Is neither of a hazardous nature nor likely to cause problems of pollution, noise, vibration, smell, smoke, discharge or fumes;…* *All proposals for development will be considered in the light of this policy."*	Addressed throughout chapter
Northampton Local Plan (Ref 9.9)	The adopted Development Plan for Northampton Borough currently comprises the following: • Northampton Local Plan Saved Policies - Adopted 1997 • Northampton Central Area Action Plan - Adopted 2013 • West Northamptonshire Joint Core Strategy Local Plan Part 1 - Adopted 2014 • Northamptonshire Minerals and Waste Local Plan – Adopted 2014 The policies within the Northampton Local Plan that are relevant to the Air Quality Assessment (E21, H13, H19 and R12) have been deleted.	-
West Northamptonshire Joint Core Strategy Local Plan (Part 1) (ref 9.10)	***"Policy S10 – Sustainable Development Principles*** *Development will:…* *K) Minimise pollution from noise, air and run off."* ***"Policy BN9 - Planning for Pollution Control*** *Proposals for new development which are*	Addressed throughout chapter Addressed within

	likely to cause pollution or likely to result in exposure to sources of pollution or risks to safety will need to demonstrate that they provide opportunities to minimise and where possible reduce pollution issues that are a barrier to achieving sustainable development and healthy communities including: *A) Maintaining and improving air quality, particularly in poor air quality areas, in accordance with national air quality standards and best practice;* *….."* *"**Policy T1 - Spatial Strategy for Towcester*** *The role of Towcester as a rural service centre will be supported and enhanced by the following development and other proposals:* *E) Delivery of an A5 relief road and complementary sustainable transport measures to improve air quality and reduce congestion in the town centre;* *….."*	*Embedded Mitigation* and *Adaptive Mitigation* sections The A5 relief road has been modelled for the 2021 and 2031 scenarios
Defra (2016) Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16) (Ref 9.11)	Provides guidance for undertaking air quality assessments for planning.	Used throughout chapter
EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning For Air Quality (Ref 9.12)	Provides guidance for undertaking air quality assessments for planning.	Used throughout chapter
IAQM (2014) Guidance on the assessment of dust from demolition and construction (Ref 9.13)	Provides guidance for assessing dust from the construction phase.	Used for Construction Phase assessment of dust.

UK Air Quality Strategy

9.12 For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used. The limit values and objectives relevant to this assessment are summarised below.

Table 9.2 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/Limit Values	Not to be Exceeded More Than	Target Date
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter (PM_{10})	24 hour	50 µg.m^{-3}	35 times per calendar year	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background locations (c)		Between 2010 and 2020 (b)
	Annual	25µg.m^{-3}	-	01.01.2020 (a)
		25µg.m^{-3}		01.01.2015 (b)

(a) Target date set in UK Air Quality Strategy 2007

(b) Target date set in Air Quality Standards Regulations 2010

(c) Aim to not exceed 18 µg.m^{-3} by 2020

9.13 In July 2017, Defra published the *'UK plan for tackling roadside nitrogen dioxide concentrations'* (the UK Air Quality Plan). This describes the Government's plan for bringing roads with NO_2 concentrations above the EU Limit Value back into compliance within the shortest possible time.

Licenses and Permits

9.14 There are no relevant air quality licences or permits required to construct, operate and maintain the development.

Scoping and Consultation

9.15 This section provides a summary of consultation with SNC and NBC, and relevant issues raised within the adopted Scoping Opinion dated January 2016.

Table 9.3 Summary of Scoping Opinion Relevant to Air Quality

Scoping Opinion section/paragraph	Summary of issue raised	Where in the PEIR is this addressed?
Scoping Opinion Section 2/paragraph 2.35	Secretary of State – *"The ES should identify the anticipated year of operation. This will be important for a number of the technical assessments, for example traffic and transport, and air quality impacts."*	Operation will be phased between 2021 and 2031 with units being completed as market demand requires. Modelling has been undertaken for 2021 (with partial development build out) and 2031 (with full build out) and results shown in *Assessment of Operational-Phase Air Quality Impacts* section
Scoping Opinion Section 8/paragraph 3.21	Secretary of State – *"The Secretary of State welcomes the definition of the study area and recommends that this is agreed with the relevant Environment Health Officers of the local planning authorities."*	The approach to defining the study area has been agreed with the relevant EHO. See *Summary of consultations undertaken* table
Scoping Opinion Section 8/paragraph 3.22/3.23	Secretary of State – *"Assessment of the existing baseline [nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$] should be informed by a comprehensive and up-to-date data set….* *The Secretary of State recommends that these [diffusion tube monitoring] locations are agreed with the relevant Environment Health Officers of the local planning authorities and that any such agreements are documented within the ES…..* *Details of the diffusion tube colocation study (referred to in paragraph 8.10 of the Scoping Report) should be provided*	Diffusion tube monitoring for NO_2 has been undertaken since April 2015 and the results are presented in **Table 9.5** including a colocation study. Monitoring locations were agreed with SNC. The existing baseline for PM_{10} and $PM_{2.5}$ was derived from a review of the Councils' Review and Assessment process, the results of available local monitoring and data available in the Defra maps.

	within the ES."	
Scoping Opinion Section 8/paragraph 3.25	Secretary of State – *"The methodology for assessing construction phase impacts should be clearly set out in the ES."*	The construction phase methodology is set out in *Method of Assessment* section
Section 8/paragraph 3.26	Secretary of State – *"The Secretary of State welcomes that dispersion modelling will be undertaken and notes that the input for this will be dependent on traffic data. The ES should provide clear cross referencing to where this data can be found."*	**Appendix 9.3** refers to **Chapter 19: Highways and Transportation** for more information about the traffic model used. Traffic data can be found in **Appendix 9.3.**
Scoping Opinion Section 8/paragraph 3.28	*"The ES should clearly identify the discrete receptor locations that will be assessed (as noted in paragraph 8.37 of the Scoping Report), along with their sensitivities. The ES should provide definitions for sensitivities of receptors…."*	**Appendix 9.3** identifies the receptor locations assessed (shown in Figures 9.3, 9.4 and 9.5, and in Table 9.18 onwards). The definition of sensitivities of receptors is shown in **Appendix 9.3**. All receptors modelled are defined as high sensitivity receptors.
Scoping Opinion Section 8/paragraph 3.30/3.31	Secretary of State/Northampton Borough Council – "*The Secretary of State considers that adverse change to air quality should be assessed in relation to compliance with European air quality limit values and AQMAs. It would be useful for the full extent of the AQMAs to be visually displayed on a figure within the ES…..* *The applicant's attention is drawn to the comments of Northampton Borough Council (see Appendix 3 of this Opinion) regarding the Air Quality Management Area (AQMA) located along the M1 between Junctions 15 and 16. The Secretary of State advises that potential impacts on this AQMA are considered within the ES."*	**Figure 9.2** shows a map of the AQMAs. The AQMAS have been modelled as receptors as shown in **Appendix 9.3.** The development has been assessed against the EU air quality limit. It is noted that the SoS is the competent authority in this regard.
Scoping Opinion Section 8/paragraph 3.32	Secretary of State/South Northamptonshire Council – *"The Secretary of State draws the attention of the applicant to the comments made by South Northamptonshire Council (see Appendix 3 of this Opinion) in respect of local air quality and the potential effects of increased traffic flows. The Secretary of State considers that potential impacts*	The A508, Roade Village and Towcester AQMA have been modelled as receptors as shown in **Appendix 9.3**.

	on the A508, Roade village and the Towcester AQMA should be considered within the ES."	
Scoping Opinion Section 8/paragraph 3.33/3.34/3.35	Secretary of State – *"Air quality and dust levels should be considered not only on site but also off site, including along access roads, local footpaths and other PROW [public rights of way]….* *Cross reference should be made to the Highways and Transportation chapter in relation to dust arising from traffic movements…..* *Consideration should be given to appropriate mitigation measures and to monitoring dust complaints."*	A number of receptors both onsite and offsite have been modelled as receptors as shown in **Appendix 9.3**. A Construction Environmental Management Plan (CEMP) has been produced.
Scoping Opinion Section APPENDIX 3 – RESPONDENTS TO CONSULTATION AND COPIES OF REPLIES	South Northamptonshire Council – *"…..The results from SNC's diffusion tubes in these locations should be used in the modelling undertaken to validate the model and predict the impact of the development."*	**Appendix 9.4** shows the model verification which utilises the results from SNC's diffusion tubes.
Scoping Opinion Scoping Report Section APPENDIX 3 – RESPONDENTS TO CONSULTATION AND COPIES OF REPLIES	Milton Malsor Parish Council – *"Levels of air pollution monitored at junction M1 Jt15/ A43 are already at or near AQM intervention levels. Collingtree (less than 2km from the PDA) is designated an Air Quality Management Area. Towcester also has an AQMA; extra traffic on the A43 will add to its problems.* *The proposed local increase in rail freight traffic will add to the pollution as goods trains are predominantly powered by diesel. As will increasing traffic on the M1 where 4 lanes will soon be possible. Lorries and employee cars arriving and leaving the freight terminal will contribute to the problem.* *Two huge new warehouses have just been completed at Jt 15 for which all access is from that junction. The Northamptonshire Major Road Strategy forecasts that by 2026 60,000 vehicles a day will use the A45 link to Jt 15, with 12% being heavy goods vehicles.* *During the construction stage there will be extensive earth moving; dust*	Dispersion modelling of traffic related emissions has been undertaken and the results shown in the *Assessment of Operational-Phase Air Quality Impacts* section. Dust during the construction phase has been assessed in the *Assessment of Construction-Phase Effects* section. Consideration of other projects is provided as part of the assessment of Cumulative Effects.

	pollution will affect the two villages."	
Late Representation: Mr and Mrs Entwistle Letter dated: 16 February 2016 Re. proposals for Rail Central – further to meeting on 3 February	*"You specifically mentioned a number of points and concerns including: the need for additional SRFI capacity in this location; design and impact; traffic mitigation issues; a buffer zone with bunding and planting; management/ownership of that potential buffer zone; and air quality. We have noted these points and we will address them both by way of future correspondence with you directly and also through the information we provide as we move into the formal (and statutory) consultation process for Rail Central, as required for all Nationally Significant Infrastructure Projects (NSIPs)."*	Air Quality effects are addressed within this chapter

Table 9.4 Summary of consultations undertaken

Consultation and date	Summary of consultation	Where in the PEIR is this addressed?
SNC – Environmental Health Officer, by e-mail 12 April 2017	Purpose of consultation was to: agree the study area for assessment; agree the scope of works for the air quality assessment and agree locations for baseline air quality monitoring using diffusion tubes. The council responded: '*The monitoring locations for the development are considered acceptable. The air quality assessment will be able to utilise the monitoring results from South Northamptonshire Council and Northampton Borough Council.* *The proposed scope of works for air quality assessment are acceptable.* *The modelling for the development will need to take into account the proposed and potential traffic movements to and from the site. This development may have the potential to impact further afield such as on the strategic road network of the A5, M1 and A43 & A508, depending on the number of HDV's. The*	Dispersion modelling of traffic related emissions has been undertaken and the results shown in the *Assessment of Operational-Phase Air Quality Impacts* section. Monitoring locations, as agreed are shown in **Figure 9.2**.

	transport assessment for the site will therefore be significant.'	
NBC - Environmental Health Officer, by e-mail 25 November 2015	Purpose of consultation was to collect feedback on the proposed scope for the air quality assessment. The council responded: *"With regard to the assessment have you identified roads in Northampton where you consider there might be a possible impact on air quality at all?* *……* *In terms of the impact on Northampton I have attached draft guidance which we steer potential developers to when considering air quality."*	The advice within the draft Air Quality & Emissions Planning Guidance provided by NBC has been considered in this assessment. The scope of the study area has been informed by a review of the traffic data from the Saturn model, including roads within Northampton.
NBC - Environmental Health Officer, by e-mail 23 March 2016	Purpose of consultation was to: discuss the study area for assessment; request the latest results of local authority air quality monitoring (for 2014 and 2015); and agree locations for baseline air quality monitoring using diffusion tubes. The council *responded "With reference to the study roads which need to be considered are those where this is likely to be any notable changes in flow, ……. This would be my initial screening approach on top of existing AQMAs and whether there are any potential new receptors being created.* *I've attached data for 2014. I have yet to complete 2015 at present. …..* [re. study-specific monitoring locations] *Many of the sites selected are out of Northampton so I am not as familiar with these. I have looked at their location on an OS map and most appear to be picking up sites around the development and would appear to make sense. My only observation is why monitor from April to April as the objective is annual mean based on a calendar year? Ideally monitoring should be compared with the appropriate objective."*	It is not practical to delay the start of a monitoring campaign to coincide with a calendar year. Monitoring is in any event ongoing as of February 2017. The diffusion tube data, have been annualised where sufficient data has not been collected for a full calendar year (January to December). This approach has been used to select monitoring locations in Northampton and South Northamptonshire as shown in **Figure 9.2.**

	Results up to December 2017 have been presented in this chapter. Selection of monitoring locations is explained in the following section.

Study Area

9.16 The study area for the effects of dust during the construction phase is up to 350 m from the site boundary based on IAQM Guidance (Ref 9.13).

9.17 The study area for the effects of traffic related emissions during the construction and operational phase are likely to be different. In each case the study area includes road links where the annual average daily traffic (AADT) flow increases by more than 25 Heavy Duty Vehicles (HDVs) or 100 Light Duty Vehicles (LDVs) within or adjacent to an AQMA or more than 100 HDVs or 500 LDVs elsewhere. Modelling has been undertaken for roads within South Northamptonshire and will also be undertaken for Northampton. **Figures 9.6 to 9.14** show the road links modelled for this assessment. It should be noted that roads were only modelled where there are sensitive receptors within 200 m of the road and the above thresholds are exceeded.

Baseline Surveys and Data

9.18 The background concentration is the underlying concentration at locations not affected by local sources such as roads. The impact from local sources are modelled and added to the background. The modelling assessment is verified by comparing this with measured concentrations at roadside monitoring locations.

Overview

9.19 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance (Ref 9.7) and EPUK/IAQM guidance (Ref 9.12) highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG16 (Ref 9.11) recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *"Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality"*.

9.20 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps (Ref 9.14), which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- published results of local authority Review and Assessment studies of air quality, including local monitoring and modelling studies.

9.21 Monitoring of baseline air quality conditions has been undertaken for the purpose of informing background (existing) concentrations at the Order Limits and also to provide data to verify modelling. Monitoring commenced in April 2015 and is ongoing. In July 2015, an additional two locations, in Milton Malsor and Blisworth, were added to the monitoring study.

9.22 The monitoring has focused on nitrogen dioxide, and uses passive diffusion tubes samplers deployed in duplicate, at twelve locations. The locations for monitoring were agreed with SNC and are summarised below and shown on **Figure 9.2**:

Table 9.5 Monitoring Locations - Diffusion Tube Study for Air Quality

Location ID	Location	Type	X	Y
1	Crematorium	Roadside (M1)	473469	256802
2	Depot	Background (off A43)	472626	255678
3	Collingtree Road	Roadside (M1)	474581	255603
4	Collingtree Court	Roadside (M1)	475002	255395
5	Marina	Roadside (A43)	471946	255054
6	Fairfield Road/Station Road	Roadside (A43)	471873	254600
7	Canal	Background	472313	254462
8	Footpath	Background	473196	254522
9	Barn Lane	Background	473899	254642
10	St Johns Road	Roadside (A43)	470864	251669
11	Blisworth Village	Roadside (Blisworth)	472722	253534
12	Milton Malsor Village	Roadside (Milton Malsor)	473181	255645

9.23 Monitoring sites have been selected at representative locations along the A43, to the south and north of the site access, locations along the M1 close to Northampton's AQMA No1, in Milton Malsor and Blisworth and across the site itself.

9.24 Monitoring covers near road and locations away from the local influence of roads to provide a full range of site types to characterise air quality in the local area. Up until November 2016, the colocation study has been undertaken using continuous monitoring data from the Automatic Urban and Rural Network (AURN) monitor at Northampton Kingsthorpe, and diffusion tube results from the AURN colocation study. The AURN colocation study uses the same laboratory and tube preparation as this study, and tube changeovers are undertaken monthly according to the same schedule. The method for monitoring has been informed by AEA Report to Defra and the Devolved Administrations (Ref 9.17).

9.25 From December 2017, triplicate tubes were added to the monitoring study to allow continued colocation at the Northampton Kingsthorpe monitor. In April 2017 the AURN monitor was moved to Spring Park and colocation monitoring is ongoing at this location.

9.26 A detailed description of how the baseline air quality has been derived for the Proposed Development site is summarised in the following paragraphs.

Review and Assessment Process

9.27 The Proposed Development lies within South Northamptonshire and Northampton. SNC has designated an AQMA encompassing the A5 Watling Street, from the Saracens Head crossroads to Silverstone Brook adjacent to 131 Watling Street, due to high levels of nitrogen dioxide (NO_2) attributable to road traffic emissions. This AQMA is 5km to the south-west of the Order Limits.

9.28 The closest AQMA is within Northampton. NBC has designated seven AQMAs, all of which are within 8km of the main SRFI site. The closest AQMA is Northampton AQMA No.1, approximately 1km to the northeast of the Main SRFI Site and comprises "the area of land which runs alongside the southbound carriageway of the M1 motorway within the boundaries of Northampton Borough Council. The area varies in depth from between 40 and 54 metres when measured from the central reservation on the M1". **Figure 9.1** shows the location of the AQMAs.

Field Survey

9.29 The raw results from monitoring have been adjusted for bias as shown in **Appendix 9.1**. The adjusted results are presented in **Table 9.6**.

Table 9.6 Average Annual-Mean NO_2 Concentration

Location ID	Location	Average NO_2 Concentration			
		2015	2016	2017	Average
1	Crematorium* - Close to M1	31.7	39.9	34.2	35.2
2	Depot	14.7	19.3	16.1	16.6

3	Collingtree Road* - Close to M1	17.0	19.6	16.9	17.5
4	Collingtree Court* - Close to M1	30.2	38.0	31.8	33.3
5	Marina* - Off A43	18.4	23.4	19.3	20.1
6	Fairfield Road/Station Road* - Off A43	15.8	21.2	16.6	17.9
7	Canal – adjacent to site	10.9	15.5	12.0	12.7
8	Footpath – on site	10.1	14.0	13.3	12.2
9	Barn Lane – on site	10.4	15.5	12.2	12.6
10	St Johns Road* - Off A43	15.5	20.0	16.1	16.9
11	Blisworth Village*	-	30.4	24.9	26.0
12	Milton Malsor Village*	-	27.0	19.4	20.6

9.30 The results of local monitoring show that the baseline NO_2 concentrations range from 12.2 µg/m^3 at the footpath on site to 35.2 µg/m^3 at the Counties Crematorium close to the M1. The Crematorium, Collingtree Court and Collingtree Road are located near properties that are close to the M1 and would not be considered representative of the background concentration. Similarly Fairfield Road, the Marina and St Johns Road are next to the A43 so are not urban background locations. The monitoring locations in Blisworth Village and Milton Malsor are also next to local roads. The remaining four monitoring locations would be considered background locations and can be used to derive a background concentration for the area. For these four locations the average NO_2 concentrations range from 12.2 to 16.6 µg/m^3.

Local Authority Urban Background Monitoring

9.31 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an

appropriate source of data for the purposes of describing baseline air quality at the Order Limits.

9.32 SNC does not carry out air quality monitoring in an urban background location. NBC monitors NO_2 and $PM_{2.5}$ at the Northampton Kingsthorpe urban background location. The most recent measured annual-mean concentrations are presented below.

Table 9.7 Automatically Monitored Urban Background Annual-Mean Concentrations

Local Authority	Monitoring Site Name	Approximate Distance to SRFI site (km)	Pollutant	2013	2014	2015
Northampton Borough Council	Northampton Kingsthorpe	10	NO_2	16	14	13
			$PM_{2.5}$	9	8	7

Defra Background Maps.

9.33 The Main SRFI Site is predominantly within the grid square: 473500,254500. The Defra mapped concentrations for the SRFI site grid square and the average Defra mapped concentrations for South Northamptonshire, Northampton in 2015 and the Midlands region are summarised below.

Table 9.8 Defra Mapped Annual-Mean Background Concentration Estimates (2015)

Location	NO_2	PM_{10}	$PM_{2.5}$
Proposed Development grid square (473500,254500)	10.1	13.6	9.2
South Northamptonshire	8.5	13.5	9.1
Northampton	14.9	15.5	10.5
Midlands Region	8.2	10.5	7.2

Baseline Conditions

9.34 The tables above outline the local measured background concentrations and the Defra mapped concentration estimates around the Proposed Development. A comparison of these have been used to determine a conservative background concentration for the assessment.

Main SRFI Site

9.35 For NO_2, measured concentrations at the four background monitoring locations are higher than the Defra mapped concentration for the SRFI site. It would seem that the conservative approach would be to take the highest monitored background concentration (in this case 16.6 $\mu g.m^{-3}$) and use that for the assessment. For this assessment it was found that by using

the lowest background monitored concentration of 12.2 µg.m^{-3}, the overall concentrations were more conservative. This is because by using a lower baseline concentration in the model verification studies, a higher adjustment factor was derived. The model verification studies are shown in **Appendix 9.4**. A higher adjustment factor can lead to a greater change in concentration and therefore could lead to a higher impact descriptor. For this reason, using a lower background concentration of 12.2 µg.m^{-3} is a more conservative approach.

9.36 In the absence of PM_{10} monitoring near the Proposed Development, the background annual-mean concentration has been derived from the highest estimated Defra mapped concentration.

9.37 For $PM_{2.5}$, the Defra mapped background concentration estimates are higher than the results from monitoring at Northampton Kingsthorpe. The background annual-mean $PM_{2.5}$ concentrations at the Proposed Development has been derived from the highest estimated Defra mapped concentration.

9.38 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations.

9.39 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

9.40 The table below summarises the annual-mean background concentrations for NO_2, PM_{10} and $PM_{2.5}$ used in this assessment.

Table 9.9 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration (µg.m^{-3})
NO_2	Blisworth	26.0
PM_{10}	Defra mapped (Northampton)	15.5
$PM_{2.5}$	Defra mapped (Northampton)	10.5

J15a Works

9.41 The background NO_2, PM_{10} and $PM_{2.5}$ concentrations at the J15a works are assumed to be the same as the Main SRFI Site.

Minor Highway Works

9.42 The background NO_2, PM_{10} and $PM_{2.5}$ concentrations at the minor highway works are assumed to be the same as the Main SRFI Site.

All Development within Order Limits

9.43 The background NO_2, PM_{10} and $PM_{2.5}$ concentrations for all Proposed Development works are assumed to be the same as the Main SRFI Site.

The Climate Change influenced baseline conditions.

9.44 **Chapter 23: Climate Change Mitigation & Adaptation** provides the potential future baseline climatic conditions within the East Midlands, based on the UKCP09 data. Qualitatively this may result in the following future baseline climatic conditions within the PDA region:

- An increase in annual average temperature;
- More very hot days particularly during long term operation;
- More intense rainfall events;
- Increase in winter rainfall; and
- An increase in dry spells particularly in summer months.

9.45 The effects of climate change are not likely to affect air quality so the future baseline conditions are the same as shown **Table 9.9**.

Method of Assessment

Overview

9.46 The National Policy Statement for National Networks (NN NPS) outlines what the environmental statement (in this case the PEIR) should describe. Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that "Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned." It lists a number of areas that might be usefully agreed at the outset.

9.47 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air

Quality document (Ref 9.12), the IAQM Guidance on the assessment of dust from demolition and construction (Ref 9.13) and, where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG16 (Ref 9.11) (noting that this is guidance prepared for local authorities undertaking area wide Review & Assessments. This methodology was agreed with SNC and NBC. It includes the key elements listed below:

- assessment of the existing air quality in the study area (existing baseline) and prediction of the future air quality without the development in place (future baseline), using official government estimates from Defra, publically available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
- a qualitative assessment of likely construction-phase impacts with mitigation and controls in place; and
- a quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation). This encompasses the impacts of the development traffic on the local area including any effects on the AQMAs

9.48 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Member of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of Chemistry and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 25 years' experience.

Summary of Key Pollutants Considered

9.49 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NOx) and particulate matter (PM_{10}). NOx emissions from combustion sources such as traffic is a mixture of nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. The assessment of operational impacts therefore focuses on changes in NO_2 and PM_{10} concentrations from changes in the traffic flow due to the Proposed Development. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of PM_{10}) concentrations has also been considered.

9.50 Regarding emissions from the rail freight traffic, the Rail Report (**Appendix 8.1**) indicates that in 2021 there is the potential for four trains per day each way. In 2026 this could increase to seven per day each way, 17 in 2033 and 21 trains per day each way in 2043. This would be a mixture of electric and diesel trains. In 2014 the Environmental Research Group (ERG) published the *Air Pollution emissions from diesel trains in London* report (Ref 9.15). It

found that modelling of diesel trains predicted high concentrations that were not seen in measured ambient concentrations. The report concluded that *"It was difficult to detect a clear pollution signal from the railways in terms of NOx. NO_2, PM and PM metals. It is possible the detection of emissions from the railways was confounded by other urban sources but it is clear from this study that diesel trains do not make a large contribution to urban air quality in London".* Whilst the report focussed on London and the site is a more rural location it is unlikely that less than two trains an hour would significantly worsen air quality. Furthermore as rail transport will move towards electric and decarbonisation in the future (as addressed in **Chapter 23: Climate Change Mitigation & Adaptation**), the air quality effect from rail transport will decrease. Air Quality in the area is more likely to be most affected by the circa 100,000 vehicles that use the M1 every day than an additional two trains per hour. Neither NBC or SNC refer to railways as a source. SNC states in their 2015 Updating and Screening Assessment that "*there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m*". The Proposed Development will not introduce stationary diesel or steams trains within 15 m of relevant exposure. On that basis a detailed assessment of rail emissions is not considered necessary and has been scoped out.

9.51 For the construction phase of the Proposed Development the key pollutant is (uncontaminated) dust, covering both the PM_{10} fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

9.52 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document (Ref 9.12) indicates that air quality assessments should include developments increasing annual average daily HDV traffic flows by more than 25 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA and more than 100 AADT elsewhere. The traffic data shows that the aforementioned EPUK/IAQM thresholds are expected to be exceeded for the site access road and the A43 between the site access and the M1. For all the other road links, the EPUK/IAQM threshold is not expected to be exceeded. Construction-related vehicles have been added to the operational traffic flows modelled for 2021 for the site access road and the A43 between the site access and the M1.

Construction Phase - Methodology

9.53 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter (Ref 9.16). Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended

in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

9.54 The type of activities that could cause fugitive dust emissions include earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; demolition; handling of loose construction materials; and movement of vehicles, both on and off site.

9.55 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

9.56 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. The implementation of proper control will ensure that dust deposition does not give rise to significant adverse effects. A CEMP will be secured as a requirement under the DCO and will list the control measures recommended by the IAQM guidance. The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

9.57 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and

- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

9.58 The IAQM *Guidance on the assessment of dust from demolition and construction* sets out 350 m (50 m for sensitive habitat sites) as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m from the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. These distances are set to be deliberately conservative. Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, whereas there are no statutory or official numerical air quality criterion for dust annoyance. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

9.59 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states: "*The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.*"

9.60 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: "*This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified*."

9.61 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.

- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

9.62 **Table 9.10** gives examples of dust emission magnitudes for demolition, earthworks and construction activities and trackout.

Table 9.10 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
Demolition - building over 50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level. **Earthworks** – total site area over 10,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes. **Construction** - total building volume over 100,000 m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Trackout** – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 20,000 to 50,000 m^3, potentially dusty construction material and demolition activities 10 - 20 m above ground level.	Medium

Earthworks – total site area between 2,500 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes. **Construction** - total building volume between 25,000 and 100,000 m^3, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years. **Trackout** – 10 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	
Demolition - building less than 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months. **Earthworks** – total site area less than 2,500 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 10,000 tonnes earthworks during winter months. **Construction** - total building volume below 25,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year. **Trackout** – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

9.63 The detail of the dust assessment methodology is provided in **Appendix 9.2.**

9.64 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be *"not significant"*.

Operational Phase - Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

9.65 Pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, including emission rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

9.66 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide

background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail earlier in this chapter.

9.67 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the United Kingdom (UK) by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

9.68 The following scenarios were modelled:

- Without the Proposed Development in the year of first opening, 2021;
- With the Proposed Development in the year of first opening including construction traffic and partial build out (approximately 130,000 sq m -20% of the final floorspace at the Main SRFI Site and only J15a constructed of the highway works), 2021;
- Without the Proposed Development in the year of full opening, 2031; and
- With the Proposed Development in the year of full opening with all units fully operational (no construction traffic), 2031.

9.69 Details of the model input and processing of model output are summarised in **Appendix 9.3**.

Fugitive PM_{10} Emissions

9.70 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current emission factors for particulate matter include brake dust and tyre wear (which studies suggest may account for approximately one-third of the total particulate emissions from road transport).

Significance Criteria for Development Impacts on the Local Area

9.71 The EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document (Ref 9.12) advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

9.72 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. The table below provides the EPUK/IAQM approach for describing the human-health air quality impacts at sensitive receptors.

Table 9.11 Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

- AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
- The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.
- The table is only designed to be used with annual mean concentrations.

- Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

- When defining the concentration as a percentage of the AQAL, the modelled scenario with the higher concentration should be used.

- The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

- It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

9.73 The human-health impact descriptors above apply at individual receptors. The EPUK/IAQM guidance states that *"…it is likely that a 'moderate' or 'substantial' impact will give rise to a significant effect and a 'negligible' or 'slight' impact will not have a significant effect…"* The guidance also states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

9.74 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Uncertainty

9.75 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

9.76 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

9.77 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

9.78 The atmospheric dispersion model used for this assessment, ADMS-Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.

9.79 LAQM.TG16 (Ref 9.11) requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their Review and Assessment duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. As outlined in Box 7.10 of LAQM.TG16 no adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

9.80 For the verification and adjustment of NOx/NO_2 concentrations for Review and Assessment purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

9.81 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for Review and Assessment purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. A model verification study will be undertaken for each borough modelled for the Draft ES. For this PEIR, a model verification study for South

Northamptonshire has been undertaken for receptors close to the M1 and a separate model verification for all other receptors and is included in **Appendix 9.4.**

Embedded Mitigation

Main SRFI Site

9.82 The construction dust assessment (undertaken in the next section) provides a dust impact risk. The IAQM dust guidance lists mitigation measures for low, medium and high dust risks. The mitigation measures have been included in the Dust Management Plan, which is included in the CEMP that will be secured by a requirement under the DCO.

9.83 During the operational phase a number of mitigation measures have been embedded into the design of the Proposed Development. The proposed changes to the Highways are expected to reduce the effect of the road traffic generated by the Proposed Development by easing congestion. These changes to the Highways are detailed in **Chapter 19: Highways and Transportation**.

J15a Works

9.84 The embedded mitigation relevant to air quality at the J15a works includes changes to the road layout to ease congestion. More detail on this can be found in **Chapter 19: Highways and Transportation**.

Minor Highway Works

9.85 The embedded mitigation relevant to air quality at the minor highway works includes widening of roads and roundabouts and changes to the road lanes. These highway works will ease congestion. More detail on this can be found in **Chapter 19: Highways and Transportation**.

All Development within Order Limits

9.86 The embedded mitigation across all Proposed Development works include the following:

- Dust mitigation measures included within CEMP;
- Changes to road layout at J15a; and
- Widening of roads and roundabouts and changes to road lanes at minor highway works locations.

Assessment of Construction-Phase Effects

All Development within Order Limits

9.87 The assessment of construction-phase effects for each aspect of the Proposed Development (the Main SRFI Site, J15a works and Minor Highway Works) is considered together under "All Development within Order Limits". This ensures the assessment undertaken is based on a worst-case scenario that the whole of the Proposed Development is constructed at the same time. In reality construction will take place in stages. When considering the Proposed Development as a whole, the Dust Emission Magnitude is likely to be Large. For each stage it is likely that the Dust Emissions Magnitude would be smaller which could lead to a smaller Dust Risk Impact. Therefore by determining the Dust Risk Impact for the site as a whole is more conservative.

Construction Dust - Risk of Dust Impacts

Source

9.88 The volume of the buildings within the Order Limits that would be demolished has been estimated at between 20,000 to 50,000 m^3. The dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as **Medium**.

9.89 The area of the Order Limits is approximately 3.6 km^2. As this is greater than 10,000 m^2, the dust emission magnitude for the earthworks phase is classified as **Large**.

9.90 The total volume of the buildings to be constructed would exceed 100,000 m^3 and the dust emission magnitude for the construction phase is classified as **Large**.

9.91 Assuming that the maximum number of outwards movements in any one day is greater than 50 HDVs, the dust emission magnitude for trackout would be classified as **Large**.

Table 9.12 Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Medium	Large	Large	Large

Pathway and Receptor - Sensitivity of the Area

9.92 Demolition activities are restricted to a number of farm houses in the north eastern part of the Main SRFI Site. Receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the farm houses have been identified, the sensitivity of the area has been classified and the results are provided in the table below.

Table 9.13 Sensitivity of the Surrounding Area for Demolition

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	No highly sensitive receptors within 100 m of demolition activities 1 – 10 high sensitivity receptors located within 350 m of the demolition activities
Human Health	Low	No highly sensitive receptors within 100 m of demolition activities Background PM_{10} concentrations for the assessment is less than 24 $\mu g.m^{-3}$ 1 – 10 high sensitivity receptors located within 350 m of the demolition activities and PM_{10} concentrations below 24 $\mu g.m^{-3}$
Ecological	-	There are no sites designated for their ecological importance within 50 m of the demolition activities.

9.93 All earthwork activities are assumed to occur within the Main SRFI Site. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the Main SRFI Site have been identified and the sensitivity of the area has been classified and the results are provided in the table below.

Table 9.14 Sensitivity of the Surrounding Area for Earthworks

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	Between 10 and 100 residential receptors (high sensitivity) within 20 m of site boundary. 10 – 100 high sensitivity receptors located within 20 m of the site boundary
Human Health	Low	Between 10 and 100 residential receptors (high sensitivity) within 20 m of site boundary. Background PM_{10} concentrations for the assessment is less than 24 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 20 m of the site boundary and PM_{10} concentrations below 24 $\mu g.m^{-3}$
Ecological	Medium	Roade Cutting SSSI (medium sensitivity

		receptor) within 20 m of site boundary.

9.94 The outskirts of the site are expected to be landscaping, bunding and screening. Receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the construction activities have been identified and the sensitivity of the area has been classified and the results are provided in the table below.

Table 9.15 Sensitivity of the Surrounding Area for Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	No highly sensitive receptors within 50 m of construction activities of the Main SRFI Site Between 10 and 100 high sensitivity receptors within 20 m of highway works 10 – 100 high sensitivity receptors located within 20 m of the construction activities
Human Health	High	No highly sensitive receptors within 50 m of construction activities of the Main SRFI Site Between 10 and 100 high sensitivity receptors within 20 m of highway works Background PM_{10} concentrations for the assessment is less than 24 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 20 m of the construction activities and PM_{10} concentrations below 24 $\mu g.m^{-3}$
Ecological	Low	There are no sites designated for their ecological importance within 50 m of the construction activities of the Main SRFI Site. Barnes Meadow Local Nature Reserve (low sensitivity receptor) within 50 m of construction activities of highway works at Barnes Meadow Interchange

9.95 The Dust Emission Magnitude for trackout is classified as large and trackout may occur on roads up to 500 m from the Main SRFI Site and highway works. The major routes within 500 m of the Main SRFI Site is the A43. There are a number of routes within 500 m of the highway works The sensitivity of the area has been classified and the results are provided in the table below.

Table 9.16 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	More than 100 residential properties within 50 m of the roads. >100 high sensitivity receptors located within 50 m of the roads
Human Health	Medium	More than 100 residential properties within 50 m of the roads. Background PM_{10} concentrations for the assessment is less than 24 $\mu g.m^{-3}$ >100 high sensitivity receptors located within 50 m of the roads and PM_{10} concentrations below 24 $\mu g.m^{-3}$
Ecological	Low	There are no sites designated for their ecological importance within 50 m of the A43. Barnes Meadow Local Nature Reserve (low sensitivity receptor) within 50 m of roads around the Highway Works at Barnes Meadow Interchange

Overall Dust Risk

9.96 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area to give the Dust Impact Risk. The table below summarises the Dust Impact Risk for the four activities.

Table 9.17 Dust Impact Risk for Demolition, Earthworks, Construction and Trackout

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	High	High	High
Human Health	Low	Low	High	Medium
Ecology	-	Medium	Low	Low
Risk	Low	High	High	High

9.97 Taking the Proposed Development as a whole, the overall unmitigated risk is deemed to be **high**. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in the Adaptive Mitigation section of this chapter.

9.98 After implementation of this package of mitigation measures, the residual construction dust effects will not be significant. These mitigation measures will be secured by a requirement under the DCO and will be included in the CEMP.

Construction Traffic

9.99 Construction traffic is included in the traffic data modelled for 2021 and the results presented in the *Assessment of Operational-Phase Effects* section below.

9.100 There are only two road links where construction traffic exceeds the EPUK/IAQM thresholds. These are the site access itself and the A43 between the site access and the M1. There are no sensitive receptors close to the site access so it has not been modelled. For the *With the Proposed development in the year of first opening including construction traffic and partial build out, 2021* scenario, the following flows have been added to the operational traffic flows for the A43 between the site access and the M1:

- 199 HDVs;
- and 539 LDVs.

Assessment of Operational-Phase Effects

All Development within Order Limits

9.101 As for construction phase effects, operational phase effects are considered as "All Development within Order Limits" given the traffic flows modelled are associated with the whole Proposed Development.

9.102 This section of the chapter summarises the future operational-phase air quality impacts of the key pollutants associated with the development traffic of the proposed scheme. Due to the timescales available for this PEIR, only receptors within the Borough of South Northamptonshire have been assessed. Other boroughs will be assessed for the Environmental Statement to be submitted with the DCO application.

Nitrogen Dioxide (NO_2) - 2021

9.103 Table 9.18 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

Table 9.18 Predicted Annual-Mean NO_2 Impacts at Existing Receptors - 2021

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	21.0	20.5	-1	Negligible
2	Ashwood Farm	14.4	14.4	0	Negligible
3	Bleak Hall Farmhouse	18.9	19.1	0	Negligible
4	Blisworth Lodge Farm	17.7	18.1	1	Negligible
5	Blisworth Marina 1	14.6	15.0	1	Negligible
6	Blisworth Marina 2	16.1	17.2	3	Negligible
7	Blisworth Park	24.1	25.9	5	Negligible
8	Blisworth Primary School	18.1	18.3	0	Negligible
9	Brackley Hatch	19.6	19.7	0	Negligible
10	Broadwater Lane	34.7	36.2	4	Slight
11	Carrs Way	15.8	16.0	1	Negligible
12	Celvert Road	14.4	14.8	1	Negligible
13	Chapmans Drive	15.9	15.9	0	Negligible
14	Collingtree Road	15.8	16.1	1	Negligible
15	Courteenhall East Lodge	13.7	13.7	0	Negligible
16	Creslow Court	14.4	14.4	0	Negligible
17	Dalvina Place	17.1	17.2	0	Negligible
18	Gaytonway	15.4	15.8	1	Negligible
19	Grafton Regis	24.9	24.0	-2	Negligible
20	Green Lane	23.7	24.3	1	Negligible
21	Greenleys Lane	18.6	18.6	0	Negligible
22	Hazelborough House	22.1	22.2	0	Negligible
23	Herbert Gardens	20.3	20.8	1	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
24	High Street	20.8	20.2	-1	Negligible
25	Hollandstone Farm	13.6	13.5	0	Negligible
26	Kiln Farm	15.1	15.1	0	Negligible
27	Kislingbury Grange	13.0	13.0	0	Negligible
28	Lordsfields Farm	13.4	13.5	0	Negligible
29	Main Road	14.9	14.8	0	Negligible
30	Mansell Close	18.7	19.1	1	Negligible
31	Maple Farm 1	17.2	17.4	0	Negligible
32	Maple Farm 2	17.6	17.8	1	Negligible
33	Mill Lane	14.1	14.1	0	Negligible
34	Millers Close	23.2	23.3	0	Negligible
35	North Street 1	14.9	15.6	2	Negligible
36	North Street 2	14.6	15.5	2	Negligible
37	Northampton Road	16.0	16.2	0	Negligible
38	Northampton Road	21.3	21.3	0	Negligible
39	Oxfield Park Drive	14.8	14.9	0	Negligible
40	Ploughmans Way	14.8	15.0	0	Negligible
41	Quiton Green	14.0	14.0	0	Negligible
42	Rectory Lane	17.3	17.7	1	Negligible
43	Roade School	17.5	17.1	-1	Negligible
44	Shearmans	14.6	14.6	0	Negligible
45	Shepherd's Lodge	16.2	16.3	0	Negligible
46	St Johns Road	23.4	24.3	2	Negligible
47	Stoke Road	14.4	14.6	1	Negligible
48	Stoneway	24.0	24.1	0	Negligible
49	The Lodge	15.9	16.5	1	Negligible
50	Third Lodge	20.8	21.4	2	Negligible
51	Tithe Way	24.9	24.0	-2	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
52	Towcester Bypass 1	21.3	22.3	3	Negligible
53	Towcester Bypass 2	17.1	17.7	2	Negligible
54	Towcester Bypass 3	15.5	15.8	1	Negligible
55	Towcester Bypass School	18.2	18.9	2	Negligible
56	Towcester Road	15.6	16.3	2	Negligible
57	Towcester Road	15.7	15.3	-1	Negligible
58	Towcester Road	17.5	17.9	1	Negligible
59	Versions Farm	22.6	22.8	0	Negligible
60	Watling Street 1	23.0	21.9	-3	Negligible
61	Watling Street 2	28.6	27.2	-3	Negligible
62	Watling Street 3	19.7	19.1	-1	Negligible
63	Watling Street 4	27.5	26.1	-3	Negligible
64	Weeden Road	26.1	25.3	-2	Negligible
65	West Lodge Cottages	19.7	19.0	-2	Negligible
66	Whitfield	19.4	19.5	0	Negligible
67	Windmill Farm	16.5	16.6	0	Negligible
68	Woodlands	15.4	15.5	0	Negligible
69	Wootton Road	15.8	16.0	1	Negligible
70	Wretton House	18.5	18.6	0	Negligible
Maximum		**34.7**	**36.2**	**4**	**-**
Minimum		**13.0**	**13.0**	**0**	**-**

9.104 Predicted annual-mean NO_2 concentrations in 2021 at the façades of the existing receptors are below the AQS objective for NO_2. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all but one receptor. At Broadwater Lane the impact descriptor is 'slight adverse'. At a

number of locations the predicted NO_2 concentration is predicted to decrease with the development.

9.105 As all predicted annual-mean NO_2 concentrations are below 60 $\mu g.m^{-3}$, the hourly-mean objective for NO_2 is likely to be met at all receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

9.106 Overall, the impact on the surrounding area (for South Northamptonshire) from NO_2 in 2021 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10}) - 2021

9.107 Table 9.19 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 9.19 Predicted Annual-Mean PM_{10} Impacts at Existing Receptors - 2021

Receptor ID	Receptor Name	Concentration ($\mu g.m^{-3}$)		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	16.8	16.7	0	Negligible
2	Ashwood Farm	15.8	15.8	0	Negligible
3	Bleak Hall Farmhouse	16.4	16.5	0	Negligible
4	Blisworth Lodge Farm	16.2	16.2	0	Negligible
5	Blisworth Marina 1	15.8	15.9	0	Negligible
6	Blisworth Marina 2	16.0	16.2	0	Negligible
7	Blisworth Park	17.2	17.4	0	Negligible
8	Blisworth Primary School	16.1	16.1	0	Negligible
9	Brackley Hatch	16.5	16.5	0	Negligible
10	Broadwater Lane	18.8	19.1	1	Negligible
11	Carrs Way	16.0	16.0	0	Negligible
12	Celvert Road	15.8	15.8	0	Negligible
13	Chapmans Drive	16.0	16.0	0	Negligible

Receptor ID	Receptor Name	Concentration (μg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
14	Collingtree Road	15.9	16.0	0	Negligible
15	Courteenhall East Lodge	15.7	15.7	0	Negligible
16	Creslow Court	15.8	15.8	0	Negligible
17	Dalvina Place	16.1	16.1	0	Negligible
18	Gaytonway	15.9	16.0	0	Negligible
19	Grafton Regis	17.4	17.3	0	Negligible
20	Green Lane	17.0	17.1	0	Negligible
21	Greenleys Lane	16.3	16.3	0	Negligible
22	Hazelborough House	16.8	16.8	0	Negligible
23	Herbert Gardens	16.6	16.7	0	Negligible
24	High Street	16.5	16.4	0	Negligible
25	Hollandstone Farm	15.7	15.7	0	Negligible
26	Kiln Farm	15.9	15.9	0	Negligible
27	Kislingbury Grange	15.6	15.6	0	Negligible
28	Lordsfields Farm	15.7	15.7	0	Negligible
29	Main Road	15.9	15.9	0	Negligible
30	Mansell Close	16.4	16.4	0	Negligible
31	Maple Farm 1	16.2	16.2	0	Negligible
32	Maple Farm 2	16.2	16.3	0	Negligible
33	Mill Lane	15.8	15.8	0	Negligible
34	Millers Close	17.1	17.1	0	Negligible
35	North Street 1	15.8	15.9	0	Negligible
36	North Street 2	15.8	15.9	0	Negligible
37	Northampton Road	16.0	16.0	0	Negligible
38	Northampton Road	16.5	16.5	0	Negligible
39	Oxfield Park Drive	15.8	15.8	0	Negligible

Receptor ID	Receptor Name	Concentration (μg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
40	Ploughmans Way	15.8	15.9	0	Negligible
41	Quiton Green	15.7	15.7	0	Negligible
42	Rectory Lane	16.1	16.2	0	Negligible
43	Roade School	16.3	16.2	0	Negligible
44	Shearmans	15.8	15.8	0	Negligible
45	Shepherd's Lodge	16.0	16.1	0	Negligible
46	St Johns Road	17.1	17.2	0	Negligible
47	Stoke Road	15.8	15.8	0	Negligible
48	Stoneway	17.1	17.2	0	Negligible
49	The Lodge	16.0	16.1	0	Negligible
50	Third Lodge	16.6	16.7	0	Negligible
51	Tithe Way	17.2	17.0	0	Negligible
52	Towcester Bypass 1	16.7	16.8	0	Negligible
53	Towcester Bypass 2	16.1	16.2	0	Negligible
54	Towcester Bypass 3	15.9	15.9	0	Negligible
55	Towcester Bypass School	16.2	16.3	0	Negligible
56	Towcester Road	15.9	16.0	0	Negligible
57	Towcester Road	16.0	16.0	0	Negligible
58	Towcester Road	16.1	16.2	0	Negligible
59	Versions Farm	17.0	17.1	0	Negligible
60	Watling Street 1	16.8	16.6	0	Negligible
61	Watling Street 2	17.4	17.3	0	Negligible
62	Watling Street 3	16.4	16.3	0	Negligible
63	Watling Street 4	17.3	17.1	0	Negligible
64	Weeden Road	17.1	17.0	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
65	West Lodge Cottages	16.6	16.5	0	Negligible
66	Whitfield	16.5	16.5	0	Negligible
67	Windmill Farm	16.1	16.1	0	Negligible
68	Woodlands	15.9	15.9	0	Negligible
69	Wootton Road	16.0	16.0	0	Negligible
70	Wretton House	16.4	16.4	0	Negligible
Maximum		**18.8**	**19.1**	**1**	**-**
Minimum		**15.6**	**15.6**	**0**	**-**

9.108 Predicted annual-mean PM_{10} concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

9.109 As all predicted annual mean PM_{10} concentrations are below 31.5 µg.m^{-3}, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

9.110 Overall, the impact on the surrounding area (for South Northamptonshire) from PM_{10} in 2021 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Fine Particulate Matter ($PM_{2.5}$) - 2021

9.111 Table presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 9.20 Predicted Annual-Mean $PM_{2.5}$ Impacts at Existing Receptors - 2021

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	12.8	12.7	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
2	Ashwood Farm	11.0	11.0	0	Negligible
3	Bleak Hall Farmhouse	12.2	12.2	0	Negligible
4	Blisworth Lodge Farm	11.7	11.8	0	Negligible
5	Blisworth Marina 1	11.1	11.2	0	Negligible
6	Blisworth Marina 2	11.5	11.7	1	Negligible
7	Blisworth Park	13.6	13.8	1	Negligible
8	Blisworth Primary School	11.6	11.6	0	Negligible
9	Brackley Hatch	12.2	12.3	0	Negligible
10	Broadwater Lane	16.5	17.0	2	Negligible
11	Carrs Way	11.3	11.4	0	Negligible
12	Celvert Road	11.0	11.1	0	Negligible
13	Chapmans Drive	11.3	11.3	0	Negligible
14	Collingtree Road	11.3	11.3	0	Negligible
15	Courteenhall East Lodge	10.9	10.9	0	Negligible
16	Creslow Court	11.0	11.0	0	Negligible
17	Dalvina Place	11.6	11.6	0	Negligible
18	Gaytonway	11.2	11.3	0	Negligible
19	Grafton Regis	13.8	13.7	-1	Negligible
20	Green Lane	13.3	13.5	1	Negligible
21	Greenleys Lane	11.9	12.0	0	Negligible
22	Hazelborough House	12.9	12.9	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
23	Herbert Gardens	12.5	12.6	1	Negligible
24	High Street	12.3	12.1	-1	Negligible
25	Hollandstone Farm	10.9	10.9	0	Negligible
26	Kiln Farm	11.2	11.2	0	Negligible
27	Kislingbury Grange	10.7	10.7	0	Negligible
28	Lordsfields Farm	10.8	10.8	0	Negligible
29	Main Road	11.2	11.2	0	Negligible
30	Mansell Close	12.1	12.2	0	Negligible
31	Maple Farm 1	11.7	11.8	0	Negligible
32	Maple Farm 2	11.8	11.9	0	Negligible
33	Mill Lane	11.0	11.0	0	Negligible
34	Millers Close	13.4	13.4	0	Negligible
35	North Street 1	11.1	11.3	1	Negligible
36	North Street 2	11.1	11.3	1	Negligible
37	Northampton Road	11.4	11.4	0	Negligible
38	Northampton Road	12.3	12.3	0	Negligible
39	Oxfield Park Drive	11.1	11.1	0	Negligible
40	Ploughmans Way	11.1	11.2	0	Negligible
41	Quiton Green	10.9	10.9	0	Negligible
42	Rectory Lane	11.6	11.7	0	Negligible
43	Roade School	11.9	11.8	0	Negligible
44	Shearmans	11.0	11.0	0	Negligible
45	Shepherd's	11.5	11.5	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
	Lodge				
46	St Johns Road	13.3	13.6	1	Negligible
47	Stoke Road	11.0	11.1	0	Negligible
48	Stoneway	13.4	13.5	0	Negligible
49	The Lodge	11.4	11.5	1	Negligible
50	Third Lodge	12.5	12.7	1	Negligible
51	Tithe Way	13.5	13.3	-1	Negligible
52	Towcester Bypass 1	12.6	12.9	1	Negligible
53	Towcester Bypass 2	11.6	11.7	1	Negligible
54	Towcester Bypass 3	11.2	11.2	0	Negligible
55	Towcester Bypass School	11.8	12.0	1	Negligible
56	Towcester Road	11.2	11.4	1	Negligible
57	Towcester Road	11.4	11.3	0	Negligible
58	Towcester Road	11.6	11.7	0	Negligible
59	Versions Farm	13.3	13.3	0	Negligible
60	Watling Street 1	12.8	12.5	-1	Negligible
61	Watling Street 2	13.9	13.7	-1	Negligible
62	Watling Street 3	12.0	11.9	0	Negligible
63	Watling Street 4	13.7	13.4	-1	Negligible
64	Weeden Road	13.4	13.3	-1	Negligible
65	West Lodge	12.4	12.3	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
	Cottages				
66	Whitfield	12.3	12.3	0	Negligible
67	Windmill Farm	11.6	11.6	0	Negligible
68	Woodlands	11.3	11.3	0	Negligible
69	Wootton Road	11.4	11.4	0	Negligible
70	Wretton House	12.1	12.1	0	Negligible
Maximum		**16.5**	**17.0**	**2**	**-**
Minimum		**10.7**	**10.7**	**-1**	**-**

AQS objective = 25 µg.m^{-3}

9.112 Predicted annual-mean $PM_{2.5}$ concentrations in the 2021 at the façades of the existing receptors are well below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

9.113 Overall, the impact on the surrounding area (for South Northamptonshire) from $PM_{2.5}$ in 2021 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Nitrogen Dioxide (NO_2) - 2031

9.114 Table 9.21 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

Table 9.21 Predicted Annual-Mean NO_2 Impacts at Existing Receptors - 2031

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	15.9	15.6	-1	Negligible
2	Ashwood Farm	13.1	13.1	0	Negligible
3	Bleak Hall	15.1	15.2	0	Negligible

Receptor ID	Receptor Name	Concentration (μg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
	Farmhouse				
4	Blisworth Lodge Farm	14.7	14.5	-1	Negligible
5	Blisworth Marina 1	13.4	13.4	0	Negligible
6	Blisworth Marina 2	14.2	14.3	0	Negligible
7	Blisworth Park	18.5	18.4	0	Negligible
8	Blisworth Primary School	15.3	14.5	-2	Negligible
9	Brackley Hatch	15.5	15.5	0	Negligible
10	Broadwater Lane	23.5	23.1	-1	Negligible
11	Carrs Way	13.6	13.8	1	Negligible
12	Celvert Road	13.3	13.4	0	Negligible
13	Chapmans Drive	14.0	13.9	0	Negligible
14	Collingtree Road	14.9	13.9	-2	Negligible
15	Courteenhall East Lodge	12.8	12.8	0	Negligible
16	Creslow Court	13.3	13.2	0	Negligible
17	Dalvina Place	14.7	14.5	0	Negligible
18	Gaytonway	14.0	13.8	-1	Negligible
19	Grafton Regis	17.8	17.1	-2	Negligible
20	Green Lane	17.6	17.6	0	Negligible
21	Greenleys Lane	15.4	15.2	-1	Negligible
22	Hazelborough House	16.6	16.6	0	Negligible
23	Herbert Gardens	16.2	16.0	-1	Negligible
24	High Street	16.4	15.3	-3	Negligible

Receptor ID	Receptor Name	Concentration (μg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
25	Hollandstone Farm	12.8	12.7	0	Negligible
26	Kiln Farm	13.5	13.4	0	Negligible
27	Kislingbury Grange	12.5	12.5	0	Negligible
28	Lordsfields Farm	12.8	12.8	0	Negligible
29	Main Road	13.3	13.3	0	Negligible
30	Mansell Close	15.4	15.2	0	Negligible
31	Maple Farm 1	14.4	14.3	0	Negligible
32	Maple Farm 2	14.9	14.5	-1	Negligible
33	Mill Lane	12.9	13.0	0	Negligible
34	Millers Close	16.9	16.7	0	Negligible
35	North Street 1	13.7	13.6	0	Negligible
36	North Street 2	13.5	13.5	0	Negligible
37	Northampton Road	13.7	13.9	0	Negligible
38	Northampton Road	17.3	16.4	-2	Negligible
39	Oxfield Park Drive	13.5	13.4	0	Negligible
40	Ploughmans Way	13.4	13.4	0	Negligible
41	Quiton Green	13.0	13.0	0	Negligible
42	Rectory Lane	15.8	14.5	-3	Negligible
43	Roade School	14.9	14.2	-2	Negligible
44	Shearmans	13.4	13.3	0	Negligible
45	Shepherd's Lodge	13.9	13.9	0	Negligible
46	St Johns Road	17.8	17.5	-1	Negligible
47	Stoke Road	13.4	13.2	-1	Negligible

Receptor ID	Receptor Name	Concentration (μg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
48	Stoneway	17.2	17.1	0	Negligible
49	The Lodge	14.1	13.9	0	Negligible
50	Third Lodge	16.5	16.3	-1	Negligible
51	Tithe Way	17.8	16.9	-2	Negligible
52	Towcester Bypass 1	16.9	17.0	0	Negligible
53	Towcester Bypass 2	14.6	14.8	0	Negligible
54	Towcester Bypass 3	13.8	13.9	0	Negligible
55	Towcester Bypass School	15.2	15	1	Negligible
56	Towcester Road	13.9	14.1	1	Negligible
57	Towcester Road	14.2	13.4	-2	Negligible
58	Towcester Road	15.0	14.9	0	Negligible
59	Versions Farm	16.8	16.7	0	Negligible
60	Watling Street 1	18.5	16.6	-5	Negligible
61	Watling Street 2	21.7	19.2	-6	Negligible
62	Watling Street 3	16.5	15.4	-3	Negligible
63	Watling Street 4	21.1	18.7	-6	Negligible
64	Weeden Road	19.6	18.1	-4	Negligible
65	West Lodge Cottages	15.7	14.8	-2	Negligible
66	Whitfield	15.3	15.3	0	Negligible
67	Windmill Farm	14.2	14.1	0	Negligible
68	Woodlands	13.5	13.5	0	Negligible
69	Wootton Road	13.9	13.9	0	Negligible
70	Wretton House	15.0	14.9	0	Negligible
Maximum		**23.5**	**23.1**	**-1**	-
Minimum		**12.5**	**12.5**	**0**	-

9.115 Predicted annual-mean NO_2 concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO_2. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors. At a number of locations the predicted NO_2 concentration is predicted to decrease with the development.

9.116 As all predicted annual-mean NO_2 concentrations are below 60 $\mu g.m^{-3}$, the hourly-mean objective for NO_2 is likely to be met at all receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

9.117 Overall, the impact on the surrounding area (for South Northamptonshire) from NO_2 in 2031 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10}) - 2031

9.118 Table 9.22 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 9.22 Predicted Annual-Mean PM_{10} Impacts at Existing Receptors - 2031

Receptor ID	Receptor Name	Concentration ($\mu g.m^{-3}$)		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	16.6	16.6	0	Negligible
2	Ashwood Farm	15.8	15.8	0	Negligible
3	Bleak Hall Farmhouse	16.4	16.4	0	Negligible
4	Blisworth Lodge Farm	16.1	16.2	0	Negligible
5	Blisworth Marina 1	15.8	15.8	0	Negligible
6	Blisworth Marina 2	16.1	16.1	0	Negligible
7	Blisworth Park	17.3	17.2	0	Negligible
8	Blisworth Primary School	16.1	16.1	0	Negligible
9	Brackley Hatch	16.4	16.4	0	Negligible
10	Broadwater	19.0	18.9	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
	Lane				
11	Carrs Way	15.9	15.9	0	Negligible
12	Celvert Road	15.8	15.8	0	Negligible
13	Chapmans Drive	16.0	15.9	0	Negligible
14	Collingtree Road	16.1	15.9	-1	Negligible
15	Courteenhall East Lodge	15.7	15.7	0	Negligible
16	Creslow Court	15.8	15.8	0	Negligible
17	Dalvina Place	16.1	16.1	0	Negligible
18	Gaytonway	16.0	15.9	0	Negligible
19	Grafton Regis	17.4	17.1	-1	Negligible
20	Green Lane	17.0	17.0	0	Negligible
21	Greenleys Lane	16.3	16.3	0	Negligible
22	Hazelborough House	16.7	16.7	0	Negligible
23	Herbert Gardens	16.6	16.6	0	Negligible
24	High Street	16.6	16.3	-1	Negligible
25	Hollandstone Farm	15.7	15.7	0	Negligible
26	Kiln Farm	15.9	15.9	0	Negligible
27	Kislingbury Grange	15.6	15.6	0	Negligible
28	Lordsfields Farm	15.7	15.7	0	Negligible
29	Main Road	15.8	15.8	0	Negligible
30	Mansell Close	16.4	16.4	0	Negligible
31	Maple Farm 1	16.2	16.1	0	Negligible
32	Maple Farm 2	16.3	16.2	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
33	Mill Lane	15.7	15.8	0	Negligible
34	Millers Close	17.0	17.0	0	Negligible
35	North Street 1	15.9	15.9	0	Negligible
36	North Street 2	15.9	15.9	0	Negligible
37	Northampton Road	15.9	16.0	0	Negligible
38	Northampton Road	16.6	16.4	0	Negligible
39	Oxfield Park Drive	15.8	15.8	0	Negligible
40	Ploughmans Way	15.8	15.8	0	Negligible
41	Quiton Green	15.7	15.7	0	Negligible
42	Rectory Lane	16.3	16.1	-1	Negligible
43	Roade School	16.3	16.2	0	Negligible
44	Shearmans	15.8	15.8	0	Negligible
45	Shepherd's Lodge	16.0	16.0	0	Negligible
46	St Johns Road	17.2	17.1	0	Negligible
47	Stoke Road	15.8	15.8	0	Negligible
48	Stoneway	17.0	17.0	0	Negligible
49	The Lodge	16.0	16.0	0	Negligible
50	Third Lodge	16.7	16.6	0	Negligible
51	Tithe Way	17.1	16.9	-1	Negligible
52	Towcester Bypass 1	16.7	16.7	0	Negligible
53	Towcester Bypass 2	16.1	16.1	0	Negligible
54	Towcester Bypass 3	15.9	15.9	0	Negligible
55	Towcester	16.2	16.3	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
	Bypass School				
56	Towcester Road	15.9	16.0	0	Negligible
57	Towcester Road	16.1	15.9	0	Negligible
58	Towcester Road	16.2	16.1	0	Negligible
59	Versions Farm	16.9	17.0	0	Negligible
60	Watling Street 1	17.0	16.6	-1	Negligible
61	Watling Street 2	17.7	17.2	-1	Negligible
62	Watling Street 3	16.5	16.3	-1	Negligible
63	Watling Street 4	17.5	17.0	-1	Negligible
64	Weeden Road	17.2	16.9	-1	Negligible
65	West Lodge Cottages	16.6	16.4	0	Negligible
66	Whitfield	16.4	16.4	0	Negligible
67	Windmill Farm	16.1	16.1	0	Negligible
68	Woodlands	15.9	15.9	0	Negligible
69	Wootton Road	16.0	16.0	0	Negligible
70	Wretton House	16.3	16.3	0	Negligible
Maximum		**19.0**	**18.9**	**0**	-
Minimum		**15.6**	**15.6**	**0**	-

9.119 Predicted annual-mean PM_{10} concentrations in 2031 at the façades of the existing receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

9.120 As all predicted annual mean PM_{10} concentrations are below 31.5 $\mu g.m^{-3}$, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

9.121 Overall, the impact on the surrounding area (for South Northamptonshire) from PM_{10} in 2031 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Fine Particulate Matter ($PM_{2.5}$) - 2031

9.122 Table 9.23 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 9.23 Predicted Annual-Mean $PM_{2.5}$ Impacts at Existing Receptors – 2031

Receptor ID	Receptor Name	Concentration ($\mu g.m^{-3}$)		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
1	A508 – Yardley Gobion	12.5	12.6	0	Negligible
2	Ashwood Farm	11.0	11.0	0	Negligible
3	Bleak Hall Farmhouse	12.2	12.2	0	Negligible
4	Blisworth Lodge Farm	11.6	11.8	1	Negligible
5	Blisworth Marina 1	11.1	11.1	0	Negligible
6	Blisworth Marina 2	11.5	11.6	0	Negligible
7	Blisworth Park	13.8	13.7	0	Negligible
8	Blisworth Primary School	11.6	11.6	0	Negligible
9	Brackley Hatch	12.2	12.2	0	Negligible
10	Broadwater Lane	17.0	16.8	-1	Negligible
11	Carrs Way	11.2	11.3	1	Negligible
12	Celvert Road	11.0	11.0	0	Negligible
13	Chapmans Drive	11.3	11.3	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
14	Collingtree Road	11.7	11.3	-1	Negligible
15	Courteenhall East Lodge	10.9	10.8	0	Negligible
16	Creslow Court	11.0	11.0	0	Negligible
17	Dalvina Place	11.7	11.6	0	Negligible
18	Gaytonway	11.4	11.3	0	Negligible
19	Grafton Regis	14.0	13.6	-2	Negligible
20	Green Lane	13.3	13.3	0	Negligible
21	Greenleys Lane	12.0	11.9	0	Negligible
22	Hazelborough House	12.8	12.8	0	Negligible
23	Herbert Gardens	12.6	12.6	0	Negligible
24	High Street	12.5	12.1	-2	Negligible
25	Hollandstone Farm	10.9	10.8	0	Negligible
26	Kiln Farm	11.2	11.2	0	Negligible
27	Kislingbury Grange	10.7	10.7	0	Negligible
28	Lordsfields Farm	10.8	10.8	0	Negligible
29	Main Road	11.1	11.1	0	Negligible
30	Mansell Close	12.2	12.1	0	Negligible
31	Maple Farm 1	11.8	11.7	0	Negligible
32	Maple Farm 2	12.0	11.8	-1	Negligible
33	Mill Lane	11.0	11.0	0	Negligible
34	Millers Close	13.4	13.3	0	Negligible
35	North Street 1	11.3	11.2	0	Negligible
36	North Street 2	11.2	11.2	0	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
37	Northampton Road	11.3	11.4	0	Negligible
38	Northampton Road	12.5	12.2	-1	Negligible
39	Oxfield Park Drive	11.1	11.1	0	Negligible
40	Ploughmans Way	11.1	11.1	0	Negligible
41	Quiton Green	10.9	10.9	0	Negligible
42	Rectory Lane	12.0	11.7	-1	Negligible
43	Roade School	11.9	11.8	-1	Negligible
44	Shearmans	11.1	11.0	0	Negligible
45	Shepherd's Lodge	11.5	11.5	0	Negligible
46	St Johns Road	13.6	13.5	-1	Negligible
47	Stoke Road	11.1	11.0	0	Negligible
48	Stoneway	13.3	13.3	0	Negligible
49	The Lodge	11.5	11.5	0	Negligible
50	Third Lodge	12.7	12.6	-1	Negligible
51	Tithe Way	13.6	13.1	-2	Negligible
52	Towcester Bypass 1	12.7	12.8	0	Negligible
53	Towcester Bypass 2	11.6	11.7	0	Negligible
54	Towcester Bypass 3	11.2	11.2	0	Negligible
55	Towcester Bypass School	11.8	11.9	0	Negligible
56	Towcester Road	11.2	11.3	0	Negligible
57	Towcester Road	11.6	11.3	-1	Negligible

Receptor ID	Receptor Name	Concentration (µg.m^{-3})		With – Without Dev as % of the AQS Objective	Impact Descriptor
		Without Development	With Development		
58	Towcester Road	11.7	11.7	0	Negligible
59	Versions Farm	13.2	13.2	0	Negligible
60	Watling Street 1	13.3	12.5	-3	Negligible
61	Watling Street 2	14.5	13.6	-4	Negligible
62	Watling Street 3	12.3	11.9	-2	Negligible
63	Watling Street 4	14.2	13.3	-4	Negligible
64	Weeden Road	13.6	13.2	-2	Negligible
65	West Lodge Cottages	12.5	12.3	-1	Negligible
66	Whitfield	12.2	12.3	0	Negligible
67	Windmill Farm	11.6	11.5	0	Negligible
68	Woodlands	11.2	11.2	0	Negligible
69	Wootton Road	11.4	11.4	0	Negligible
70	Wretton House	12.1	12.0	0	Negligible
Maximum		**17.0**	**16.8**	**-1**	-
Minimum		**10.7**	**10.7**	**0**	-

AQS objective = 25 µg.m^{-3}

9.123 Predicted annual-mean $PM_{2.5}$ concentrations in 2031 at the façades of the existing receptors are well below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

9.124 Overall, the impact on the surrounding area (for South Northamptonshire) from $PM_{2.5}$ in 2031 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Significance of Effects

9.125 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

9.126 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *"Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."* and *"…a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."*

9.127 The results of the modelling indicate that with the development, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing receptors are below the relevant long and short-term AQS objectives. When the magnitude of change in annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on existing receptors are categorised as 'negligible' at all receptors. At a number of receptors the predicted concentrations are expected to decrease with the development. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area (for South Northamptonshire) is considered to be 'negligible', using the descriptors adopted for this assessment.

9.128 Using professional judgement, the resulting air quality effect in South Northamptonshire is considered to be 'not significant' overall. Further modelling will be undertaken to determine the air quality effects in Northampton.

Assessment of Decommissioning Phase Effects

9.129 It is not known when there will no longer be a need for the Proposed Development and many elements of the development are unlikely to be decommissioned at all. The design life of the warehousing buildings will be in the order of 60+ years (approximately), and the rail infrastructure and civil engineering works will be significantly longer than this. Once the warehouses reach their design life, it is entirely feasible that they will be re-provided in a modern form. Should that occur it would be subject to its own assessment of effects at the relevant time.

9.130 The main sources of dust sources during the decommissioning phase will differ to the main sources during the construction phase. The proximity of sensitive receptors could also change. Therefore it is not possible to undertake an assessment of dust during the

decommissioning phase but in principle, it should be possible to have lesser effects at source, using phased deconstruction techniques rather than demolition.

9.131 Traffic data for the decommissioning phase is not available so detailed dispersion modelling is not possible. Assuming the number of additional vehicles during the decommissioning phase is the same as during the construction phase, the traffic related emissions are expected to be lower. This is due to the introduction of more cleaner/lower emissions vehicles. On that basis, traffic related emissions from the decommissioning phase are expected to be lower than the construction phase.

Cumulative Effects

Cumulative Assessment: Intra-Project Effects

9.132 There is the potential for intra-project effects. Changes in the number, type and speed of vehicles using the local road network can affect air quality. Changes in road vehicle emissions and its effect on air quality have been modelled in this chapter. There is also the potential to affect ecology. There is only one designated habitat site, Road Cutting, that is near to a modelled road in SNC. This SSSI is not sensitive to air quality.

Cumulative Assessment: Inter-Project Effects

Construction Dust

9.133 For the construction phase, the IAQM guidance considers the effect of dust up to 350 m from the site boundary. Therefore other developments more than 700 m (2 × 350 m) from the site boundary are not considered to have a cumulative effect. A review of the list of potential cumulative projects (**Appendix 7.1**) has been undertaken and there are a number of developments within 700 m of the Order Limits where cumulative dust from the construction phase has the potential to be an issue. Provided both the Proposed Development and the cumulative developments incorporated appropriate mitigation measures the residual cumulative effect would be 'not significant'. It is unlikely that many of the cumulative developments will be built at the same time.

Construction and Operational Traffic

9.134 Road traffic from other developments have been included in the traffic data that will be modelled when traffic data is available.

Cumulative Effects – Northampton Gateway

Construction Dust

9.135 The Northampton Gateway development would be likely to be within 700 m of the SRFI site and there is the potential for a cumulative effect. Provided both the Proposed Development

and the Northampton Gateway development incorporated appropriate mitigation measures the residual cumulative effect would be 'not significant'.

Construction and Operational Traffic

9.136 Road traffic from the Northampton Gateway have been included where possible in the traffic data that will be modelled when traffic data is available.

Cumulative Effects – Highways

9.137 The cumulative effects of traffic-related emissions will be modelled when traffic data is available.

Adaptive Mitigation

Mitigation of Dust During Construction

9.138 The dust mitigation measures presented in this chapter will be included in the CEMP which will be secured by a requirement under the DCO. This is considered as embedded mitigation. No further mitigation of dust during construction is recommended.

Mitigation for the Operational Impact of the Development on the Surrounding Area

9.139 Based on modelling of traffic-related emissions in South Northamptonshire alone, the effects were 'not significant'. Nevertheless, the following adaptive mitigation is recommended to help improve air quality:

- Staff and HGV travel planning for both operational and construction phases to include modern vehicle fleet, car share, cycling, buses etc.;
- Provision of electric charging points for staff vehicles;
- Incentives for low carbon modes of travel;
- No idling of vehicles on site;
- Monitoring of vehicles types i.e. Euro Class; and
- Tree planting. Common Alder, Field Maple, Norway Maple, Scots Pine and Silver Birch have the greatest capacity to improve air quality.

9.140 However, the residual assessment below has not relied on these measures.

Table 9.24 Proposed Mitigation Measures

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Construction			
Increase in suspended particulate matter concentrations and deposited dust	Range of dust control and mitigation measures including using enclosed chutes, use of dust suppression facilities and dampening down of potentially dusty areas.	Included with the CEMP.	-
Operation			
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from tragic generated by the development	Travel Planning, provision of electric charging points, incentives for low carbon transport, No idling, monitoring of vehicle types and tree planting	-	-
Decommissioning			
Increase in suspended particulate matter concentrations and deposited dust	Similar mitigation to construction phase	-	-
Cumulative			
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from tragic generated by the development	Travel Planning, provision of electric charging points, incentives for low carbon transport, No idling,	To be confirmed when cumulative traffic data is available.	To be confirmed when cumulative traffic data is available.

	monitoring of vehicle types and tree planting		

Residual Effects

9.141 For the construction phase, the recommended mitigation measures will be implemented, and it is considered that the residual construction dust effects would be "not significant".

9.142 For the operational phase, the effects without mitigation would be 'not significant' and therefore the residual effects will also be 'not significant' for South Northamptonshire.

Table 9.25 Summary of Residual Effects

Description of Impact	Significance of effect	Possible mitigation measures	Residual effect
Construction			
Increase in suspended particulate matter concentrations and deposited dust	Not significant after application of control and mitigation measures	Range of dust control and mitigation measures including using enclosed chutes, use of dust suppression facilities and dampening down of potentially dusty areas.	Not significant
Operation			
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from tragic generated by the development	Not significant for South Northamptonshire	Travel Planning, provision of electric charging points, incentives for low carbon transport, No idling, monitoring of vehicle types and tree planting	-
Decommissioning			
Increase in suspended particulate matter concentrations and deposited dust	Not significant after application of control and mitigation measures	Similar mitigation to construction phase	Not significant
Cumulative			
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from	Will be determined when modelling of traffic data is	Travel Planning, provision of electric charging points,	-

tragic generated by the development	complete	incentives for low carbon transport, No idling, monitoring of vehicle types and tree planting	

Monitoring

9.143 The CEMP describes the monitoring of dust to be undertaken during the construction phase. This includes visual inspections of the site perimeter and dust levels on site. All dust control equipment will be maintained and maintenance and servicing activities recorded and haul routes will be inspected for integrity and repaired as necessary. Wheel washes and road sweepers will be provided to prevent 'trackout' of mud and potential resuspension of dust from roads off site.

9.144 Monitoring of NO_2 in Blisworth and Milton Malsor will continue for three years beyond the completion of the development.

Limitations and Assumptions

9.145 An air quality model contains a set of mathematical equations that try to explain the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. Considering the turbulent nature of the atmosphere, the predictive ability of even the best model will be limited. The atmospheric dispersion model used for this assessment, ADMS-Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas.

9.146 Where assumptions relating to data inputs have to be made, these assumptions have been made towards the upper end of the range informed by an analysis of relevant, available data to ensure we have assessed a worse case scenario.

9.147 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in the table below.

Table 9.26 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most conservative value from a comparison of measured and Defra mapped concentration	The background concentration is the major proportion of the total predicted concentration.

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		estimate.	The conservative assumptions adopted ensure that the background concentration used within the model is towards the top of the uncertainty range, rather than a central estimate.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	
Fraction from Modelled Sources	Traffic flow estimates	High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration.
	Traffic speed estimates	The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data	

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly.	

9.148 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the Proposed Development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

Summary

9.149 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the Proposed Development.

9.150 Impacts during construction, such as dust generation and plant vehicle emissions, are predicted to be of short duration (at any particular receptor, although the construction period as a whole is anticipated to last 10 years) and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be High. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as "*not significant*".

9.151 Regarding the operational impact of the Proposed Development on the surrounding area, detailed atmospheric dispersion modelling for South Northamptonshire has been undertaken for the first year in which the development is expected to be fully operational, 2031 and an interim year of 2021. The operational impact of the Proposed Development on existing South Northamptonshire receptors is predicted to be 'negligible' taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the overall impact on South Northamptonshire is described as 'negligible'.

9.152 Using professional judgement, the resulting air quality effect of the Proposed Development is considered to be 'not significant' for South Northamptonshire.

9.153 Dispersion modelling for neighbouring boroughs and an assessment of cumulative effects will be undertaken for the ES Chapter. Similarly, an overall judgement on the risk as to whether the project would affect the UK's ability to comply with the Air Quality Directive will be made, in accordance with the requirement of NN NPS. Although such a judgement is highly likely at this stage to suggest that the Proposed Development would not have such an effect, all data should be considered to provide this statement.

References

9.1 Northampton Borough Council (2014) Air Quality Progress Report Doe Northampton Borough Council

9.2 South Northamptonshire Council (2016) 2016 Air Quality Annual Status Report

9.3 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.

9.4 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.

9.5 Department for Transport (2014) National Policy Statement for National Networks

9.6 Communities and Local Government, March 2012, National Planning Policy Framework

9.7 Communities and Local Government, March 2012, National Planning Practice Guidance

9.8 South Northamptonshire Council (1997) South Northamptonshire Local Plan

9.9 Northampton Borough Council (1997) Northampton Local Plan

9.10 West Northamptonshire Joint Planning Unit (2014) West Northamptonshire Joint Core Strategy Local Plan (Part 1)

9.11 Defra (2016) Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16)

9.12 EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning For Air Quality

9.13 IAQM (2014) Guidance on the assessment of dust from demolition and construction

9.14 Drawn from Defra Maps at http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015

9.15 Environmental Research Group (2014) Air pollution emissions from diesel trains in London

9.16 British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary

9.17 AEA (2008) Report to Defra and the Devolved Administrations (Issue 1a Feb 2008): 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance for Laboratories and Users, ED48673043.