9. AIR QUALITY

9.1 INTRODUCTION

9.1.1 This chapter summarises the assessment work carried out on the proposed 'Northampton Gateway' project with respect to air quality.

9.1.2 The Main Site consists of the strategic rail freight interchange (SRFI) with access from the A508. The total area of the Main Site is approximately 225ha. The Proposed Development is described in detail in Chapter 2 and also consists of other elements including a Roade Bypass and other highway mitigation works, including:

- A substantial upgrade to M1 J15
- Improvements to the A45 north of M1 Junction 15;
- M1 J15A improvements;
- A508 route upgrade – works at a number of small sites, including:
  - Courteenhall Road junction improvement;
  - Rookery Lane / Ashton Road junction improvement;
  - Pury Road junction improvement; and
  - Knock Lane / Stoke Road junction improvement.

9.1.3 The Main Site itself is predominantly under arable agricultural use at present. There are urban areas on the outskirts of Northampton to the north and east of the Main Site, including Grange Park and Collingtree village. Agricultural uses predominate the land in all other directions, with the M1 and strategic rail infrastructure also very apparent in the landscape surrounding the Main Site. The location of the Main Site is included on Figure 9.1.

9.1.4 With respect to air quality, the main existing pollution sources are vehicles travelling on the local and national road network.

9.1.5 The proposals include the construction of a bypass for the village of Roade, to the south of the Main Site. One objective of the bypass is to remove the A508 through-traffic from the village centre. The potential for predominantly beneficial local air quality impacts is described in later sections of this Chapter. The alignment of the corridor for the bypass is included on Figure 9.2.

9.1.6 A number of air quality management areas (AQMAs) have been declared in the area as a result of elevated concentrations of nitrogen dioxide (NO_2). These include Northampton Borough Council's AQMAs No.1, No.2, No.3, No.4, No.5, No.6 and No.8 and South Northamptonshire Council's Towcester AQMA.

9.1.7 The assessment of air quality for the Proposed Development focuses on the potential for traffic generation to affect pollution concentrations at sensitive receptor locations in the local area, including the above AQMAs. However, it also considers effects at a regional and national level, as is required for a Nationally Significant Infrastructure Project (NSIP).

9.2 RELEVANT POLICY

9.2.1 A summary of the key legislation that is applicable to the air quality assessment for the Proposed Development is provided below.

National Policy Statement for National Networks (NPSNN)

9.2.2 The NPSNN provides policy guidance (Ref: 9.1) regarding Nationally Significant Infrastructure Projects (NSIPs) on the national networks, including the assessment of environmental impacts.

9.2.3 With regard to air quality, the NPSNN sets out what the Environmental Statement should describe and this is taken into account in this Air Quality chapter of the ES.

9.2.4 The NPSNN also refers to some of the key considerations when assessing impact on air quality, with an emphasis on local authority AQMAs and UK Air Quality Plan zones (e.g. the East Midlands) (Ref: 9.2), and also identifies some of the key mitigation measures which may be considered:

"5.12 The Secretary of State must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and / or where they lead to a deterioration in air quality in a zone/agglomeration.

5.13 The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will:

- *result in a zone/agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or*
- *affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision"*

9.2.5 It should be noted that there are currently few zones that are compliant with the EU Air Quality Directive. The 'East Midlands' zone in which the Proposed Development is located is currently non-compliant, with exceedances of the annual mean Air Quality Standard (AQS) for NO_2 recorded at a number of locations, particularly in major urban areas. The UK government has mandated Clean Air Zones (CAZ) be implemented in five cities to deliver compliance in the shortest practicable time. The five mandated CAZ cities include Derby which is in the East Midlands zone. The UK government has also identified an additional thirty-three other authorities across the UK that are required to undertake additional measures to improve air quality to achieve compliance in the shortest practicable time. Northampton was not identified as one of these authorities requiring additional measures, reflecting the overall baseline position of generally good air quality as set out later in this Chapter.

9.2.6 With respect to mitigation, the NPSNN states:

"5.14 The Secretary of State should consider whether mitigation measures put forward by the applicant are acceptable. A management plan may help codify mitigation at this stage. The proposed mitigation measures should ensure that the net impact of a project does not delay the point at which a zone will meet compliance timescales.

5.15 Mitigation measures may affect the project design, layout, construction, operation and/or may comprise measures to improve air quality in pollution hotspots beyond the immediate locality of the scheme. Measures could include, but are not limited to, changes to the route of the new scheme, changes to the proximity of vehicles to local receptors in the existing route, physical means including barriers to trap or better disperse emissions, and speed control. The implementation of mitigation measures may require working with partners to support their delivery."

9.2.7 The NPSNN also sets out:

- the need for development of road, rail and strategic rail freight interchange projects on the national networks; and
- the policy against which decisions on major road and rail projects will be made.

9.2.8 In paragraph 2.29, the NPSNN identifies goals and objectives for the railway in the context of the Government's overall vision for the transport system, stating that the railway must provide for the movement of freight across the country including "*to and from ports*" to support "*environmental goals and improve quality of life".* Explicit references to the roles of SRFIs are also made in this context of delivering environmental as well as economic and social outcomes, and balancing a range of potential impacts and effects:

"2.44 The aim of a strategic rail freight interchange (SRFI) is to optimise the use of rail in the freight journey by maximising rail trunk haul and minimising some elements of the secondary distribution leg by road, through co-location of other distribution and freight activities. SRFIs are a key element in reducing the cost to users of moving freight by rail and are important in facilitating the transfer of freight from road to rail, thereby reducing trip mileage of freight movements on both the national and local road networks.

2.45 This requires the logistics industry to develop new facilities that need to be located alongside the major rail routes, close to major trunk roads as well as near to the conurbations that consume the goods. […]

2.51 The environmental advantages of rail freight have already been noted at paragraph 2.40 and 2.41. Nevertheless, for developments such as SRFIs, it is likely that there will be local impacts in terms of land use and increased road and rail movements, and it is important for the environmental impacts at these locations to be minimised. […]

3.4 The Appraisal of Sustainability accompanying this NPS recognises that some developments will have some adverse local impacts on noise, emissions, landscape/visual amenity, biodiversity, cultural heritage and water resources. The significance of these effects and the effectiveness of mitigation is uncertain at the strategic and non-locationally specific level of this NPS. Therefore, whilst applicants should deliver developments in accordance with Government policy and in an environmentally sensitive way, including considering opportunities to deliver environmental benefits, some adverse local effects of development may remain."

9.2.9 As such, it is recognised that adverse local environmental impacts may remain following mitigation and therefore, a holistic view of more regional, or national, impacts is required in assessing an NSIP project.

National Planning Policy Framework (NPPF)

9.2.10 The NPPF, which was published in March 2012 (Ref: 9.3), sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. A core principle in the NPPF that relates to air quality effects from development is that planning should *"contribute to conserving and enhancing the natural environment and reduce pollution"*. In achieving this, it states in paragraph 109 that:

"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 […]".

9.2.11 With regard to assessing cumulative effects the NPPF states the following at paragraph 120:

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or Proposed Development to adverse effects from pollution, should be taken into account".

9.2.12 The NPPF offers a broad framework, but does not afford a detailed methodology for assessments. Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

Planning Practice Guidance

9.2.13 The Planning Practice Guidance (PPG) on Air Quality (Ref: 9.4), which was updated in March 2014, provides guiding principles on how planning can take account of the impact of new development on air quality. This Air Quality PPG is the relevant guidance under the National Planning Policy Framework which summarises the importance of air quality in planning and the key legislation relating to it.

9.2.14 As well as describing the importance of International, National and Local Policies (detailed elsewhere in this report), it summarises the key sources of air quality information. It also explains when air quality is likely to be relevant to a planning decision:

"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 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) […]

When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *Significantly affect traffic in the immediate vicinity of the Proposed Development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate Heavy Goods Vehicle flows over a period of a year or more.*

- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, this is likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

The UK Air Quality Strategy

9.2.15 The UK Air Quality Strategy (UKAQS) (Ref: 9.5) sets the required "standard" concentrations that are to be achieved at sensitive receptor locations across the UK by various "objective" dates. The sensitive locations at which the standards and objectives apply are places where the population is expected to be exposed to the various pollutants over the particular averaging period. Thus, for those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to measure concentrations against the set standards are areas of residential housing, since it is reasonable to expect that people living in their homes could be exposed to pollutants over the relevant averaging period. For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time.

9.2.16 The objectives adopted in the UK are based on the Air Quality Regulations 2000 (Ref: 9.6) and (Amendment) Regulations 2002 (Ref: 9.7) for the purpose of Local Air Quality Management (LAQM). These Air Quality Regulations have adopted into UK law the limit values required by European Union Daughter Directives on air quality.

9.2.17 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.

9.2.18 Northampton Borough Council (NBC) is required to publish annual air quality review and assessment reports under the LAQM regime and through this process have identified and declared seven AQMAs within the borough. These AQMAs were declared due to breaches of the annual AQS for NO_2 at the following locations:

- AQMA 1: M1
- AQMA 2: Victoria Promenade (City Centre)
- AQMA 3: St James/Weedon Rd (City Centre)
- AQMA 4: Kingsthorpe Grove/Harborough Rd (City Centre)
- AQMA 5: A45 Wootton
- AQMA 6: Campbell Square/Grafton Street (City Centre)
- AQMA 8: St Michael's Road (City Centre)

9.2.19 South Northamptonshire Council (SNC) has also declared one AQMA due to breaches of the annual AQS for NO_2 in Towcester. This AQMA is 7km to the south of the Main Site.

UK Air Quality Plan

9.2.20 The latest UK Government Air Quality Plan for nitrogen dioxide (NO_2) in the UK (2017) was published in July 2017 (Ref: 9:2). It is consistent with the NPSNN regarding the role of SRFI projects and contains some key points of relevance, as follows:

"Investment in the national and local road network

194. Traffic speed and flow can impact on NO_x emissions, which are typically higher when an engine is under higher loads, such as during acceleration. Infrastructure schemes to tackle road congestion, which reduce stop-start traffic and thus acceleration events can also have air quality benefits.

195. In the 2016 Autumn Statement, the UK Government announced new funding (Annex A) to relieve road congestion, including additional investment to tackle key pinch-points on the strategic road network (motorways and major A roads) in England.

197.Through the Road Investment Strategy (74) the UK Government has allocated a ring fenced £100 million for an Air Quality Fund available through to 2021 for Highways England to improve air quality on its network, to meet the dual vision of the Strategy of not only protecting the environment but also improving it, including air quality."

9.2.21 The Air Quality Plan identified and has required identified local authorities to set out their initial plans for "delivering cleaner air in the shortest time possible" by July 2018.

Local Planning Policies

9.2.22 The West Northamptonshire Joint Core Strategy (WNJCS) (Ref: 9.8) was adopted in December 2014 and forms a key part of the Local Development Framework. The Joint Core Strategy contains a number of specific policies of relevance to air quality, including Policy S10 (Sustainable Development Principles), and Policy BN9 (Planning for Pollution Control). Throughout the document there is a theme of seeking to improve, rather than just maintain the existing air quality in the area:

"*Policy BN9 – Planning for pollution control* […]

Development that is likely to cause pollution, either individually or cumulatively, will only be permitted if measures can be implemented to minimise pollution to a level which provides a high standard of protection for health and environmental quality."

"*Policy S10 Sustainable Development Principles* […]

Development will […]

Minimise pollution from noise, air and run off."

9.2.23 Also relevant are a number of saved policies from the South Northamptonshire Local Plan (1997) (Ref: 9.9), which states in Policy G3 that planning permission will normally be granted where the development:

"Will not unacceptably harm the amenities of any neighbouring properties;

Is neither of a hazardous nature nor likely to cause problems of pollution, noise, vibration, smell, smoke, discharge or fumes"

9.2.24 The NBC Planning Obligations Strategy SPD (Ref: 9.10) states that where air quality impacts cannot be mitigated through planning conditions, the council will *"seek the provision of appropriate and mitigating and offsetting measures*".

9.2.25 The Northampton Low Emissions Strategy (NLES) (Ref: 9.11) was adopted in full by NBC Council in February 2018. It has been developed through collaboration between NBC and Northamptonshire County Council. It is aimed at helping the planning authority to deliver air quality objectives that are in line with Local Plan policies. It will help to inform other strategies including the Local Transport Plan and will include technical guidance, mitigation and an air pollution emissions cost calculator. Parts of the NLES relevant to the scheme include:

"14 Theme 3 – Reducing Vehicle Emissions: Commercial Vehicles & Freight […]

14.1 Northamptonshire is a prime location for the distribution of goods – many distribution centres and logistics operators are located within the region, with the freight & logistics sector being a major contributor to the region's economy. Road freight is the most used mode for freight movements in Northampton.

Heavy and light goods vehicles are a significant contributor to elevated pollution concentrations in the urban centre and along arterial routes. […]

14.2 Freight and commercial activity is potentially one of the most difficult for the Borough to directly influence, given that decisions in relation to the procurement of fleet vehicles is entirely a commercial decision. However, commercial organisations are required to report on CO_2 emissions and are encouraged to reduce their emissions, and from this we will seek to support from commercial operators to reduce transport emissions.

14.3 Examples of what can be done include:

- Seeking opportunities to increase the take-up of alternative fuels and technologies by HGV and LGV operators, for example natural and bio gas refuelling stations could be supported at key locations near to the strategic road network (possibly in conjunction with bus operators).
- Working with commercial fleet operators to use whole-life costing during vehicle procurement to promote the economic as well as environmental and health benefits from low emission HGVs and LGVs.
- Using the Northampton Air Quality & Planning Technical Guide (see Theme 2 – Creating a Low Emission Future) to ensure that new commercial developments incorporate facilities for low emissions vehicles, such as electric charging points and minimum Euro emission standards for fleet vehicles.
- Encourage more freight to be transported by rail for long-haul journeys.

- Using sustainable procurement criteria to reward those businesses which have a lesser impact on the environment.
- Minimising emissions in urban areas from HGVs and LGVs – the so-called “last mile” of deliveries – for example through the use of freight consolidation centres and consideration of Low Emission Service Delivery Plans.”

9.2.26 Northamptonshire Transportation Plan (Ref: 9.12) sets out the overarching strategic aims for Transportation in Northamptonshire. Strategic Policy 22 is focused on how the impact of transport on the local environment can be reduced:

“Strategic Policy 22 […]

We will seek to reduce the impact that motor vehicles have on the local environment in Northamptonshire by minimising the effects of severance, noise and the emissions from transport.

This Strategy will lead to a number of transport related proposals and all of these projects will be subjected to Environmental Impact Assessment where appropriate. However this strategy sets out the following principles that will guide future developments:

- There should be a net gain in biodiversity value – there is also an opportunity to contribute towards biodiversity goals set out in the Northamptonshire Arc policy document; […]
- Design of new infrastructure and maintenance of existing infrastructure should protect and enhance the natural environment […]
- Any proposals that would significantly harm a European site would not be supported by the Strategy. […]
- All new development should be ‘air quality neutral.’

9.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Guidance

9.3.1 Defra Technical Guidance LAQM.TG16 (Ref: 9.13) updated in 2018 has been followed in carrying out this air quality assessment. Guidance published by the IAQM (Ref: 9.14) on the ‘Assessment of Dust from Demolition and Construction’ has been used when assessing the construction phase of the Proposed Development. The Greater London Authority’s supplementary planning guidance (Ref: 9.15) for the control of dust from construction has also been referred to. Whilst produced for development in London, it is seen as a high standard for developments across the UK. It suggests a number of mitigation measures that should be adopted to minimise impacts of dusts and fine particles.

9.3.2 The latest Environmental Protection UK (EPUK) & IAQM guidance, updated in January 2017 on ‘Planning for Air Quality’ (Ref: 9.16) has also been followed in assessing air quality at the sites and is particularly important for determining the significance of effects at each stage. These significance criteria are included in Appendix 9.1.

9.3.3 The Streamlined PCM Technical Report (Ref: 9.17) has been followed when assessing the Proposed Development against the UK’s Air Quality Plan and the EU Directive 2008/50/EC and its amendments.

9.3.4 The DMRB Volume 11, Section 3, Part 1 has been referred to in the assessment of regional impacts (Ref: 9.18).

Assessment Methodology

Construction Phase

Dust

9.3.5 The construction phase of the Proposed Development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles. The IAQM's guidance on assessing the impacts of construction on human and ecological receptors has been followed in carrying out the air quality assessment.

9.3.6 The guidance suggests that where a human receptor is located within 350m of a site boundary and/or within 50m of a route used by construction vehicles, up to 500m from the site entrance, there is the potential for significant dust impacts. Figures 9.1, 9.2, 9.3 and 9.4 show the location of receptors that could be sensitive to dust that are located within 350m of the boundaries of the Proposed Development.

9.3.7 When considering ecological receptors, impacts can be considered *Negligible* when receptors are located over 50m from the site boundary and/or over 50m of a route used by construction vehicles, up to 500m from the site entrance.

9.3.8 Review of Defra's Multi Agency Geographic Information for the Countryside (MAGIC) website (www.magic. gov.uk), which incorporates Natural England's interactive maps, has identified no statutory ecologically sensitive receptors within 50m of the Main Site or junction improvement locations. Although the location of the site entrances are not yet known, there are no statutory ecological receptors within 50m of any road potentially used by construction vehicles within 500m of the Proposed Development.

9.3.9 It is noted that the Roade Cutting Site of Special Scientific Interest (SSSI) is located within 50m of the proposed Roade bypass; however, this SSSI has been designated for its geological, rather than ecological, importance.

9.3.10 Therefore, the Proposed Development will have a *Negligible* impact on statutory ecological receptors, in terms of dust emissions, and this will not be considered further within this assessment. Non-statutory ecological receptors would be of very low sensitivity and are therefore not considered. Note that the ecological assessment is included in Chapter 6.

Vehicle emissions (Construction)

9.3.11 Being a large site, emissions from construction phase vehicle movements also have the potential to affect local air quality. The volume of construction traffic will vary throughout the course of the construction phase. It is anticipated that this will be front loaded, with the largest number of vehicle movements expected in years one and two. No heavy construction vehicles will be permitted to use the A508 to the south of the Main Site and delivery vehicles would be routed via the principal and strategic road network (M1 & A45) to avoid effects on local residential areas.

9.3.12 AQMA 1 and AQMA 5 are, however, situated on the M1 and A45, respectively, and the increase in the total number of daily HGV movements at these locations is expected to exceed the IAQM threshold for assessment (i.e. >25 HGV AADT). As such, an assessment of construction phase traffic has been undertaken on the A45 and M1.

9.3.13 The increase in construction related HGV and LGV flows were assessed in 2021, using the 'without development' scenario as a future baseline. Full details of the construction phase vehicle emission assessment are included in Appendix 9.11.

Operational Phase

Dust

9.3.14 There are plans for an Aggregates Terminal to be relocated from centre of Northampton to the Main Site. As shown in Figure 9.5, there are human receptors within 350m of the aggregate terminal and as such, there is the potential for operational dust impacts from this source.

9.3.15 An assessment of operational dust impacts will, therefore, be undertaken.

Vehicle emissions

9.3.16 In order to determine the effects on local air pollution concentrations from the operation of the Proposed Development, emissions from roads have been assessed using a detailed air dispersion model. The modelling has used the ADMS-Roads model (version 4.1.1), which is produced by CERC and has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads. The assessment has been based on the detailed traffic data that underpins the Transport Assessment.

9.3.17 The most likely locations for significant impacts (both adverse and beneficial) have been identified and are listed in Table 9.1, below. The selection of these study areas has been based on both anticipated changes to vehicle movements and existing air quality.

Table 9.1: Operational Phase Assessment Study Areas

Study Area	AQMAs	Relevant Local Authorities	Relevant Figure
Collingtree and Northampton South Sustainable Urban Extension (NSSUE)	Northampton AQMA No.1	Northampton Borough Council	Figure 9.6
Northampton (Wootton)	Northampton AQMA No.5	Northampton Borough Council	Figure 9.7
Harborough Road, Kingsthorpe	Northampton AQMA No.4	Northampton Borough Council	Figures 9.8
Victoria Promenade	Northampton AQMA No.2	Northampton Borough Council	Figures 9.9
Campbell Square	Northampton AQMA No.6	Northampton Borough Council	Figures 9.10
St Michaels Road	Northampton AQMA No.8	Northampton Borough Council	Figures 9.11
St James/Weedon Road	Northampton AQMA No.3	Northampton Borough Council	Figures 9.12
Roade and West Lodge Cottages	N/A	South Northamptonshire District Council	Figure 9.13
Blisworth and Milton Malsor	N/A	South Northamptonshire District Council	Figure 9.14
Towcester	Towcester AQMA	South Northamptonshire District Council	Figure 9.15
Hartwell	N/A	South Northamptonshire District Council	Figure 9.16
Grafton Regis & Potterspury	N/A	South Northamptonshire District Council	Figure 9.17

9.3.18 The Proposed Development is anticipated to remove more than 100 daily HGV movements, resulting in improvements to air quality, through at least 57 AQMAs (Listed in Appendix 9.10) on routes to major towns and cities, as well as key Ports, by 2031, reflecting the role of SRFIs in serving national and international supply chains and markets.

9.3.19 The impact of the proposed development would likely be considered *Negligible,* with reference to the IAQM impact descriptors, at each of these 57 AQMA as the reductions in HGV flows are very small when compared to the baseline Annual Average Daily Traffic (AADT) flows for these key roads, which are generally in excess of 40,000 daily vehicles.

9.3.20 However, this wider effect across a large geographic area is one of the objectives of the national policy of encouraging a shift from road to rail, and the cumulative effects of increasing modal shift, including that enabled by increasing the network of SRFIs, would clearly become more significant nationally with time.

9.3.21 Detailed, hourly sequential meteorological data are used by the model to determine pollutant dispersion and levels of dilution by the wind and vertical air movements. Meteorological data used in the model for the local study areas have been obtained from Bedford meteorological station as it is considered to provide the most representative data of similar conditions to the application site and surrounding area. Meteorological data from 2015 and 2016 have been used, dependant on which data relevant to that particular study area were available for verification.

9.3.22 The surface roughness applied to the model for the meteorological station and site was 0.5m for most study areas, which is typically used for “open suburbia”. Full details of model inputs are available in Appendix 9.2.

9.3.23 Modelled receptor locations are shown in the Figures listed in Table 9.1. Discrete model receptors were positioned at the façades of existing residential dwellings and other receptors closest to the main pollution sources. These are considered worst-case locations, as pollutant concentrations would be expected to reduce with distance from the roads. All of the receptors were modelled at the “breathing height” which is, by convention, 1.5m above ground unless otherwise specified.

9.3.24 ES traffic data in the form of AADT and Annual Average Weekday Traffic (AAWT) flows have been provided by WSP from the Northamptonshire Strategic Transport Model (NSTM2), which they maintain and operate on the behalf of Northamptonshire County Council (NCC). WSP has produced the ES traffic data in accordance with their standard methodology for this process. This involves the use of peak period to AADT and AAWT conversion factors, which are applied across the whole of the NSTM2 modelled area. The model includes all of the committed developments associated with the Joint Core Strategy, including all of the Sustainable Urban Extensions and other growth planned over the plan-period; as such, the assessment of cumulative impacts are included in the main body of the assessment and cannot be separated out.

9.3.25 The following scenarios were modelled for local areas:

- Model verification – the most recent relevant monitoring data, at the time of writing, for each study area;
- 2018 baseline year;
- 2021 (opening year), without development (B1);
- 2021 (opening year), with development (H1);
- 2031 (assumed full operation year), without development (D1);
- 2031 (assumed full operation year), with development (J1d); and
- 2031 (assumed full operation year), with development and proposed ‘Rail Central’ development (J3).

9.3.26 Full details of the modelled traffic data are included in Appendix 9.2.

9.3.27 Emissions factors were derived from the latest Defra Emissions Factor Toolkit (EFT) (V8.0.1 December 2017). The updated EFT projects that vehicle NO_x emissions will decline with advances in engine technology, tightening emissions control systems on new vehicles and the predicted phasing out of older, higher emitting vehicles in future years.

9.3.28 The current EFT provides the fleet emission factors up to the year 2030; as such, 2021 emissions factors were used for 2021 scenarios; however in the absence of predicted 2031 emission factors, 2030 emission factors were used for all 2031 scenarios. National modelled UK- AIR background map concentrations are projected to decline over time, and are also only available up to the year 2030; as such 2021 background concentrations were used for 2021 scenarios and 2030 background concentrations used for 2031 scenarios.

Rail Central

9.3.29 An additional transport scenario (J3) has looked at the cumulative impact of both the emerging Rail Central and Northampton Gateway developments, in the absence of a highway mitigation scheme developed specifically to accommodate both developments, in 2031. This scenario includes the following highway mitigation measures, taken from a combination of both projects:

- A Rail Central grade-separated site access junction onto the A43;
- Rail Central improvement at M1 J15A (instead of the Northampton Gateway improvement at this junction);
- Rail Central improvement at A43/Trove roundabout; and
- All Northampton Gateway highway mitigation (other than M1 J15A, which is as above).

Model Verification

9.3.30 Following guidance set out in LAQM.TG16, model results have been compared with monitoring data to determine whether they need adjusting to more accurately reflect local air quality. This process is known as verification and reduces the uncertainty associated with local effects on pollution dispersion and allows the model results to be more site-specific.

9.3.31 A separate verification study has been undertaken for each study area using monitoring data from the relevant local authority or authorities. This is with the exception of the Collingtree study area, and the assessment of receptors at West Lodge Cottages, which utilised project specific diffusion tube monitoring data instead of local authority data. Comparisons of modelled and monitored total annual mean NO_2 in each study area have been included in Appendix 9.3.

Sensitivity Analysis

9.3.32 In order to assess the sensitivity of the results to model input choices, a sensitivity analysis has been undertaken. This analysis has focused on the impact of model verification year choice on results, and has focused on the sensitive AQMAs within the NBC study areas.

9.3.33 The 2017 Annual Status Report for NBC (Ref: 9.19) notes that in regard to NO_2:

"there are increases, when comparing mean averages from 2015 to 2016 at most locations. There are no clear explanations as to why annual averages have increased in general (e.g. new development/roadworks, increase in flows/ bad year for air quality)".

9.3.34 When comparing diffusion tube data across the past five years, it appears that 2016 was the worst year in terms of air quality; as such, model verification has been based on this year. This is to ensure a conservative approach of assessment.

9.3.35 However, the verification factor (an indicator of model performance) was consistently lower (i.e. model performing better) when using 2015 traffic, monitoring and meteorological data, as opposed to 2016 data. Using 2015 data, therefore, resulted in a smaller discrepancy between real world monitoring and modelled concentrations. As such, the results for the NBC study areas are based on 2015 verification and are included in Appendix 9.4.

9.3.36 The results from this sensitivity test have been used to help ascribe an overall significance in each study area.

Model Uncertainty

9.3.37 There are a number of inherent uncertainties associated with the air quality assessment process, including:

- Model uncertainty – due to model formulations;
- Data uncertainty – due to errors/assumptions in input data, including emissions estimates, background estimates, meteorology; and
- Variability – randomness of measurements used.

9.3.38 Using a validated air quality model such as ADMS Roads, as well as undertaking the model verification takes into account much of the modelling uncertainty. This assessment includes model verification in each study area to account for the local dispersive characteristics and traffic flows.

9.3.39 The choices of the practitioner throughout the air quality assessment process are also essential to the management of uncertainty, and to whether the predicted impact tends towards a worst-case estimate or a central estimate.

9.3.40 This assessment has chosen inputs tending towards 'worst-case', where appropriate, to ensure a conservative and robust approach. For example, a limited number of receptors were chosen in each study area and these were generally the closest receptors to the roads; as such, the judgement of overall significance in each study area was based on the impacts at the worst-case locations.

9.3.41 A major uncertainty is related to the rate at which the vehicle fleet is anticipated to improve/be updated over time. In the absence of any other official stance we have assumed that the vehicle fleet will improve in line with predictions made by DEFRA. To have assumed no future improvement (i.e. tending towards worst-case) would have resulted in an unrealistic worst-case estimate, not suitable for an assessment of 'likely' significant effects.

Regional Impacts

9.3.42 The UK government has international commitments under The European Commission National Emission Ceilings Directive (NECD), and the UNECE Gothenburg Protocol, to combat transboundary air pollution through the reduction of pollutant emissions.

9.3.43 The assessment of regional impacts has followed the guidance set out in the Design Manual for Roads and Bridges Volume 11 Section 3, Part 1 (Ref: 9.18). This guidance recognises the importance of regional assessments as pollutants can travel long distances, crossing regional, national and even international boundaries. Potential wider-scale impacts include acidification, excess nitrogen deposition and generation of tropospheric ozone.

9.3.44 Estimates of NO_x and PM_{10} emission rates were provided by the latest EFT (v.8.0.1). It was assumed that the operation of the Proposed Development in 2021 will result in a reduction in 23 million HGV miles (i.e. one quarter of 92 million miles) and that the Proposed Development will come online at a steady rate between 2021 and 2031.

Compliance with the EU Air Quality Directives (East Midlands zone)

9.3.45 As an NSIP, it is anticipated that the Proposed Development will affect traffic flows not only locally, but also at various locations across the UK. NPSNN guidance refers to wider impacts within zones; therefore, the operational phase assessment has considered not only local impacts but also the impact on the UK's Air Quality Plan East Midlands zone.

9.3.46 As referred to above, the Proposed Development sits within the EU UK ambient air quality reporting zone of East Midlands. The East Midlands zone includes the counties of Derbyshire (including Derby), Leicestershire, Lincolnshire, Northamptonshire (including Northampton) and Nottinghamshire but excludes the Leicester and Nottingham urban areas (*Note: Highways England managed roads are excluded from the zone assessments*). The impact of the Proposed Development has also been assessed upon this zone to determine compliance with the UK's Air Quality Plan and the EU Directive 2008/50/EC and its amendments.

9.3.47 The A45 was identified in the UK Air Quality Plan as being the only location predicted to be non-compliant within the NBC authority area in 2019. This location has been predicted to become compliant after 2019. This is dependent on the implementation of Clean Air Zones (CAZ) in nearby Derby and Nottingham as well as expected emissions reductions predicted to occur through other "additional measures" across the East Midlands zone.

9.3.48 Without the implementation of the Derby CAZ and other measures, the A45 would not become compliant until after 2020. However, as Derby has been mandated to implement a CAZ, it is expected to be in place by 2020.

9.3.49 The A45 has therefore been assessed to determine whether the development is predicted to result in non-compliance and/or affect the ability of a non-compliant area to achieve compliance within the shortest time possible (i.e. delay compliance) with the EU Directive annual limit value (LV) for NO_2, assuming the implementation of CAZ measures.

9.3.50 In order to assess the Proposed Development's impact on LVs the assessment has used the UK Air Quality Plan model, Streamlined Pollution Climate Model (SL-PCM).

9.3.51 The SL-PCM is a tool that has been developed to quickly assess the effect that changes in fleet composition could have on emissions and specifically on the ability of Zones or Agglomerations to comply with LVs. The SL-PCM is a compact version of the full UK Air Quality Plan model, Pollution Climate Model (PCM), which can take several weeks to run.

9.3.52 Baseline traffic data used in the SL-PCM is based on DfT traffic counts, whilst traffic flows, including development traffic flows used in the air quality assessment are based on outputs from the validated NSTM2 model.

9.3.53 There are differences between the SL-PCM baseline (2021) A45 flows and the corresponding A45 flows (2021) produced from the NSTM2 model. To present a conservative (i.e. worst-case) assessment of the impact of the development on the A45, the NSTM2 development contribution traffic flows were added to the baseline SL-PCM (DfT) traffic flows. This represents the combination of highest A45 traffic flows for the assessment using the SL-PCM model.

Consultations

9.3.54 The Air Quality Officers at NBC and SNC were contacted in order to discuss the approach to the air quality assessment, as outlined in the Proposed Development Environmental Statement Scoping Report.

9.3.55 The Officers' key requirement was that the assessment should cover any roads close to residential areas where significant changes in traffic flows would likely occur. It was determined that impacts on the AQMAs within Northampton would probably be more sensitive than those likely to occur south of the Application Site in the area of SNC.

9.3.56 As NBC monitoring already covers much of the key areas in the town centre AQMAs, the location of NO_2 diffusion tube monitoring for the project-specific study included a focus on Collingtree, where limited monitoring by NBC currently takes place.

9.3.57 NBC and SNC have both provided recent air quality monitoring data, which have been included in the baseline section of this chapter.

9.3.58 Copies of meeting notes from key meetings held with the Air Quality Officers at NBC and SNC are included in Appendix 9.5.

Nitrogen Deposition

9.3.59 Review of Defra's MAGIC website which incorporates Natural England's interactive maps, has identified a number of statutory receptors, within proximity of roads that may see a significant increase in traffic flows, due to operation of the Proposed Development, these include:

- Roade Cutting (SSSI)
- Upper Nene Valley Gravel Pits (SPA)

9.3.60 Increases in traffic flows and emissions have the potential to increase rates of nitrogen deposition at these statutory receptors. However, neither is considered to be particularly sensitive to changes in nitrogen deposition rates.

9.3.61 The Roade Cutting SSSI has been designated due to geological importance. There is no citation of a sensitive plant community that could be adversely influenced by nitrogen deposition (Ref: 9.20).

9.3.62 "Standing Open Water and Water Canals", which is the main habitat type of the Upper Nene Valley Gravel Pits, are generally considered Phosphorus limited ecosystems and as such, increased nitrogen deposition is not likely to influence the trophic state of the ecosystem. Furthermore, the APIS website (Ref: 9.21), states that:

"the critical load should only be applied to oligotrophic waters with low alkalinity with no significant agricultural or other human inputs"

9.3.63 The Upper Nene Gravel Pits are located adjacent to the A45 and agricultural land-use; as such, it is not considered necessary to further assess the impact of nitrogen deposition at this receptor.

Significance Criteria: Construction

9.3.64 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages. Whilst the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables mean that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a *"technically competent assessor".* The construction phase assessment therefore relies on the experience of the appraiser.

9.3.65 As such, attempts to define precisely what constitutes a negligible, small, medium or large dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and time, the construction materials and the plant to be used must be considered.

9.3.66 The second step is to define the sensitivity of the area around the construction site. As stated in the IAQM guidance:

"7.3 the sensitivity of the area takes into account a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentrations; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust."

9.3.67 Based on these factors, the area should be categorised as being of 'Low', 'Medium' or 'High' sensitivity.

9.3.68 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the construction stages assessed. Again, this is subject to professional judgement, but often the highest risk stage will predominate in influencing the overall level of risk.

9.3.69 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the application site will also be released. A construction phase traffic assessment has been undertaken and is included in Appendix 9.11. The significance criteria used in this assessment are the same as for the operational phase traffic assessment, as described below.

Operational

Local Study Areas

9.3.70 Guidance published by the EPUK & IAQM in 2017 (Ref: 9.16) provides impact descriptors, which are derived from the both the magnitude of change in pollution concentrations and the long term average concentrations at the receptor, with reference to the appropriate UK air quality standards. A table illustrating the operational phase impact descriptors is included in Appendix 9.1.

9.3.71 The impact descriptors described in Appendix 9.1 are intended for application at a series of individual receptors, the assessment of overall significance is, however, based on professional judgement. The reasons for reaching an overall significance should be clear and set out logically, and will take into consideration factors such as:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Compliance with EU Air Quality Directives (East Midlands zone)

9.3.72 The impact of the Proposed Development will only be considered significant if it results in non-compliance, or delays compliance of the East Midlands zone.

National Scale Impacts

9.3.73 The National Scale impact assessment provides an annual figure for the reduction in NO_x and PM_{10} emissions. The significance of these figures is more difficult to ascertain as its impact could be local or trans-boundary.

9.3.74 Therefore, the assessment has considered a "damage cost approach", based on guidance provided by Defra (Ref: 9.22). The annual reductions in emissions due to the Proposed Development have been multiplied by a "damage cost" to estimate the value of the emission reduction to society.

9.3.75 The damage cost approach is not strictly relevant to a development of national importance that seeks to achieve a strategic shift to more sustainable transport modes. However, it does illustrate how valuable the Proposed Development could be in terms of its ability to reduce air pollutant emissions on a national/regional scale.

9.3.76 Full details of the damage cost calculation are included in later sections of this Chapter (Section 9.5), and in Appendix 9.6.

9.4 BASELINE CONDITIONS

9.4.1 Defra provides estimated background concentrations of the UKAQS pollutants on the world wide web at the UK Atmospheric Information Resource (UK-AIR) website (www.airquality.co.uk). These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km^2 National Grid square locations across the UK. These were updated in November 2017 and are based on monitoring data from 2015.

9.4.2 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emission sources in the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.

9.4.3 For the Main Site in the baseline year, the assumed opening year and the assumed year of full occupation, the predicted background pollution concentrations for the two main UKAQS pollutants of interest are presented in Table 9.3. These data were taken from the central grid square location closest to the Main Site (i.e. grid reference: 475500, 254500).

Table 9.3: Background concentrations of pollutants at the Main Site from the UK-AIR (Note Table 9.2 does not exist)

Pollutant	Predicted background concentration ($\mu g.m^{-3}$)			Averaging period	Air quality standard ($\mu g.m^{-3}$)
	2015	2021	2030		
NO_2	18.2	13.4	9.0	annual mean	40
PM_{10}	16.6	15.9	15.6	(gravimetric) annual mean	40

***Proposed PM_{10} objectives for 2010 were dropped in the 2007 Air Quality Strategy, but are generally still referred to in the Review and Assessment process (For $PM_{2.5}$ there are no specific AQSs applicable in England, however LAQM.TG(16) states that local authorities should consider $PM_{2.5}$ as part of the LAQM process and should work towards its reduction).**

9.4.4 The data in Table 9.3 show that background annual mean concentrations of NO_2 and PM_{10} in the vicinity of the application site are predicted to be well below the annual average (40$\mu g.m^{-3}$) Air Quality Standards (AQSs), in all years of assessment.

9.4.5 Background annual mean concentrations of both NO_2 and PM_{10} are predicted to fall each year; this is partly due to the gradual replacement of the UK vehicle fleet with lower emission vehicles and general reductions in UK and other transboundary concentrations.

Local Sources of Monitoring Data

9.4.6 Monitoring at background locations is considered an appropriate source of data for the purposes of describing baseline air quality.

Automatic Monitoring

9.4.7 A summary of the most recent automatic monitoring data for NO_2 within Northampton and South Northamptonshire are presented below in Table 9.4. NBC and SNC have not undertaken any monitoring for PM_{10} in recent years as it is understood that NO_2 is the primary pollutant of concern to health.

Table 9.4: Annual Mean NO_2 Concentrations from Automatic Monitors

Site name	Site Type	Distance from Main Site (km)	Annual mean concentration (µg.m^{-3})					
			2011	2012	2013	**2014**	**2015**	**2016**
NBC								
Spring Park AURN	B	9.0	-	-	14.0	14.0	14.0	16.0
Wellingborough Road	R	5.7	36.5	35.9	32.7	-	-	-
Hermitage Way	R	1.8	36.5*	35.7	34.0	-	-	-
SNC								
Towcester Town Hall	R	7.0	22.4*	34.6	33.1	33.1	-	-

Note: AURN: Automatic Urban and Rural Network site “B” = background; “R” = roadside. *Less than 75% data capture, therefore result may be unreliable.

9.4.8 The data in Table 9.4 indicate that annual mean concentrations of NO_2 in Northampton and South Northamptonshire tend to be below the 40µg.m^{-3} AQS, even at roadside locations. The highest recorded concentration was 36.5µg.m^{-3} in 2011, at both NBC roadside monitors. This was 9% below the AQS.

9.4.9 There is no strong evidence of downward trend in NO_2 concentrations at the NBC or the SNC monitors. This is not in line with UK-AIR data presented in Table 9.3.

9.4.10 The Spring Park AURN air quality monitoring station (AQMS), classed as a background monitoring site, recorded annual mean NO_2 concentrations 60% below the AQS in 2016. This is broadly comparable to the UK-AIR data in Table 9.3. Despite being some distance away from the Proposed Development Site, this monitor is likely to be generally representative of background concentrations there, being located on the edge of the town.

Non-Automatic Monitoring

9.4.11 NBC and SNC carry out non-automatic (passive) NO_2 diffusion tube monitoring at numerous locations across their respective districts. A summary of the most recent available data is included in Table 9.5 for all background tubes and the roadside tubes closest to the Main Site.

Table 9.5: NO_2 Concentration Data from Local Diffusion Tubes

Site name	Site Type	Distance from Main Site (km)	Annual mean concentration ($\mu g.m^{-3}$)				
			2012	2013	2014	2015	2016
NBC							
High St Collingtree	R	0.1	33.3	32.4	35.4	34.0	33.5
A45	R	1.3	**43.0**	**42.4**	**44.6**	**40.9**	**46.5**
Chestnut Av	R	1.5	36.7	30.2	30.3	31.6	36.6
Crematorium	R	1.5	38.8	33.3	35.3	34.1	37.2
Hermitage Way (triplicate)	R	1.9	**40.6**	36.7	38.0	38.1	**43.0**
Riverside	UB	4.3	-	21.6	21.0	18.9	24.1
Spring Park (triplicates)	UB	9.0	-	14.0	13.3	12.6	14.9
SNC							
GPKa – Saxon Av Junction	R	<0.1	32.5	28	28.3	28.2	30.3
RO1 – 40 Stratford Rd	R	2.9	24.5	22	23.1	22.5	23.8
RO2 – 16 London Rd	R	2.2	36.5	32	31.2	31.1	29.7
RO3 – 1 London Rd	R	2.5	28.3	27	27.5	26.6	26.0
RO4 – 30 High St	R	2.3	18.9	17	15.5	16.4	16.6
RO6 – A508 / Chaplin Yard	R	2.9	31.4	23	22.7	31.7	25.0

Note: "R" = roadside. "UB" = Urban Background Bold denotes exceedance of the AQS. "Data Capture <75% so result may be unreliable.

9.4.12 The diffusion tube data results presented in Table 9.5 show that annual mean NO_2 concentrations sometimes exceed the 40µg.m^{-3} AQS at busy roadside locations. The highest concentration was recorded at the A45 tube, in Northampton AQMA No.5, where a 16% exceedance of the AQS was recorded in 2016. However, it is noted that this tube is located at a roadside location, where the annual mean AQS would not apply. The annual mean AQS relates to locations where people spend long periods of time, such as residential properties, hospitals or schools (For further detail refer to paragraph 9.2.15).

9.4.13 The monitored SNC annual mean concentrations of NO_2 were consistently below the AQS in South Northamptonshire, within 3km of the site.

9.4.14 There are two background tubes sites within Northampton: Riverside and the Spring Park triplicate set. The Riverside tube is located towards the centre of Northampton, whilst the Spring Park triplicate set is located in the northern suburbs, co-located with the Spring Park AURN AQMS. Annual mean concentrations of NO_2 at the Riverside tube results are considerably higher than Spring Park. Between 2012 and 2016 the Riverside concentrations ranged from 47% to 61% of the AQS, with Spring Park being lower at 32% to 37% of the AQS.

9.4.15 It should be noted that background NO_2 concentrations at both sites showed a consistent decrease between 2012 and 2015, in line with predictions made by UK-AIR, but recorded their highest concentration in 2016. As aforementioned in paragraph 9.3.33, NBC saw a consistent but unexplained, increase in annual mean NO_2 concentrations across the town in 2016. As there were no localised reasons for increased emissions, the 'unexplained' increase in annual mean NO_2 across the whole town could have been influenced by higher background concentrations of the pollutant. These higher background concentrations can be influenced by meteorology through long periods of settled heat or cold weather events reducing the normal dispersion of pollutants or through the importation of trans-boundary pollution.

9.4.16 Table 9.6 below presents the background concentrations of NO_2 predicted by UK-AIR for the squares where the Riverside and Spring Park tubes are located (475000, 259500 & 476500 264500).

Table 9.6: UK-AIR background data at NBC diffusion tubes locations.

Grid Square (Tube)	Annual Mean NO_2	
	2015	2016
475000, 259500 (Riverside)	17.6	17.1
476500, 264500 (Spring Park)	13.7	13.3

9.4.17 Comparison of the Riverside and Spring Park tubes data in Table 9.5 with the UK-AIR data in Table 9.6 reveals that recorded concentrations of NO_2 are largely comparable to the predictions made by UK-AIR. A discrepancy of 7$\mu g.m^{-3}$ was, however, recorded between the Riverside background tube and the predictions made by UK-AIR, in 2016.

Project Specific Diffusion Tubes

9.4.18 Given the scale of the development and the potential for impacts on receptors in nearby AQMAs, particularly at Collingtree, and following consultation with NBC, the decision was made to undertake a programme of diffusion tube monitoring at key locations around the Main Site. The diffusion tubes locations are detailed in Figures 9.6 and 9.13. Diffusion tubes were installed for 12 months at the following locations: four locations in Collingtree, to monitor emissions from the M1; one adjacent to West Lodge Cottages on the A508; and one on the Main Site, approximately 100m from the M1, as a background location.

9.4.19 The diffusion tubes were located in triplicate in order to ensure precision, and to reduce the chance of any erroneous results being included in the analysis. It is noted that most of the NBC sites use single tubes. The project tubes were in situ for 12 months, in order to collect representative annual mean concentrations (as pollution concentrations vary throughout the year, as a result of seasonal patterns in both meteorological conditions and emissions). The details of the project monitoring locations are provided in Table 9.7, with results summarised in Table 9.8. Raw results from the laboratory are included in Appendix 9.7.

Table 9.7: Project Specific Diffusion Tube Details

Location (see Figure 9.6/9.13)	Site Type	Distance from Road (m)	National Grid Reference	
			x	y
1	R	49 (M1)	475003.2	255394.3
2	R/B	91 (M1)	475025.2	255432.1
3	B	132 (M1)	475046.4	255470.9
4	R	19.5 (M1)	474931.5	255426.9
5	B	98 (M1)	474927.3	255212.5
6	R	1.5 (A508)	475272.0	253277.0

Note: "R" = roadside; "B" = background.

Table 9.8: Project Specific Diffusion Tubes – Recorded NO_2 Concentrations (2016-2017)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Mean	Defra Bias Factor	Adj. MEAN
Location	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul			
Collingtree Tubes															
1	26.50	35.52	30.66	41.30	42.85	46.17	40.06	46.19	33.84	27.86	27.86	28.09	35.57	**0.92**	**32.7**
2	25.44	33.09	27.09	38.80	37.20	40.76	36.44	37.48	28.30	24.60	24.60	25.51	31.61		**29.1**
3	23.26	30.96	26.67	37.56	36.11	39.85	37.98	31.54	28.89	24.09	24.09	21.89	30.24		**27.8**
4	38.69	45.50	37.05	46.34	42.54	47.88	43.21	41.99	-	37.61	33.98	40.09	41.35		**38.0**
5	12.72	16.16	21.81	28.76	-	24.69	30.52	12.43	16.30	19.09	19.09	16.74	19.85		**18.3**
A508 Tube															
6	26.60	34.98	39.26	74.15	54.30	33.71	50.39	18.43	27.07	40.26	40.26	33.18	39.38	**0.92**	**36.2**

9.4.20 Location (Tube) 1 was co-located with NBC's High Street Collingtree tube (see Table 9.7). This allows an extra check of the method's validity by comparison with NBC's data.

9.4.21 The tubes in Collingtree show that concentrations decline rapidly with distance from the M1. At Location 4, which is approximately the same distance from the M1 as the closest dwelling, the adjusted period mean concentration is 5% below the $40\mu g.m^{-3}$ AQS.

9.4.22 Location 1 is co-located with NBC's Collingtree tube. With reference to Table 9.7, the period mean at this tube is broadly similar to the annual mean for recent years at the council's tube.

9.4.23 It is noted that the concentrations at Tube 5, to the west of the M1, are somewhat lower than those at Tube 2, which is a similar distance from the road, to the east. This is likely to be the result of pollution from the M1 being carried north-eastwards by the prevailing south-westerly wind, as well as emissions from local sources including vehicles using the High Street in Collingtree. As such, Tube 5 is thought to be most representative of true background concentrations in the vicinity.

9.4.24 The background concentration recorded at Tube 5 is directly comparable to the predictions made by UK-AIR for the Main Site.

Summary of Background/Baseline Data Used in the Assessment

9.4.25 The most appropriate annual mean background NO_2 and PM_{10} concentrations were used in this assessment (i.e. reasonably representative of the key receptors). In general, there was a good agreement between the predictions made by UK-AIR and background monitors; as such, all annual mean background concentrations of NO_2 and PM_{10} used in the assessment are from UK-AIR.

9.4.26 A gradual improvement in background concentrations has also been assumed, in line with predictions made by Defra.

9.5 LIKELY SIGNIFICANT EFFECTS

Construction Effects

Dust Emissions

9.5.1 A preliminary assessment of the potential risk of dust effects occurring at nearby sensitive receptors is set out below and is based on professional judgement and the IAQM guidance (Ref: 9.14), as previously outlined.

9.5.2 As the development is large in scale and covers a wide geographical area it was decided to carry out three separate construction phase assessments. The first covers the development itself and the improvements to J15, M1 J15A and the A45. The second covers the Roade Bypass and the third considers the construction phase impacts of the remainder of the road improvements such as those at Junction 15A.

Northampton Gateway Main Site, M1 & A45 highway improvements

Demolition

9.5.3 The vast majority of the Main Site is currently agricultural and does not contain large built structures. However, some demolition will be required for scattered farm buildings and other structures, plus the breakup of existing road surfaces around Junction 15.

9.5.4 Overall, the dust emission magnitude for the demolition stage is considered to be *Small*.

Earthworks

9.5.5 Ground clearance works, site levelling and excavations for foundations will be performed during this stage.

9.5.6 Sites greater than 10,000m^2 are considered ‘Large’ with reference to the IAQM guidance. As the Main Site is far larger than this threshold (circa 25,000,000m^2) it is anticipated that significant earthworks will be required and the dust emission magnitude is considered to be *Large.*

Construction

9.5.7 During construction, activities which may have the potential to cause significant dust emissions may include concrete batching, sandblasting and piling, in addition to the general handling of construction materials and windblow from stockpiles of friable materials, particularly during higher wind speeds.

9.5.8 Primary construction materials will be concrete, steel framework and metal cladding to roof and walls. These materials and methods of construction are of relatively low dust generating potential.

9.5.9 However, the scale of the Proposed Development, which will include over 500,000m^3 warehousing space, will be far in excess of the IAQM’s 100,000m^3 ‘Large’ threshold. As such, the dust emission magnitude for construction is considered to be *Large*.

Trackout

9.5.10 Construction traffic, when travelling over soiled road surfaces, has the potential to generate dust emissions and also to soil the local road network. During dry weather, unsurfaced and soiled roads can lead to dust being emitted due to pick-up by vehicle wheels. The potential for roads to be soiled is dependent on the length of the on-site unpaved roads.

9.5.11 Given the scale of the site, it is likely that track-out will have a *Large* dust emission magnitude, regardless of the nature of onsite road surfaces.

Construction Emissions Summary

9.5.12 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout, as specified in the IAQM guidance and discussed above, are listed in Table 9.9 below. Overall, the dust emission magnitude is predicted to be *Large*.

Table 9.9: Dust Emission Magnitude Summary

Construction Stage	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

9.5.13 Having established the emission magnitude for dust above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor. High sensitivity human receptors include residential dwellings, schools and hospitals.

9.5.14 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.

9.5.15 With the exponential decline in dust with distance from dust generating activities, it is considered that for receptors more than 350m from the site boundary, or more than 50m from a road used by construction vehicles, within 500m of the site entrance, the risk is negligible. Furthermore, the risks at over 100m are only potentially significant in certain weather conditions, e.g. downwind of the source during dry periods.

9.5.16 The approximate number of high sensitivity human receptors in the vicinity of the application site is detailed in Table 9.10 below, with distance contours shown in Figure 9.1. Most sensitive receptors in the vicinity are located to the east. These include residential dwellings and a nursery school. There are, only 2 high sensitivity receptors within 20m of the site boundary (see Table 9.10).

Table 9.10: High Sensitivity Receptors 'at risk' of dust impacts

Distance from source	Approx. Number of High Sensitivity Receptors	Details
<20m from site boundary	2	Residential dwellings in Collingtree.
20-100m from site boundary	20	Residential dwellings in Collingtree.
100-350m from site boundary	40	Dwellings in Collingtree, Milton Malsor and Grange Park. Milton Malsor Village Park. Kiddi Caru Day Nursery.
20m from roads within 500m of site entrance	>10	Residential Dwellings off Collingtree Rd & Rectory Lane, in Milton Malsor; West Lodge Cottages; Ash Lane, Collingtree,
50m from roads within 500m of site entrance*	10-100	Residential Dwellings off A45 in Wootton Residential Dwellings off Collingtree Rd in Milton Malsor; Dwellings off Ash Lane, Collingtree

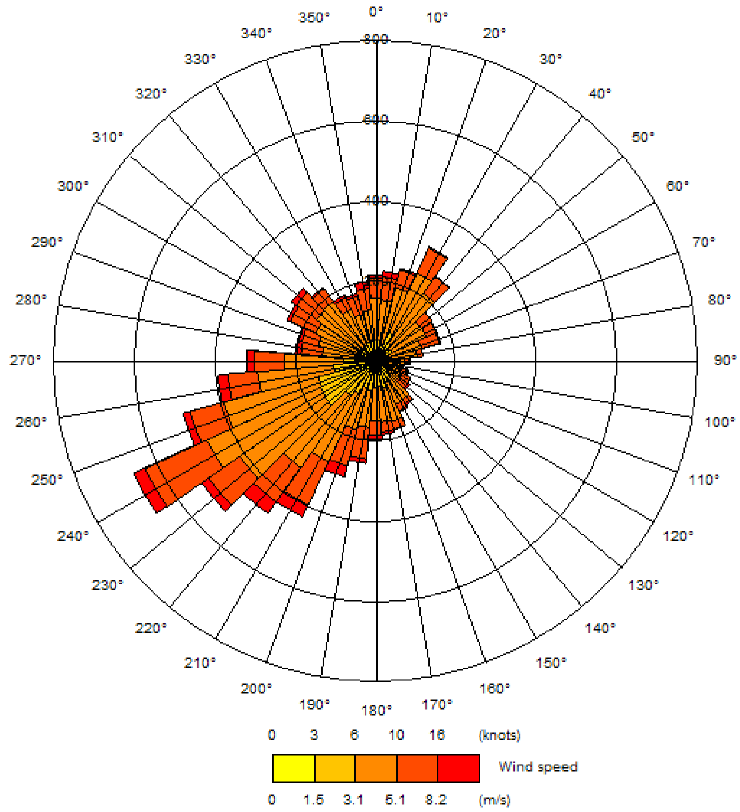
Note: *500m from site boundary in the absence of detailed knowledge of site entrance(s) locations.

9.5.17 Plate 9.1, below, shows the prevailing wind is from the south-west. A large proportion of the potentially sensitive receptors identified in Table 9.10 are to the north-east of the development, downwind of the prevailing wind. It is considered, therefore, that although there are very few sensitive receptors in the immediate vicinity of the site, the potential sensitivity of the area to Demolition, Earthworks and Construction effects is *Medium*.

9.5.18 There are over 10 receptors within 20m of roads within 500m of the site entrance; as such, the sensitivity of the area to Trackout is considered *High.*

9.5.19 The likelihood of exceedances of the PM_{10} AQSs is considered to be *Low*, due to relatively low background concentrations, in comparison to the 40μg.m^{-3} annual mean AQS.

Plate 9.1: Wind Rose for Bedford, 2016



Risk Effects and Significance of the Construction Phase

9.5.20 Having established the likely dust emission magnitude and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 9.11.

Table 9.11: Summary risk effects of construction, based on the IAQM's dust guidance

Source	Dust Soiling Effects	PM_{10} Effects	Ecological Effects
Demolition	Negligible Risk	Low Risk	Negligible
Earthworks	Medium Risk	Low Risk	Negligible
Construction	Medium Risk	Low Risk	Negligible
Trackout	High Risk	Low Risk	Negligible

9.5.21 In the absence of any mitigation, including the Construction Environmental Management Plan (CEMP) measures; Demolition, Earthworks and Construction emissions are considered to present a ***Medium Risk*** of dust soiling effects, whilst, Trackout is considered to present a ***High Risk*** of dust soiling effects. The Proposed Development is considered ***Low Risk*** for PM_{10} health effects, in the absence of any mitigation.

Roade Bypass & A508 Improvements

Demolition

9.5.22 The vast majority of the Roade bypass site is currently agricultural and does not contain built structures. However, some demolition may be required for the break-up of existing road surfaces on the A508, between the Main Site and the proposed Bypass.

9.5.23 Overall, the dust emission magnitude for the demolition stage is considered to be *Small*.

Earthworks

9.5.24 Sites greater than 10,000m^2 are considered 'Large' with reference to the IAQM guidance. As the site is far larger than this threshold it is anticipated that significant earthworks will be required and the dust emission magnitude is considered to be *Large.*

Construction

9.5.25 During construction, activities which may have the potential to cause significant dust emissions may include concrete batching, sandblasting and piling. It is not currently known if any of these activities will take place during construction. In addition to the general handling of construction materials and windblow from stockpiles of friable materials, particularly during higher wind speeds.

9.5.26 The scale of the Proposed Development will be in excess of the IAQM's 100,000m^3 'Large' threshold. As such, the dust emission magnitude for construction is considered to be *Large*.

Trackout

9.5.27 Construction traffic, when traveling over soiled road surfaces, has the potential to generate dust emissions and also to soil the local road network. During dry weather, unsurfaced and soiled roads can lead to dust being emitted due to pick-up by vehicle wheels. The potential for roads to be soiled is dependent on the length of the on-site unpaved roads.

9.5.28 Given the scale of the site, it is likely that trackout will have a *Large* dust emission magnitude, regardless of the nature of onsite road surfaces.

Construction Emissions Summary

9.5.29 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout, as specified in the IAQM guidance and discussed above, are listed in Table 9.12 below. Overall, the dust emission magnitude is predicted to be *Large*.

Table 9.12: Dust Emission Magnitude Summary

Construction Stage	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

9.5.30 The approximate number of high sensitivity human receptors in the vicinity of the Bypass site is detailed in Table 9.13 below, with distance contours shown in Figure 9.2. The majority of sensitive receptors are located in the village of Roade. This includes numerous residential dwellings and the Elizabeth Woodville School. None of these are located within 20m of the site boundary, however, there are some residential dwellings and farms on the outskirts of Roade that do fall within 20m of the Bypass site boundary, primarily areas for earthworks and landscaping while they remain further from the route of the proposed road itself.

Table 9.13: High Sensitivity Receptors 'at risk' of dust impacts

Distance from source	Approx. Number of High Sensitivity Receptors	Details
<20m from site boundary	10	White House Farm, Bailey Brooks Lane residential, Hyde Farm Dovecote Road residential and West Lodge Cottages.
20-100m from site boundary	50	Residential dwellings in Roade.
100-350m from site boundary	1,500+	Residential dwellings in Roade and the Elizabeth Woodville School
20m from roads within 500m of site entrance	>10	Residential dwellings off the A508, Bailey Brooks Lane, Stratford Road & Elizabeth Woodville School.
50m from roads within 500m of site entrance*	10-100	Residential dwellings off the A508, Bailey Brooks Lane, Stratford Road & Elizabeth Woodville School.

Note: *500m from site boundary in the absence of detailed knowledge of site entrance(s) locations.

9.5.31 Plate 9.1 shows the prevailing wind is from the south-west. A large proportion of the potentially sensitive receptors identified in Table 9.13 are to the north-east of the development, downwind of the prevailing wind. Furthermore, there are some receptors located within 20m of the bypass. As such the sensitivity of the area to Construction, Earthworks and Demolition is considered to be *Medium*.

9.5.32 There are over 10 receptors within 20m of roads within 500m of the site entrance; as such, the sensitivity of the area to Trackout is considered *High.*

9.5.33 The likelihood of exceedances of the PM_{10} AQSs is considered to be Low, due to relatively low background concentrations, in comparison to the 40µg.m^{-3} annual mean AQS.

Risk Effects and Significance of the Construction Phase

9.5.34 Having established the likely dust emission magnitude and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 9.14.

Table 9.14: Summary risk effects of construction, based on the IAQM's dust guidance

Source	Dust Soiling Effects	PM_{10} Effects	Ecological Effects
Demolition	Negligible Risk	Low Risk	Negligible
Earthworks	Medium Risk	Low Risk	Negligible
Construction	Medium Risk	Low Risk	Negligible
Trackout	High Risk	Low Risk	Negligible

9.5.35 In the absence of any mitigation, including Construction Environmental Management Plan (CEMP) measures, Demolition, Earthworks and Construction are considered to present a ***Medium Risk*** of dust soiling effects, whilst, Trackout is considered to present a ***High Risk*** of dust soiling effects. The Proposed Development is considered ***Low Risk*** for PM_{10} health effects, in the absence of any mitigation.

Other Highways Mitigation Measures

9.5.36 As stated previously, the proposals also include a package of small-scale improvements to the local road network, as shown in Figures 9.3 and 9.4. As these improvements are minor (e.g. road widening or junction reconfiguration), it was decided that a full construction phase assessment was not required and as such the overall dust magnitude of these improvements is considered to be *Small*.

9.5.37 These sites are located in more rural areas, away from any large population centres and as such the sensitivity of these areas is considered to be *Low*. Overall, these minor road improvements are considered Low Risk for dust soiling effects and Negligible Risk for PM_{10} health effects, in the absence of any mitigation.

Intra-development cumulative dust

9.5.38 There will be some overlap in the construction of both the Main Site, and the Roade Bypass and A508 Corridor; however, there are very few sensitive receptors within 350m of both sites and no identified receptors downwind, and within 350m of both sites. As such, the risk of intra-development cumulative dust impacts is considered to be *Negligible*.

Vehicle Emissions

9.5.39 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the site will also be released. Given the scale of the Proposed Development, the volumes and periods over which these releases will occur are likely to have the potential to cause effects at nearby existing sensitive receptors.

9.5.40 Appendix 9.11 shows that the emissions from construction related vehicles associated with the Proposed Development will have a ***Negligible*** impact on local receptors in AQMA No.1 and AQMA No.5.

Operational Effects

Dust Impacts (Aggregate Terminal)

9.5.41 The operation of the Proposed Development includes an Aggregate Terminal for the storage and movement of aggregates.

9.5.42 Estimates of the magnitude of dust emissions are based on the current operation of GRS's aggregate terminal. The terminal has no conveyor system in place at their current site and as such, stockpiles rarely exceed 5m in height.

9.5.43 The current site, which is located in central Northampton and in proximity to a number of highly sensitive human receptors, has had no dust issues; this indicates that dust emissions from the site are currently not significant.

9.5.44 Using the IAQM construction guidance, the magnitude of dust emissions from the processing and storage of aggregates is, however, estimated to be *Medium.* This is a worst-case estimate.

9.5.45 Figure 9.5 shows the number of sensitive receptors within 350m the site boundary. The 350m boundary is shown to account for the receptors potentially susceptible to emissions from the storage and processing of the aggregates.

9.5.46 Rathvilly and Lodge Farms are the only human receptors currently located within 350m of the Proposed Aggregate Terminal; however, the Proposed Development will introduce a number of additional human receptors within this boundary. These receptors are, however, not considered highly sensitive to nuisance dust impacts. Given, the number of human receptors and their low sensitivity to dust soiling, the overall sensitivity of the area is considered *Low*.

9.5.47 The operation of the Aggregates Terminal is, therefore, considered ***Low Risk*** for nuisance dust impacts and ***Low Risk*** for PM_{10} health effects, in the absence of mitigation, including CEMP measures.

Road Emissions

9.5.48 Full results from the ADMS-Roads assessment for each local study areas are presented below.

9.5.49 Discrete model receptors were positioned at the façades of the sensitive receptors, predominantly residential dwellings, closest to the source of pollution, i.e. roads.

9.5.50 Results are provided in summary tables identifying modelled concentrations at receptors for the baseline year (2018) and future years (2021 and 2031) providing the "without" the development contribution total concentration and "with" the development contribution total concentration.

9.5.51 The tables also present the difference in concentrations and the percentage change (%) with regard to the long term AQSs for NO_2 and PM_{10} (40µg.m^{-3}). The IAQM impact descriptor is also provided for each receptor.

Northampton AQMA No.1, Collingtree and NSSUE

9.5.52 Modelled receptors in the Northampton AQMA No.1 study area are detailed in Appendix 9.2, and displayed on Figure 9.6.

9.5.53 Highways England will soon be implementing a Smart Motorway scheme in this area. This will see the current hard shoulder used as an additional running lane for 24 hours a day, except during emergency conditions (i.e. breakdown or collision). The Smart Motorway scheme will see traffic move closer to the receptors in Collingtree and the NSSUE; a sensitivity test was undertaken which showed that pollution concentrations increased with the Smart Motorway scheme at these locations, assuming no improvements to traffic flow. As such, all future scenarios have assumed that the Smart Motorway scheme will be in place.

9.5.54 Tables 9.15 and 9.16 below show the impact of the Proposed Development, in Collingtree and the NSSUE, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.55 The data in Table 9.16 show that annual mean concentrations of PM_{10} are predicted to be below the 40µg.m^{-3} AQS in all scenarios. Annual mean concentrations of NO_2 are predicted to be below the 40µg.m^{-3} AQS in all future scenarios; however, one exceedance of the AQS is predicted at C1 in the baseline year.

9.5.56 For the hourly AQS for NO_2 (200µg.m^{-3} not to be exceeded more than 18 times a year), TG(16) paragraph 7.90 states that if the annual mean is below 60µg.m^{-3}, the hourly AQS should be met. The data in Table 9.15 show that this threshold is not expected to be exceeded.

9.5.57 For PM_{10} the following equation can be used to derive the number of days that the daily mean AQS limit for 50µg.m^{-3} is likely to be exceeded.

$$\textit{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \textit{annual mean}^3 + (206/\textit{annual mean})$$

9.5.58 The data in Table 9.16 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 20.1µg.m^{-3}. Based on the above formula, this would lead to 3.49 exceedance days, which is 90% below the 35-day limit.

9.5.59 The data in Tables 9.15 and 9.16 shows that all changes in annual mean NO_2 and PM_{10} concentrations, in both 2021 and 2031, are predicted to be Negligible, with reference to the EPUK & IAQM Impact Descriptors.

9.5.60 The largest change in annual mean NO_2 is anticipated to occur at C1 and C16 with the development in 2031, where increases of 0.5% relative to the 40µg.m^{-3} AQS [3] are predicted. The largest change in annual mean PM_{10} is predicted to occur at C1, C2, C3 and C16 with the development in 2031, where increases of 0.5% are predicted.

9.5.61 Considering the above, the Proposed Development is expected to have an overall ***Negligible*** impact on local air quality at Collingtree and the NSSUE.

9.5.62 The impact of the Proposed Development on receptors in Collingtree and the NSSUE is expected to remain overall ***Negligible*** in the interim period.

9.5.63 The junction improvements to J15 and J15a will likely reduce congestion, and hence pollution, on the M1 adjacent to Collingtree and as such, the above conclusions are likely worst-case.

Table 9.15: Predicted concentration (μg.m[-3]) of NO_2 in the Collingtree and NSSUE Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
C1	**40.1**	34.8	34.8	0.0	-0.1	Negligible	21.0	21.2	0.2	0.5	Negligible
C2	38.6	33.5	33.5	0.0	0.0	Negligible	20.3	20.5	0.2	0.4	Negligible
C3	37.0	32.1	32.1	0.0	0.0	Negligible	19.5	19.7	0.2	0.4	Negligible
C4	35.5	30.8	30.7	0.0	0.0	Negligible	18.8	19.0	0.2	0.4	Negligible
C5	29.0	25.0	25.0	0.0	0.0	Negligible	15.8	15.9	0.1	0.3	Negligible
C6	32.1	27.8	27.8	0.0	0.0	Negligible	17.2	17.4	0.1	0.4	Negligible
C7	30.4	26.3	26.3	0.0	0.0	Negligible	16.5	16.6	0.1	0.3	Negligible
C8	33.1	28.7	28.7	0.0	0.0	Negligible	17.7	17.9	0.2	0.4	Negligible
C9	33.2	28.7	28.7	0.0	0.0	Negligible	17.7	17.9	0.2	0.4	Negligible
C10	33.1	28.7	28.6	0.0	0.0	Negligible	17.7	17.8	0.1	0.4	Negligible
C11	33.1	28.6	28.6	0.0	0.0	Negligible	17.7	17.8	0.1	0.4	Negligible
C12	33.1	28.6	28.6	0.0	0.0	Negligible	17.7	17.8	0.1	0.4	Negligible
C13	35.0	30.3	30.3	0.0	0.0	Negligible	18.6	18.7	0.2	0.4	Negligible
C14	35.0	30.3	30.3	0.0	0.0	Negligible	18.5	18.7	0.2	0.4	Negligible
C15	34.8	30.1	30.1	0.0	0.0	Negligible	18.5	18.6	0.2	0.4	Negligible
C16	39.6	34.3	34.3	0.0	0.0	Negligible	20.7	20.9	0.2	0.5	Negligible
C17	34.6	30.0	30.0	0.0	0.0	Negligible	18.4	18.5	0.2	0.4	Negligible
NSSUE1	26.9	23.2	23.2	0.0	0.0	Negligible	14.9	15.0	0.1	0.3	Negligible
NSSUE2	29.4	25.4	25.4	0.0	0.0	Negligible	16.0	16.1	0.1	0.3	Negligible
NSSUE3	28.6	24.7	24.7	0.0	0.0	Negligible	15.6	15.7	0.1	0.3	Negligible

Table 9.16: Predicted concentration (μg.m^{-3}) of PM_{10} in the Collingtree and NSSUE Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
C1	20.1	19.8	19.9	0.0	0.1	Negligible	19.6	19.8	0.2	0.5	Negligible
C2	19.8	19.6	19.6	0.0	0.1	Negligible	19.3	19.5	0.2	0.5	Negligible
C3	19.6	19.3	19.3	0.0	0.1	Negligible	19.1	19.3	0.2	0.5	Negligible
C4	19.3	19.1	19.1	0.0	0.1	Negligible	18.8	19.0	0.2	0.4	Negligible
C5	18.3	18.1	18.1	0.0	0.1	Negligible	17.8	17.9	0.1	0.3	Negligible
C6	18.8	18.5	18.6	0.0	0.1	Negligible	18.3	18.4	0.1	0.4	Negligible
C7	18.6	18.3	18.3	0.0	0.1	Negligible	18.0	18.1	0.1	0.3	Negligible
C8	19.0	18.7	18.7	0.0	0.1	Negligible	18.4	18.6	0.2	0.4	Negligible
C9	19.0	18.7	18.7	0.0	0.1	Negligible	18.4	18.6	0.2	0.4	Negligible
C10	19.0	18.7	18.7	0.0	0.1	Negligible	18.4	18.6	0.2	0.4	Negligible
C11	19.0	18.7	18.7	0.0	0.1	Negligible	18.4	18.6	0.2	0.4	Negligible
C12	19.0	18.7	18.7	0.0	0.1	Negligible	18.4	18.6	0.2	0.4	Negligible
C13	19.3	19.0	19.0	0.0	0.1	Negligible	18.7	18.9	0.2	0.4	Negligible
C14	19.2	19.0	19.0	0.0	0.1	Negligible	18.7	18.9	0.2	0.4	Negligible
C15	19.2	18.9	19.0	0.0	0.1	Negligible	18.7	18.9	0.2	0.4	Negligible
C16	20.0	19.7	19.8	0.0	0.1	Negligible	19.5	19.7	0.2	0.5	Negligible
C17	19.2	18.9	19.0	0.0	0.1	Negligible	18.7	18.8	0.2	0.4	Negligible
NSSUE1	18.0	17.7	17.8	0.0	0.1	Negligible	17.5	17.6	0.1	0.3	Negligible
NSSUE2	18.4	18.1	18.1	0.0	0.1	Negligible	17.9	18.0	0.1	0.3	Negligible
NSSUE3	18.3	18.0	18.0	0.0	0.1	Negligible	17.7	17.9	0.1	0.3	Negligible

Local Study Area: Northampton AQMA No.5, Wootton

9.5.64 Modelled receptors in the Northampton AQMA No.5 study area are detailed in Appendix 9.2, and displayed on Figure 9.7.

9.5.65 Tables 9.17 and 9.18, below, show the impact of the Proposed Development, in Collingtree and the NSSUE, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.66 The data in Table 9.17 and Table 9.18 show that annual mean concentrations NO_2 and PM_{10} are predicted to be below the 40µg.m^{-3} AQS in all scenarios.

9.5.67 Table 9.17 identifies the highest annual mean concentration of NO_2 (i.e. 28.6µg.m^{-3}) was recorded at W4, in the baseline year. This is 'well below' 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met.

9.5.68 The data in Table 9.18 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 19.7µg.m^{-3}, at W4 with the Proposed Development in 2031. Based on the formula in 9.5.57 that, this would lead to 3.04 exceedance days, which is 91% below the 35-day limit for the daily mean AQS.

9.5.69 The data in Tables 9.17 and 9.18 shows that all changes in annual mean NO_2 and PM_{10} concentrations, in both 2021 and 2031, are predicted to be Negligible, with reference to the EPUK & IAQM Impact Descriptors.

9.5.70 The largest change in annual mean NO_2 is anticipated to occur at W4 with the development in 2021, where an increase of 1.3µg.m^{-3} (3.2% relative to the AQS) is predicted. The largest change in annual mean PM_{10} is also predicted at W4 with the development in 2031, where an increase of 0.8µg.m^{-3} (1.9% relative to the AQS) is predicted. Concentrations of NO_2 and PM_{10} are anticipated to increase at all receptors in all scenarios.

9.5.71 Considering the above, the Proposed Development is expected to have an overall ***Negligible*** impact on local air quality at AQMA No.5, Wootton.

9.5.72 According to Table 9.17, the baseline year was the worst year for NO_2. As such, the predicted increases in annual mean NO_2 in 2021 were offset by improving background concentrations and improvements to the vehicle fleet in just three years.

9.5.73 The re-distribution of traffic flows as a result of J15 improvements are a more significant contributor to increases in traffic on the A45 than HGV traffic generated by vehicles travelling to and from the Proposed Development in 2021. As the J15 improvements will have already occurred, traffic flows on the A45 are not, therefore, anticipated to grow as quickly in the interim period.

9.5.74 Therefore, the impact of the Proposed Development on receptors in Northampton AQMA No.5 is expected to remain overall ***Negligible*** in the interim period.

Table 9.17: Predicted concentration (µg.m^{-3}) of NO_2 in the Northampton AQMA No.5, Wootton Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
W1	21.3	17.9	18.6	0.7	1.7	Negligible	11.2	11.6	0.4	1.0	Negligible
W2	28.0	23.4	24.7	1.3	3.1	Negligible	13.9	14.5	0.7	1.6	Negligible
W3	23.9	20.0	20.9	0.9	2.2	Negligible	12.2	12.7	0.5	1.2	Negligible
W4	28.6	23.9	25.2	1.3	3.2	Negligible	14.1	14.8	0.7	1.7	Negligible
W5	24.9	20.8	21.8	1.0	2.5	Negligible	12.6	13.1	0.5	1.3	Negligible

Table 9.18: Predicted concentration (µg.m^{-3}) of PM_{10} in the Northampton AQMA No.5, Wootton Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
W1	17.9	17.6	17.8	0.2	0.6	Negligible	17.5	17.9	0.4	1.0	Negligible
W2	19.2	18.9	19.4	0.5	1.2	Negligible	18.8	19.6	0.7	1.8	Negligible
W3	18.4	18.1	18.4	0.3	0.8	Negligible	17.9	18.5	0.5	1.4	Negligible
W4	19.3	19.0	19.5	0.5	1.2	Negligible	18.9	19.7	0.8	1.9	Negligible
W5	18.6	18.3	18.6	0.3	0.9	Negligible	18.1	18.7	0.6	1.5	Negligible

Local Study Area: Northampton AQMA No.4

9.5.75 Modelled receptors in the Northampton AQMA No.4 study area are detailed in Appendix 9.2, and displayed on Figure 9.8.

9.5.76 Tables 9.19 and 9.20, below, show the impact of the Proposed Development, in AQMA No.4, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.77 The data in Table 9.19 show that the highest annual mean concentration of NO_2 (i.e. 44.4µg.m^{-3}) was recorded at K7, in the baseline year. This is below 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met.

9.5.78 The data in Table 9.20 show that annual mean concentrations of PM_{10} are predicted to be below the 40µg.m^{-3} AQS in all scenarios. Annual mean concentrations of NO_2 are predicted to be below the 40µg.m^{-3} AQS in all future scenarios.

9.5.79 The data in Table 9.20 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 23.0µg.m^{-3}, at K7 in the baseline year. Based on the formula in 9.5.57, this would lead to 8.05 exceedance days, which is 77% below the 35-day limit for the daily mean AQS.

9.5.80 The data in Table 9.20 show that all changes in annual mean PM_{10} concentrations are predicted to be *Negligible*, with reference to the EPUK & IAQM Impact Descriptors. Changes in annual mean NO_2 concentrations are predicted to be Negligible in both 2031 scenarios.

9.5.81 However, three *Moderate Adverse* impacts and one *Slight Adverse* impact are predicted in 2021 due to the early operation of the Proposed Development. Of the receptors where likely significant impacts are expected (K4, K7, K10 and K12), all were located on Harborough Road, within proximity of junctions and slowed traffic, where long term concentrations of NO_2 are predicted to be 5% below the AQS.

9.5.82 The largest change in annual mean NO_2 occurs at K10, which is predicted to experience a 0.9 µg.m^{-3} increase; this is a 2.3% change with reference to the 40µg.m^{-3} AQS. The highest predicted annual mean NO_2 concentration with the Proposed Development (i.e. 39.6µg.m^{-3}) was also predicted here in 2021; this was 1% below the AQS.

9.5.83 Concentrations of NO_2 and PM_{10} are anticipated to increase marginally at all receptors in all scenarios, with none expected to breach the AQS.

9.5.84 A review of the sensitivity analysis in Appendix 9.4 shows that only one *Slight Adverse* impact is predicted in AQMA No.4, in 2021, due to the early operation of the Proposed Development, when basing the assessment on 2015 verification data. This impact is anticipated at Receptor K10.

9.5.85 In this sensitivity test, the largest increase in annual mean NO_2 occurs at K10, where a 0.7 µg.m^{-3} increase is predicted, this is a 1.8% increase with reference to the AQS. The highest predicted annual mean NO_2 concentration with the Proposed Development (i.e.34.1µg.m^{-3}) was also predicted here; this was 15% below the AQS.

9.5.86 Due to inherent uncertainties in the modelling methodology the IAQM recommends that percentage changes should be rounded to their nearest whole number. As such, the increases predicted at K10 between the two sensitivity tests are directly comparable. The discrepancy in significance between the two sensitivity tests is due to the 'long term average concentration' at each receptor, with concentrations in the 2016 sensitivity on average 3.5µg.m^{-3} higher at each receptor.

9.5.87 Considering the above, the impact of the Proposed Development on local air quality, without mitigation, in 2021, is considered to be, at worst, ***Slight Adverse***. By 2031, the overall impact of the Proposed Development will be ***Negligible***, even in the absence of mitigation.

9.5.88 As the baseline year (2018) was consistently worst-case for NO_2 at all receptors, predicted improvements to the vehicle fleet are predicted to off-set any increases in NO_2 due to the Proposed Development (SRFI flows and re-distributed traffic due to highway works) within three years. Highway improvement works are also anticipated to reduce total AADT flows on Harborough Road by 2031, compared to 2021.

9.5.89 Given that the *Moderate Adverse* impact predicted at receptor K10 would require an increase of 2.3 $\mu g.m^{-3}$, in 2021, for it to become *Substantial Adverse*, it is considered that there is sufficient head-room for impacts to remain at worst *Moderate Adverse* at isolated dwellings in the interim period.

9.5.90 It is, therefore, considered that the overall impact of the Proposed Development on AQMA 4 will remain at worst ***Slight Adverse****,* in the interim period.

Table 9.19: Predicted concentration (μg.m^{-3}) of NO_2 in the Northampton AQMA No.4 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
K1	36.5	26.1	26.3	0.2	0.5	Negligible	17.2	17.3	0.1	0.3	Negligible
K2	27.4	21.0	21.1	0.1	0.3	Negligible	14.4	14.6	0.2	0.4	Negligible
K3	**44.2**	29.3	29.6	0.3	0.7	Negligible	19.1	19.2	0.2	0.4	Negligible
K4	**40.3**	37.5	38.2	0.7	1.8	Moderate	22.1	22.3	0.2	0.4	Negligible
K5	38.7	32.7	33.2	0.5	1.3	Negligible	19.6	19.7	0.1	0.1	Negligible
K6	39.8	33.6	34.1	0.5	1.3	Negligible	20.1	20.1	0.1	0.2	Negligible
K7	**44.4**	37.7	38.3	0.6	1.5	Moderate	22.1	22.1	0.1	0.2	Negligible
K8	30.4	26.0	26.3	0.3	0.8	Negligible	16.1	16.1	0.0	0.1	Negligible
K9	27.1	23.4	23.7	0.3	0.7	Negligible	14.8	14.8	0.0	0.0	Negligible
K10	**42.4**	38.7	39.6	0.9	2.3	Moderate	22.2	22.5	0.3	0.7	Negligible
K11	34.9	31.6	32.2	0.6	1.5	Negligible	18.8	18.9	0.1	0.1	Negligible
K12	35.4	31.9	32.5	0.7	1.6	Slight	18.8	18.9	0.2	0.4	Negligible
K13	39.2	33.2	33.7	0.5	1.3	Negligible	19.8	19.9	0.1	0.1	Negligible

Table 9.20: Predicted concentration (µg.m^{-3}) of PM_{10} in the Northampton AQMA No.4 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without Development	2031 With Development	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
K1	21.2	20.0	20.1	0.1	0.1	Negligible	20.2	20.2	0.1	0.2	Negligible
K2	19.6	18.8	18.8	0.0	0.1	Negligible	18.8	18.9	0.1	0.2	Negligible
K3	22.6	20.8	20.9	0.1	0.2	Negligible	21.0	21.1	0.1	0.2	Negligible
K4	21.7	22.2	22.4	0.2	0.4	Negligible	22.0	22.2	0.1	0.3	Negligible
K5	21.7	21.5	21.6	0.1	0.3	Negligible	21.4	21.4	0.1	0.2	Negligible
K6	22.0	21.7	21.9	0.1	0.3	Negligible	21.6	21.7	0.1	0.2	Negligible
K7	23.0	22.8	23.0	0.2	0.4	Negligible	22.6	22.7	0.1	0.2	Negligible
K8	20.1	19.9	20.0	0.1	0.2	Negligible	19.7	19.7	0.0	0.1	Negligible
K9	19.1	19.3	19.4	0.1	0.2	Negligible	19.1	19.1	0.0	0.1	Negligible
K10	21.4	21.5	21.6	0.1	0.4	Negligible	21.1	21.2	0.1	0.2	Negligible
K11	20.8	20.9	21.0	0.1	0.3	Negligible	20.6	20.6	0.1	0.1	Negligible
K12	20.4	20.4	20.5	0.1	0.3	Negligible	20.0	20.1	0.0	0.1	Negligible
K13	21.8	21.6	21.7	0.1	0.3	Negligible	21.5	21.6	0.1	0.2	Negligible

Northampton AQMAs No.2, 6 and 8

9.5.91 Modelled receptors in the Northampton AQMA No.2, No.6 and No.8 study area are detailed in Appendix 9.2, and displayed on Figure 9.9 to 9.11, respectively.

9.5.92 Tables 9.21 and 9.22, below, show the impact of the Proposed Development on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.93 Table 9.21 identifies an exceedance of the annual mean AQS for NO_2, in both "without" and "with" Proposed Development scenarios at receptor CS1. As such, it can be confirmed that the Proposed Development is not going to result in an exceedance of any long-term AQS.

9.5.94 The highest annual mean concentration of NO_2 with the Proposed Development (i.e. 47.2µg.m^{-3}) was recorded at CS1, in 2021. This is below 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met with the Proposed Development. However, other exceedances of the annual mean AQS for NO_2 are predicted in the 2018 baseline year.

9.5.95 The data in Table 9.22 show that annual mean concentrations of PM_{10} are predicted to be below the 40µg.m^{-3} AQS in all scenarios.

9.5.96 The data in Table 9.22 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 25.8µg.m^{-3}. Based on the formula in 9.5.57, this would lead to 14.5 exceedance days, which is 58.6% below the 35-day limit.

9.5.97 The data in Table 9.21 and 9.22 show that all changes in annual mean NO_2 and PM_{10} concentrations, in AQMA No.2, No.6 and No.8 are predicted to be *Negligible*, in both 2021 and 2031, with reference to the EPUK & IAQM Impact Descriptors.

9.5.98 The largest change in annual mean NO_2 is anticipated to occur at CS4 with the development in 2021, where an increase of 0.6µg.m^{-3} (1.4% relative to the AQS) is predicted.

9.5.99 The largest change in annual mean PM_{10} is predicted at CS4 with the development in 2031, where an increase of 0.2µg.m^{-3} (0.5% relative to the AQS) is predicted.

9.5.100 Review of Appendix 9.4 shows that the above results are insensitive to year of model verification; all impacts remain *Negligible* in significance when using 2015 as the year of model verification.

9.5.101 Considering the above, the Proposed Development is expected to have an overall ***Negligible*** impact on AQMA No.2. No.6 and No.8, in both 2021, 2031 and in the interim years.

Table 9.21: Predicted concentration (μg.m^{-3}) of NO_2 in the Northampton AQMA No.2, 6 and 8 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development (2021)		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development (2031)		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
VP1	37.8	25.7	25.9	0.1	0.3	Negligible	19.7	19.7	0.0	0.0	Negligible
VP2	39.8	27.0	27.1	0.1	0.3	Negligible	20.3	20.3	0.0	0.0	Negligible
VP3	**50.0**	33.7	33.7	0.0	0.0	Negligible	23.3	23.1	-0.1	-0.4	Negligible
VP4	36.4	29.9	29.8	-0.1	-0.2	Negligible	21.7	21.7	0.0	0.0	Negligible
VP5	34.1	29.3	29.2	-0.1	-0.3	Negligible	21.6	21.5	-0.1	-0.1	Negligible
VP6	36.3	30.3	30.5	0.1	0.4	Negligible	22.0	22.1	0.1	0.2	Negligible
SM1	29.1	26.0	26.0	0.0	0.0	Negligible	20.3	20.2	0.0	0.0	Negligible
SM2	27.7	25.0	25.0	0.0	0.0	Negligible	19.8	19.8	0.0	0.0	Negligible
SM3	27.5	24.9	24.9	0.0	0.0	Negligible	19.7	19.7	0.0	-0.1	Negligible
CS1	**62.6**	**47.1**	**47.2**	0.1	0.3	Negligible	31.4	31.7	0.4	0.9	Negligible
CS2	**46.5**	36.9	37.2	0.3	0.6	Negligible	24.7	25.1	0.3	0.9	Negligible
CS3	33.9	29.2	29.5	0.4	0.9	Negligible	19.8	20.1	0.3	0.7	Negligible
CS4	35.5	31.5	32.1	0.6	1.4	Negligible	21.6	22.1	0.5	1.2	Negligible

Table 9.22 Predicted concentration (µg.m[-3]) of PM_{10} in the Northampton AQMA No.2, 6 and 8 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
VP1	19.6	17.6	17.7	0.0	0.1	Negligible	17.4	17.3	-0.1	-0.1	Negligible
VP2	19.8	17.9	17.9	0.0	0.1	Negligible	17.6	17.6	0.0	-0.1	Negligible
VP3	20.9	19.1	19.1	0.0	0.0	Negligible	18.8	18.8	0.0	0.0	Negligible
VP4	19.1	18.5	18.5	0.0	0.0	Negligible	18.3	18.2	0.0	0.0	Negligible
VP5	18.8	18.4	18.4	0.0	-0.1	Negligible	18.2	18.1	0.0	-0.1	Negligible
VP6	19.3	18.8	18.8	0.0	0.1	Negligible	18.6	18.6	0.1	0.2	Negligible
SM1	16.9	16.6	16.6	0.0	0.0	Negligible	16.5	16.4	0.0	0.0	Negligible
SM2	16.9	16.5	16.5	0.0	0.0	Negligible	16.4	16.4	0.0	0.0	Negligible
SM3	17.7	17.4	17.4	0.0	0.0	Negligible	17.3	17.3	0.0	0.0	Negligible
CS1	25.3	24.3	24.3	0.0	0.0	Negligible	25.7	25.8	0.2	0.4	Negligible
CS2	22.2	21.7	21.8	0.0	0.1	Negligible	22.3	22.5	0.1	0.3	Negligible
CS3	20.1	20.0	20.1	0.1	0.2	Negligible	20.1	20.2	0.1	0.3	Negligible
CS4	20.2	20.3	20.4	0.1	0.2	Negligible	20.7	20.9	0.2	0.5	Negligible

Local Study Area: AQMA No.3

9.5.102 Modelled receptors in the Northampton AQMA No.3 study area are detailed in Appendix 9.2, and displayed on Figure 9.12.

9.5.103 Tables 9.23 and 9.24, below, show the impact of the Proposed Development on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.104 Table 9.23 identifies the highest annual mean concentration of NO_2 (i.e. 56.60µg.m^{-3}) was recorded at SJ4, in the baseline year 2018. This is below 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met.

9.5.105 Changes in annual mean NO_2 concentrations as a result of the Proposed Development are predicted to be *Negligible* in 2031. However, one *Substantial Beneficial*, one *Moderate Beneficial* and two *Slight Beneficial* impacts were predicted in 2021 at receptor SJ4, SJ2 and SJ1 and SJ12, respectively, due to the early operation of the Proposed Development and its highway mitigation measures.

9.5.106 Of the receptors where likely significant beneficial impacts are expected (SJ1, SJ2, SJ4, SJ12), all were located on Weedon Road. *Negligible Beneficial* impacts were predicted at receptors on St James Road and *Negligible Adverse* Impacts at the crossroad of Spencer Bridge Road and Harlestone Road.

9.5.107 The largest change in annual mean NO_2 occurs at SJ2 and SJ4, which are predicted to experience a 1.0 µg.m^{-3} decrease; this is a 2.60% decrease with reference to the 40µg.m^{-3} AQS. This decrease is considered to be S*ubstantial Beneficial* at SJ4, whilst only *Moderate Beneficial* at SJ2 as the long term ambient concentration is lower at SJ2.

9.5.108 The data in Table 9.24 show that long term concentrations of PM_{10}, at identified receptor locations, are anticipated to be below the annual mean AQS in all future scenarios.

9.5.109 Review of Table 9.23 shows that in 2021, with and without the Proposed Development, three receptors (SJ4, SJ9 and SJ2) are predicted to be in exceedance of the annual mean NO_2 AQS. No additional exceedances of the AQS are therefore anticipated as a result of the Proposed Development.

9.5.110 The data in Table 9.24 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 22.2µg.m^{-3}. Based on the formula in 9.5.57, this would lead to 6.6 exceedance days, which is 81.1% below the 35-day limit.

9.5.111 The data in Table 9.24 show that all changes in annual mean PM_{10} concentrations are predicted to be *Negligible*, with reference to the EPUK & IAQM Impact Descriptors.

9.5.112 A review of the sensitivity analysis in Appendix 9.4 shows that only two *Slight Beneficial* impacts are predicted in AQMA No.3, in 2021, due to the early operation of the Proposed Development, when basing the assessment on 2015 verification data. These impacts are anticipated at Receptors SJ2 and SJ4. All other impacts remained *Negligible* in significance.

9.5.113 It is reasonable to anticipate there will be significant beneficial impacts at sensitive receptors adjacent to junctions on Weedon Road, in 2021 and that all other changes across AQMA No.3 are likely to be *Negligible* in significance.

9.5.114 Considering the above, the Proposed Development is expected to have an overall ***Slight Beneficial*** impact on AQMA No.3 in 2021. By 2031, the overall impact on AQMA No.3 will be ***Negligible*** in significance.

9.5.115 The benefits of the Proposed Development in AQMA No.3 are likely to be generated by the re-distribution of traffic flows, rather than reductions in HGV flows associated with the SRFI terminal. The receptors which are predicted to experience significantly beneficial impacts, in 2021, as a result of the early operation of the Proposed Development are all predicted *Negligible Adverse* impacts due to its operation in 2031. This suggests further traffic re-distribution in AQMA No.3 in the interim period. Therefore, it is predicted that in the interim, the overall impact will be ***Negligible*** in significance.

Table 9.23: Predicted concentration (μg.m^{-3}) of NO_2 in the Northampton AQMA No.3 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
SJ1	**46.9**	38.7	38.0	-0.7	-1.8	Slight	23.4	23.5	0.1	0.3	Negligible
SJ2	**55.1**	**44.9**	**43.9**	-1.0	-2.6	Moderate	26.3	26.4	0.1	0.2	Negligible
SJ3	36.3	29.8	29.3	-0.5	-1.3	Negligible	18.6	18.6	0.0	0.1	Negligible
SJ4	**56.6**	**46.3**	**45.3**	-1.0	-2.6	Substantial	27.1	27.2	0.1	0.2	Negligible
SJ5	**41.0**	34.3	33.8	-0.5	-1.2	Negligible	21.1	21.2	0.1	0.3	Negligible
SJ6	38.6	32.3	32.4	0.1	0.3	Negligible	21.9	21.9	0.0	0.0	Negligible
SJ7	**41.0**	34.5	34.6	0.0	0.1	Negligible	23.4	23.3	0.0	0.0	Negligible
SJ8	38.1	32.1	32.5	0.3	0.8	Negligible	21.7	21.7	-0.1	-0.2	Negligible
SJ9	**50.0**	**40.1**	**40.2**	0.1	0.2	Negligible	26.5	26.6	0.1	0.2	Negligible
SJ10	**45.3**	37.0	37.1	0.2	0.4	Negligible	24.6	24.6	0.0	0.1	Negligible
SJ11	26.6	23.5	23.2	-0.2	-0.5	Negligible	15.7	15.7	0.0	-0.1	Negligible
SJ12	36.2	31.3	30.6	-0.7	-1.8	Slight	17.9	18.0	0.1	0.4	Negligible
SJ13	22.9	20.2	20.1	-0.2	-0.4	Negligible	14.0	14.0	0.0	0.0	Negligible
SJ14	26.5	23.1	22.9	-0.2	-0.6	Negligible	15.3	15.3	0.0	-0.1	Negligible
SJ15	39.8	34.3	33.9	-0.5	-1.2	Negligible	20.4	20.2	-0.2	-0.5	Negligible
SJ16	33.3	30.2	29.9	-0.3	-0.8	Negligible	18.7	18.6	-0.1	-0.3	Negligible

Table 9.24 Predicted concentration (µg.m^{-3}) of PM_{10} in the Northampton AQMA No.3 Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
SJ1	20.5	20.8	20.7	-0.2	-0.4	Negligible	21.3	21.4	0.0	0.1	Negligible
SJ2	20.9	21.2	21.0	-0.2	-0.4	Negligible	21.7	21.7	0.0	0.1	Negligible
SJ3	18.2	18.4	18.3	-0.1	-0.2	Negligible	18.8	18.8	0.0	0.0	Negligible
SJ4	21.2	21.5	21.4	-0.2	-0.4	Negligible	22.0	22.1	0.0	0.1	Negligible
SJ5	19.3	19.7	19.6	-0.1	-0.2	Negligible	20.1	20.1	0.0	0.1	Negligible
SJ6	18.9	19.3	19.3	0.0	0.1	Negligible	20.4	20.4	0.0	0.0	Negligible
SJ7	19.4	19.7	19.7	0.0	0.0	Negligible	21.0	21.0	0.0	0.0	Negligible
SJ8	18.9	19.3	19.4	0.1	0.2	Negligible	20.5	20.5	0.0	-0.1	Negligible
SJ9	20.3	20.5	20.5	0.0	0.0	Negligible	21.9	21.9	0.0	0.1	Negligible
SJ10	19.7	20.0	20.1	0.0	0.1	Negligible	21.3	21.3	0.0	0.0	Negligible
SJ11	17.1	17.5	17.4	0.0	-0.1	Negligible	17.9	17.9	0.0	0.0	Negligible
SJ12	18.7	19.2	19.1	-0.1	-0.3	Negligible	18.9	19.0	0.0	0.1	Negligible
SJ13	16.7	17.1	17.1	0.0	-0.1	Negligible	17.5	17.4	0.0	-0.1	Negligible
SJ14	17.4	17.8	17.8	-0.1	-0.1	Negligible	18.1	18.1	-0.1	-0.1	Negligible
SJ15	19.4	20.0	20.0	-0.1	-0.2	Negligible	20.3	20.2	-0.1	-0.3	Negligible
SJ16	18.7	19.6	19.5	-0.1	-0.2	Negligible	19.9	19.8	-0.1	-0.3	Negligible

Local Study Area: Roade and West Lodge Cottages

9.5.116 Modelled receptors in the Roade and West Lodge study area are detailed in Appendix 9.2 and displayed on Figure 9.13.

9.5.117 The Proposed Development includes plans for a bypass that will take the A508 out of the centre of Roade, reducing traffic and hence pollution levels in the village. The A508 bypass is not due to be operational until after 2021 and as such, the centre of Roade is expected to see increases in traffic flows in the short-term as the Proposed Development opens.

9.5.118 Also assessed were the impacts at West Lodge Cottages, which lie on the A508 between Roade and the Main Site. These will experience an increase in flows as they are north of the proposed bypass.

9.5.119 Tables 9.25 and 9.26, below, show the impact of the Proposed Development on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.120 The data in Tables 9.25 and 9.26 show that the long term concentrations of NO_2 and PM_{10}, at identified sensitive receptors, are anticipated to be well below the AQS in all future scenarios, and as such the Proposed Development is not anticipated to lead to the exceedance of the long term AQSs for NO_2 and $PM_{10.}$

9.5.121 The highest annual mean concentration of NO_2 (i.e. 32.5µg.m^{-3}) was recorded at RO6, in 2018. This is below 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met in all scenarios.

9.5.122 The data in Table 9.26 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 17.9µg.m^{-3}. Based on the formula in 9.3.57, this would lead to 1.34 exceedance days, which is 96% below the 35-day limit.

9.5.123 The data in Table 9.25 and Table 9.26 show that, in 2021, due to the early operation of the Proposed Development, all changes in annual mean concentrations of NO_2 and PM_{10} are predicted to be *Negligible Adverse*, with reference to the EPUK & IAQM Impact Descriptors.

9.5.124 A maximum 1.1 µg.m^{-3} increase in annual mean NO_2 is anticipated at receptor RO5; this is a 2.8% increase relative to the AQS. Although this increase in annual mean NO_2 is relatively large, concentrations of NO_2 remain well below the AQS and such, it is considered *Negligible*.

9.5.125 However, by 2031 and after the implementation of the Roade bypass, changes in annual mean NO_2 and PM_{10} are predicted to be beneficial at most receptors in the Roade and WLC study area.

9.5.126 One *Slight Beneficial* impact on annual mean PM_{10} is predicted at RO6 in 2031. At RO6, the annual mean concentration of PM_{10} is predicted to change by -2.3µg.m^{-3} (-5.8% with reference to the AQS). This is the largest predicted change in annual mean PM_{10}, at any receptor within any study area, due to the operation of the Proposed Development; however, as baseline concentrations of PM_{10} are 'well below' the AQS this is only considered a *Slight Beneficial* impact.

9.5.127 Three *Moderate Beneficial* and three *Slight Beneficial* impacts on annual mean NO_2 are predicted in Roade, in 2031, due to the implementation of the by-pass.

9.5.128 Of the receptors where significant beneficial impacts are expected (RO2, RO5, RO6, RO7, RO10 and RO11) in 2031, all were located on the A508 London road and A508 Stratford road. The A508 (Stratford road and London road) is currently the main road through Roade; however, upon implementation of the bypass most of the Roade through-traffic is predicted to use the A508 bypass instead.

9.5.129 Impacts at the West Lodge Cottages are considered to be *Negligible*, in all scenarios.

9.5.130 Considering the above, the overall impact of the Proposed Development in Roade, in the absence of mitigation, is considered to be ***Negligible*** *Adverse* in 2021 and ***Slight Beneficial*** in 2031.

Roade Bypass 2023 (Interim period)

9.5.131 The A508 Roade bypass will be built within two years of the first occupation of the Main Site. The above assessment has predicted the impacts of the bypass eight years after its implementation. In the interim period, it is predicted that the vehicle fleet will gradually be replaced by more technologically advanced and cleaner powered vehicles. As such, the same reduction in AADT traffic flows in 2031 will have a smaller impact on pollution than the same reduction in 2023. The overall *Slight Beneficial* impact predicted in 2031 is, therefore, likely worst-case for Roade in the interim period.

9.5.132 In 2023, it is predicted that the impact in Roade would be considered *Moderate Beneficial*; however, the receptors which are not expected to benefit from the bypass (i.e. WLC1, WLC2 and RO9) would likely see *Slight Adverse* impacts. As such, the overall significance of the Proposed Development in the interim period should remain ***Slight Beneficial.***

Table 9.25 Predicted concentration (μg.m^{-3}) of NO_2 in the Roade and West Lodge Cottages Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
RO1	23.9	15.0	15.5	0.5	1.2	Negligible	9.4	7.4	-2.0	-5.0	Negligible
RO2	27.6	16.3	16.9	0.6	1.4	Negligible	10.1	7.5	-2.5	-6.4	Slight
RO3	16.0	12.2	12.5	0.3	0.9	Negligible	8.2	7.2	-1.0	-2.4	Negligible
RO4	13.4	12.3	12.7	0.4	1.0	Negligible	8.5	7.6	-0.9	-2.3	Negligible
RO5	26.3	19.8	20.9	1.1	2.8	Negligible	11.8	8.1	-3.7	-9.2	Slight
RO6	32.5	24.1	25.1	1.1	2.7	Negligible	13.9	8.2	-5.7	-14.2	Moderate
RO7	27.6	20.5	21.2	0.7	1.8	Negligible	12.1	7.5	-4.6	-11.6	Moderate
RO8	11.7	9.8	9.9	0.1	0.2	Negligible	7.1	6.9	-0.2	-0.5	Negligible
RO9	9.3	8.1	8.1	0.0	0.0	Negligible	6.1	7.3	1.2	3.0	Negligible
RO10	25.0	18.7	19.3	0.6	1.5	Negligible	11.2	7.2	-4.0	-10.0	Moderate
RO11	18.5	14.2	14.6	0.4	0.9	Negligible	9.0	6.8	-2.2	-5.5	Slight
WLC1	24.1	16.2	17.1	0.9	2.2	Negligible	9.8	11.4	1.5	3.9	Negligible
WLC2	28.1	16.3	17.2	0.9	2.3	Negligible	9.9	11.5	1.6	4.0	Negligible

Table 9.26 Predicted concentration (µg.m^{-3}) of PM_{10} in the Roade and West Lodge Cottages Study Area

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
RO1	16.0	15.5	15.6	0.1	0.3	Negligible	15.3	14.4	-1.0	-2.4	Negligible
RO2	16.4	15.8	15.9	0.1	0.4	Negligible	15.7	14.4	-1.2	-3.1	Negligible
RO3	15.0	14.8	14.9	0.1	0.2	Negligible	14.6	14.2	-0.4	-1.1	Negligible
RO4	14.9	14.8	14.9	0.1	0.2	Negligible	14.7	14.3	-0.4	-0.9	Negligible
RO5	16.2	15.7	15.9	0.1	0.3	Negligible	15.6	14.4	-1.2	-3.1	Negligible
RO6	17.4	16.9	17.0	0.2	0.4	Negligible	16.8	14.5	-2.3	-5.8	Slight
RO7	16.8	16.3	16.4	0.1	0.3	Negligible	16.2	14.2	-2.0	-4.9	Negligible
RO8	14.5	14.3	14.3	0.0	0.0	Negligible	14.1	14.0	0.0	0.1	Negligible
RO9	14.1	13.9	13.9	0.0	0.0	Negligible	13.7	14.3	0.6	1.6	Negligible
RO10	16.4	16.0	16.1	0.1	0.3	Negligible	15.8	14.1	-1.7	-4.3	Negligible
RO11	15.4	15.1	15.2	0.1	0.2	Negligible	14.9	14.0	-0.9	-2.3	Negligible
WLC1	17.1	15.8	16.1	0.3	0.7	Negligible	15.6	16.7	1.1	2.9	Negligible
WLC2	17.9	15.8	16.1	0.3	0.7	Negligible	15.6	16.8	1.2	2.9	Negligible

Local Study Area: Blisworth and Milton Malsor

9.5.133 Modelled receptors in the Blisworth and Milton Malsor study area are detailed in Appendix 9.2, and displayed on Figure 9.14.

9.5.134 Tables 9.27 and 9.28, below, show the impact of the Proposed Development, in Blisworth and Milton Malsor, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.135 The data in Tables 9.27 and 9.28 show that annual mean concentrations of NO_2 and PM_{10} are predicted to be below the 40µg.m^{-3} AQS in all scenarios.

9.5.136 The highest annual mean concentration of NO_2 (i.e. 23.2µg.m^{-3}) in Table 9.27 was recorded at BL6, in the baseline year. This is 'well below' 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met.

9.5.137 The data in Table 9.28 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 16.8µg.m^{-3}. Based on the formula in 9.3.57, this would lead to 0.64 exceedance days, which is 98% below the 35-day limit.

9.5.138 The data in Tables 9.27 and 9.28 show that all changes in annual mean NO_2 and PM_{10} concentrations are predicted to be Negligible, with reference to the EPUK & IAQM Impact Descriptors.

9.5.139 The Proposed Development is anticipated to have some beneficial impacts on annual mean PM_{10} in both 2021 and 2031. Whilst impacts on annual mean NO_2 are largely beneficial in 2031 and more mixed due to the early operation of the Proposed Development in 2021.

9.5.140 In terms of the magnitude of change, Blisworth and Milton Malsor, are predicted to experience some comparatively large changes in pollution concentrations, especially in 2031, where comparatively large benefits are predicted. However, due to good baseline ambient air quality, these changes are not considered significant according to IAQM guidance.

9.5.141 Considering the above, the overall impact of the Proposed Development in Blisworth and Milton Malsor is predicted to be ***Beneficial*** in 2021, 2031 and the interim period.

Table 9.27 Predicted concentration (μg.m^{-3}) of NO_2 in the Blisworth and Milton Malsor Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
BL1	9.7	8.7	8.7	0.1	0.1	Negligible	7.2	6.7	-0.4	-1.1	Negligible
BL2	11.5	10.0	9.8	-0.1	-0.3	Negligible	7.2	7.0	-0.2	-0.4	Negligible
BL3	20.6	16.3	15.6	-0.7	-1.7	Negligible	10.6	10.6	0.0	0.1	Negligible
BL4	13.0	10.0	10.4	0.4	1.0	Negligible	6.9	6.3	-0.6	-1.5	Negligible
BL5	14.1	10.5	11.2	0.7	1.8	Negligible	7.1	6.4	-0.7	-1.8	Negligible
MM1	11.4	10.0	10.0	0.0	0.0	Negligible	7.2	7.3	0.1	0.3	Negligible
MM2	19.4	16.4	15.8	-0.6	-1.5	Negligible	10.9	11.3	0.3	0.9	Negligible
MM3	10.4	9.2	9.1	-0.1	-0.2	Negligible	6.7	6.6	-0.1	-0.1	Negligible
MM4	12.0	11.1	11.1	-0.1	-0.2	Negligible	7.7	7.5	-0.2	-0.5	Negligible
MM5	10.3	9.8	10.0	0.2	0.4	Negligible	6.8	6.8	0.0	0.0	Negligible
BL6	23.2	18.6	18.7	0.1	0.3	Negligible	11.0	11.1	0.1	0.3	Negligible

Table 9.28 Predicted concentration (μg.m^{-3}) of PM_{10} in the Blisworth and Milton Malsor Study Area

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
BL1	14.5	14.2	14.3	0.0	0.0	Negligible	14.3	14.2	-0.2	-0.4	Negligible
BL2	14.8	14.5	14.5	0.0	-0.1	Negligible	14.4	14.3	0.0	-0.1	Negligible
BL3	15.7	15.4	15.3	-0.1	-0.1	Negligible	15.2	15.2	0.0	-0.1	Negligible
BL4	15.0	14.5	14.6	0.1	0.3	Negligible	14.2	13.9	-0.3	-0.6	Negligible
BL5	15.2	14.7	14.8	0.2	0.5	Negligible	14.3	14.1	-0.3	-0.7	Negligible
MM1	14.8	14.5	14.5	0.0	0.0	Negligible	14.3	14.4	0.1	0.1	Negligible
MM2	16.1	15.7	15.6	-0.1	-0.2	Negligible	15.8	16.0	0.2	0.4	Negligible
MM3	14.7	14.4	14.4	0.0	0.0	Negligible	14.2	14.1	0.0	0.0	Negligible
MM4	14.9	14.8	14.8	0.0	0.0	Negligible	14.7	14.6	-0.1	-0.2	Negligible
MM5	14.6	14.5	14.6	0.0	0.1	Negligible	14.2	14.2	0.0	0.0	Negligible
BL6	16.8	16.4	16.5	0.0	0.1	Negligible	16.1	16.3	0.2	0.5	Negligible

Local Study Area: Towcester

9.5.142 Modelled receptors in Towcester study area are detailed in Appendix 9.2, and displayed on Figure 9.15.

9.5.143 Tables 9.29 and 9.30, below, show the impact of the Proposed Development, in Towcester, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.144 The data in Tables 9.29 and 9.30 show that the long term concentrations of NO_2 and PM_{10}, at identified sensitive receptors, are anticipated to be well below the AQS in all future scenarios and as such, the Proposed Development is not anticipated to lead to the exceedance of the long term AQSs for NO_2 and PM_{10}.

9.5.145 The highest annual mean concentration of NO_2 with the Proposed Development (i.e. 33.9µg.m^{-3}) was recorded at TW1, in both 2021 scenarios. This is 'well below' 60µg.m^{-3} which indicates that the hourly AQS for NO_2 should be met.

9.5.146 The data in Table 9.30 show that the highest annual mean PM_{10} concentration, in any scenario, was 22.9µg.m^{-3}. Based on the formula in 9.5.57 this would lead to 7.9 exceedance days, which is 77% below the 35-day limit.

9.5.147 Impacts on air quality in Towcester are predicted to be beneficial in 2031 and imperceptible in 2021.

9.5.148 The data in Tables 9.29 and 9.30 shows that all changes in annual mean NO_2 and PM_{10} concentrations are predicted to be Negligible, with reference to the EPUK & IAQM Impact Descriptors.

9.5.149 Considering the above, the Proposed Development is expected to have a ***Negligible*** impact on local air quality in Towcester, in 2021, 2031 and in the interim period.

Table 9.29 Predicted concentration (μg.m^{-3}) of NO_2 in the Towcester Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E- D	As a % of AQS	
TW1	56.3	33.9	33.9	0.0	0.0	Negligible	17.9	17.7	-0.2	-0.4	Negligible
TW2	31.1	19.2	19.2	0.0	0.0	Negligible	11.0	10.9	-0.1	-0.2	Negligible
TW3	44.1	26.6	26.6	0.0	0.0	Negligible	14.4	14.2	-0.1	-0.3	Negligible

Table 9.30 Predicted concentration (μg.m^{-3}) of PM_{10} in the Towcester Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
TW1	22.9	19.9	19.9	0.0	0.0	Negligible	19.1	19.0	-0.1	-0.1	Negligible
TW2	18.3	16.9	16.9	0.0	0.0	Negligible	16.3	16.3	0.0	-0.1	Negligible
TW3	20.5	18.3	18.3	0.0	0.0	Negligible	17.7	17.6	0.0	-0.1	Negligible

Local Study Area: Hartwell

9.5.150 Modelled receptors in the Hartwell study area are detailed in Appendix 9.2, and displayed on Figure 9.16.

9.5.151 Tables 9.31 and 9.32, below, show the impact of the Proposed Development, in Hartwell, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.152 The data in Table 9.31 and Table 9.32 show that the long term concentrations of NO_2 and PM_{10}, at identified sensitive receptors, are anticipated to be well below the AQS in all future scenarios and as such, the Proposed Development is not anticipated to lead to the exceedance of the long term AQSs for NO_2 and $PM_{10.}$

9.5.153 The data in Table 9.31 shows that all modelled NO_2 annual mean concentrations are predicted to be below 60µg.m^{-3} and, therefore, the hourly AQS should be met.

9.5.154 The data in Table 9.32 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 16.1µg.m^{-3}. Based on the formula in 9.5.57 this would lead to 0.35 exceedance days, which is 99% below the 35-day limit.

9.5.155 The data in Tables 9.31 and 9.32 shows that all changes in annual mean NO_2 and PM_{10} concentrations are predicted to be Negligible, with reference to the EPUK & IAQM Impact Descriptors.

9.5.156 Considering the above, the Proposed Development is expected to have a ***Negligible*** impact on local air quality in Hartwell, in 2021, 2031 and in the interim period.

Table 9.31 Predicted concentration (μg.m^{-3}) of NO_2 in the Hartwell Study Area

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E- D	As a % of AQS	
H1	19.4	14.1	14.2	0.0	0.0	Negligible	9.1	9.1	0.0	0.0	Negligible
H2	20.7	15.3	15.3	0.0	0.1	Negligible	9.7	9.7	0.0	0.0	Negligible
H3	23.4	17.5	17.6	0.1	0.2	Negligible	10.8	10.8	0.0	0.1	Negligible
H4	21.3	15.7	15.7	0.0	0.1	Negligible	9.9	9.9	0.0	0.1	Negligible

Table 9.32 Predicted concentration (μg.m^{-3}) of PM_{10} in the Hartwell Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
H1	15.6	15.0	15.0	0.0	0.0	Negligible	15.0	15.0	0.0	0.0	Negligible
H2	15.8	15.2	15.2	0.0	0.1	Negligible	15.2	15.2	0.0	0.1	Negligible
H3	16.1	15.5	15.6	0.0	0.1	Negligible	15.5	15.6	0.0	0.1	Negligible
H4	15.8	15.2	15.3	0.0	0.1	Negligible	15.2	15.3	0.0	0.1	Negligible

Local Study Area: Grafton Regis and Potterspury

9.5.157 Modelled receptors in the Grafton Regis and Potterspury study area are detailed in Appendix 9.2, and displayed on Figure 9.17.

9.5.158 Tables 9.33 and 9.34, below, show the impact of the Proposed Development, in Grafton Regis and Potterspury, on annual mean NO_2 and PM_{10} concentrations, respectively.

9.5.159 The data in Tables 9.33 and 9.34 show that the long term concentrations of NO_2 and PM_{10}, at identified sensitive receptors, are anticipated to be well below the AQS in all future scenarios and as such, the Proposed Development is not anticipated to lead to the exceedance of the long term AQSs for NO_2 and $PM_{10.}$

9.5.160 The data in Table 9.33 shows that all modelled NO_2 annual mean concentrations are predicted to be below 60µg.m^{-3} and, therefore, the hourly AQS should be met.

9.5.161 The data in Table 9.34 show that the highest annual mean PM_{10} concentration predicted, in any scenario, was 17.8.µg.m^{-3}. Based on the formula in 9.3.57 this would lead to 1.25 exceedance days, which is 96% below the 35-day limit.

9.5.162 The data in Table 9.33 and Table 9.34 show that all changes in annual mean NO_2 and PM_{10} concentrations, in Grafton Regis are predicted to be Negligible, in both 2021 and 2031, with reference to the EPUK & IAQM Impact Descriptors.

9.5.163 Considering the above, the Proposed Development is expected to have a ***Negligible*** impact on Grafton Regis and Potterspury, in 2021, 2031 and in the interim period.

Table 9.33 Predicted concentration (µg.m^{-3}) of NO_2 in the Grafton Regis and Potterspury Study Area.

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
GF1	-	8.2	8.2	0.0	0.1	Negligible	6.9	7.6	0.7	1.8	Negligible
GF2	-	8.0	8.0	0.0	0.1	Negligible	6.8	7.4	0.6	1.6	Negligible
P1	-	8.0	8.0	0.0	0.0	Negligible	7.0	6.9	-0.1	-0.1	Negligible
P2	-	8.1	8.1	0.0	0.0	Negligible	7.1	7.0	-0.1	-0.1	Negligible

Table 9.34 Predicted concentration (µg.m^{-3}) of PM_{10} in the Grafton Regis and Potterspury Study Area

Receptor	2018 Baseline	2021 Without	2021 With	Change due to Development		IAQM Impact Descriptor	2031 Without	2031 With	Change due to Development		IAQM Impact Descriptor
	A	B	C	C-B	As a % of AQS		D	E	E-D	As a % of AQS	
GF1	-	16.8	16.9	0.1	0.2	Negligible	16.4	17.8	1.4	3.4	Negligible
GF2	-	16.5	16.6	0.1	0.2	Negligible	16.1	17.4	1.2	3.1	Negligible
P1	-	16.6	16.6	0.0	0.0	Negligible	16.4	16.3	-0.1	-0.3	Negligible
P2	-	16.8	16.8	0.0	0.0	Negligible	16.6	16.5	-0.1	-0.3	Negligible

Overall Impact in Local Study Areas – Summary

9.5.164 Table 9.35 summarises the overall impact of the Proposed Development on annual mean NO_2 and PM_{10} concentrations in each study area.

Table 9.35: Overall impact of Proposed Development in each study area

Study area	Overall significance of impact (NO_2)			Overall significance of impact (PM_{10})		
	2021	**Interim**	**2031**	**2021**	**Interim**	**2031**
AQMA 1	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
AQMA 5	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
AQMA 4	**Slight Adverse**	**Slight Adverse**	Negligible	Negligible	Negligible	Negligible
AQMA 2	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
AQMA 6	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
AQMA 8	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
AQMA 3	**Slight Beneficial**	Negligible	Negligible	Negligible	Negligible	Negligible
Roade & WLC	Negligible	**Slight Beneficial**	**Slight Beneficial**	Negligible	Negligible	Negligible
Blisworth & Milton Malsor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Towcester	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Hartwell	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Grafton Regis and Potterspury	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

9.5.165 The Proposed Development is anticipated to have a ***Slight Adverse*** impact on annual mean NO_2 concentrations in AQMA No.4 and a ***Slight Beneficial*** impact on annual mean NO_2 in AQMA No.3, in 2021.

9.5.166 By 2031, the impact of the Proposed Development on annual mean PM_{10} and NO_2 is considered ***Negligible*** in all study areas, except within the Roade and WLC study area, where an overall ***Slight Beneficial*** impact on annual mean NO_2 is expected due to the implementation of the bypass. The overall impact on annual mean PM_{10}, in Roade, is overall ***Negligible*** in 2031, even when considering that a *Slight Beneficial* impact is predicted at one receptor.

9.5.167 In the interim period between 2021 and 2031, improvements to the vehicle fleet will lessen the impact of changes to traffic flows. As such, it is considered unlikely that overall impacts will become more significant, e.g. changes from *Slight Beneficial* to *Moderate* Beneficial or from *Slight Adverse* to *Moderate Adverse* in this period.

9.5.168 The ***Slight Adverse*** impact on annual mean NO_2 predicted in AQMA No.4 is considered likely to remain significant for much of the interim period; however, the impact in AQMA No.4 is predicted to become overall ***Negligible*** in the interim due to further re-distribution of traffic flows.

9.5.169 It is anticipated that upon construction of the A508 bypass at Roade, Roade itself will see a *Moderate Beneficial* Impact, yet the West Lodge Cottages and properties in proximity to the bypass are likely to see *Slight Adverse* impacts and as such, the overall significance for that study area is considered to be overall ***Slight Beneficial*** in the interim.

National Scale Impacts

9.5.170 Based on an assessment of the changes to national HGV routes which could result from introduction of the Northampton Gateway SRFI it is anticipated that the Proposed Development could lead to a reduction of 969 HGV loads per day on UK roads, which equates to over 92 million HGV miles per year. Details of this example are included in the Transport Chapter (Chapter 12).

9.5.171 Splitting the reduction in HGV flows between the ports of Felixstowe, London and Southampton, on a pro-rata basis based on current tonnage into and out of each port, and between Glasgow, Leeds and Cardiff based on anticipated train movements, results in an anticipated reduction in HGV flows of over 100 annual average daily total (AADT) movements in or adjacent to at least 57 AQMAs (listed in Appendix 9.10).

9.5.172 The Proposed Development will, therefore, contribute to improving air quality at all of those identified AQMA locations. Using the significance criteria for local study areas, the impact on each AQMA would likely be *Negligible*, as the reductions in AADT flows only form a very small fraction of total AADT flows on these roads.

9.5.173 Table 9.36, below, summarises the estimated reduction in NO_2 and PM_{10} emissions and its corresponding 'value' to society, based on the damage cost approach, between 2021 and 2035. Further details of the damage cost approach, including inputs and assumptions, are presented in Appendix 9.6.

Table 9.36 Reduction in Pollutant Emissions between 2021 and 2035 and estimated value of this reduction

Year (s)	Reduction in emissions (tonne)		Value (£)		
	NO_x	PM_{10}			
			Lower estimate	Central estimate	Upper estimate
2021	22.2	3.0	£321,786	£639,600	£943,500
2022	23.6	3.8	£370,739	£716,198	£1,043,885
2023	24.5	4.6	£415,530	£782,689	£1,128,244
2024	25.2	5.4	£459,065	£846,094	£1,207,690
2025	26.1	6.2	£503,599	£911,882	£1,290,895
2026	27.4	7.1	£552,461	£988,156	£1,390,713
2027	29.1	7.9	£603,901	£1,070,618	£1,500,310
2028	31.0	8.7	£658,060	£1,159,539	£1,620,075
2029	33.1	9.6	£713,833	£1,252,374	£1,746,045
2030	35.4	10.4	£771,546	£1,349,946	£1,879,537
2031-2035	191.4	56.2	£4,170,518	£7,297,003	£10,159,659
Sum (2021-2035)	**469.1**	**122.9**	£9,541,038	£17,014,100	£23,910,553

9.5.174 Between 2021 and 2035, the Proposed Development is predicted to result in a reduction in NO_x emissions of 469.1 tonnes and a reduction in PM_{10} emissions of 122.9 tonnes.

9.5.175 This reduction in emissions will be spread over a wide area, including within AQMAs on the strategic road network.

9.5.176 Using an adapted Defra damage cost approach this reduction in emissions could result in a benefit to society of a value ranging between £9.5 million and £24.0 million, with a central estimate of £17.0 million, between 2021 and 2035.

Compliance with UK National Plan and EU limit Values.

9.5.177 The SL-PCM model has been used to assess whether the Proposed Development is going to delay compliance of the East Midlands zone with the UK National Plan and EU LVs.

9.5.178 The A45 was identified in the UK National Plan to be the road link at most risk of non-compliance in 2021, in the East Midlands zone, in a scenario in which CAZ measures have been implemented.

9.5.179 The maximum NO_2 concentration results using the SL-PCM model are presented in Table 9.37 for the following traffic scenario:

- SL-PCM (DfT) baseline (with CAZ measures) + NSTM2 development contribution

Table 9.37: Annual Mean NO_2 Concentration on A45 (UK Plan assessed road)

Traffic scenario	Baseline 2021 ($\mu g.m^{-3}$)	With Development 2021 ($\mu g.m^{-3}$)	Change ($\mu g.m^{-3}$)
SL-PCM (DfT) baseline(with CAZ measures) + NSTM2 development contribution	36.0	36.8	0.8

9.5.180 The results show that the Proposed Development is predicted to increase annual mean NO_2 concentrations by $0.8\mu g.m^{-3}$ at the A45 location. The total concentration 'With Development', in 2021, is predicted to be $36.8\mu g.m^{-3}$, which is below the EU LV of $40\mu g.m^{-3}$.

9.5.181 The location and zone will, therefore, continue to be in compliance with both the UK National Plan and EU objectives.

9.6 MITIGATION

Construction

9.6.1 The Greater London Authority guidance, which is used as a benchmark across the UK, suggests a number of best practice measures that should be adopted in order to minimise impacts from dusts and fine particles; these include:

- cutting, grinding and sawing must not be conducted on-site and pre-fabricated material and modules must be brought in where possible;
- where such work must take place, water suppression must be used to reduce the amount of dust generated;
- skips, chutes and conveyors must be completely covered and, if necessary enclosed to ensure that dust does not escape;
- no burning of any materials must be permitted on site;
- any excess material must be reused or recycled on-site in accordance with appropriate

legislation;

- developers must produce a waste or recycling plan;
- following earthworks, exposed areas and soil stockpiles must be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
- stockpiles must be stored in enclosed or bunded containers or silos and kept damp where necessary;
- hard surfaces must be used for haul routes where possible;
- haul routes must be swept/washed regularly;
- vehicle wheels must be washed on leaving the site;
- all vehicles carrying dusty materials must be securely covered; and
- delivery areas, stockpiles and particularly dusty items of construction plant must be kept as far away from neighbouring properties as possible.

9.6.2 In addition, the IAQM lists recommended mitigation measures for low, medium and high Dust Impact Risks. The highly recommended measures, based on the Construction Phase dust assessment are included in Appendix 9.8 of this report.

9.6.3 The highest risk activities will be avoided in the areas of the Main Site closest to sensitive receptors. These are shown as a Priority Dust Mitigation Zone on Figures 9.1 and 9.2,. Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures will be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of potentially dust-generating activities.

9.6.4 The measures listed above and in Appendix 9.8 of this report have used to contribute to part of the CEMP which is submitted as part of the application, and which provides a framework for future detailed phase specific CEMPs (see document reference 6.11). After the implementation of the CEMP, the significance of effects from each phase of the construction programme will be reduced.

Operational

Aggregates Terminal

9.6.5 The risk of dust emissions from the operation of the Proposed Development will be mitigated through a range of standard and best practice measures, referred to in Appendix 9.8. Some of these are similar to those outlined in 9.6.1 in the context of the construction effects, with the most relevant practices to be deployed being the water suppression of any stockpiles of material (where needed), wheel washing of vehicles on exit, and the cleaning and dampening of haul routes.

Road Emissions

9.6.6 A Framework Travel Plan and Public Transport Strategy have been produced for the Proposed Development, and include a number of measures to encourage travel by a range of modes other than the private car. These will align with NBC's Low Emissions Strategy and wider sustainability measures related to encouraging and enabling modal shift to low emission transport. These include enabling the adoption of zero emission electric vehicles through charge point provision, providing improved bus services, adding a new dedicated express bus service, designating motorcycle and priority car share bays, as well as other modal shift support initiatives.

9.6.7 An additional important issue in assessing the operational effects of the Proposed Development is the strategic context of the wider air quality benefits delivered by a shift from road to rail. The assessment suggests that the SRFI could remove in excess of 92 million HGV miles from the national road network as a result of potential changes of patterns to existing freight routes, with a shift from road to rail (See Chapter 12). This is predicted to result in a reduction in NO_x and PM_{10} emissions totalling 469.1 tonnes and 122.9 tonnes over a 15-year period.

9.6.8 As described above, these beneficial impacts will be seen across a wide area, including within other AQMAs on the strategic road network and within the East Midlands zone.

9.6.9 As referred to above, overall the Proposed Development is expected to have a largely Negligible impact on both NO_2 and PM_{10} locally. Some significantly adverse local impacts are, however, anticipated in Northampton's AQMA No.4, in 2021 and in the interim period.

9.6.10 The potential to reduce the significance of adverse impacts in AQMA No.4 have been discussed with Northampton Borough Council, and the detail is being explored further. Measures being considered include supporting the introduction of cleaner Euro VI class buses for the dedicated SRFI express bus service. The applicant has also indicated a willingness to make a contribution to enable delivery of new electric vehicle charging points or other low emission initiatives for Northampton in support of the Council's Low Emissions Strategy.

9.6.11 As the SRFI HGV traffic will form only a small fraction of total AADT flows through this AQMA, it is considered that proposed mitigation strategies should focus on non-HGV measures. As such the mitigation strategy focuses on encouraging and enabling modal shift toward adopting vehicles with cleaner engines and providing more frequent bus services to support reduced emissions within the AQMAs.

9.6.12 Roade is predicted to experience a *Negligible Adverse* impact due to the early operation of the Proposed Development. However, the Proposed Development includes a bypass, which will be built within two years of the first occupation of the site; this will result in overall *Slight Beneficial* Impacts in the Roade and West Lodge Cottages Study area.

9.6.13 Notwithstanding the above, it is not considered that there is a need for extensive, off-setting measures associated with total emissions as the Proposed Development is anticipated to be air quality positive, in that total emissions nationwide, as a result of the Proposed Development, will be reduced.

9.6.14 Furthermore, many of the improvements to the local highway network, inherent to the Proposed Development, will likely reduce congestion and have a positive air quality impact beyond that described in this assessment.

9.7 RESIDUAL EFFECTS

Construction

9.7.1 The construction of the Proposed Development could potentially cause emissions of dust that might pose a nuisance to adjacent property. However, by adopting appropriate mitigation measures in the CEMP to reduce any such emissions and their potential effect on the surrounding area, there are expected to be no significant nuisance effects.

Operational

9.7.2 After the implementation of best practice measures, the residual risk of dust soiling due to the operation of the Aggregate Terminal is expected to be *Negligible*.

9.7.3 It is anticipated that the development will have a *Negligible Beneficial* impact on air quality at a regional and national scale, as a result of the transfer of freight from road to rail. This wider, albeit small-scale effect across a large geographic area is one of the objectives of the national policy of encouraging a shift from road to rail. The cumulative effects of increasing modal shift, including that enabled by increasing the network of SRFIs, would clearly become more significant nationally with time.

9.7.4 These strategic impacts are of direct relevance in the context of the NPSNN policy on air quality which considers SRFIs with regard to the contribution they make to aiding efforts to meet the required air quality standards in non-compliant zones.

9.7.5 The Proposed Development will result in changes in traffic flows on the local road network. The Proposed Development is anticipated to have a *Negligible* impact on local air quality in most study areas between 2021 and 2031.

9.7.6 It is, however, considered that an overall Slight Adverse impact may persist in Northampton's AQMA No.4 in 2021 and the interim period. The adverse impacts are isolated to residential dwellings close to junctions and slow moving traffic where air quality is already poor. However, even in the absence of mitigation measures, the impact in 2031 is considered *Negligible*. As such, any significantly adverse impact as a result of the Proposed Development is only temporary.

9.7.7 The mitigation measures suggested above will encourage a modal-shift and help mitigate any temporary impacts of the Proposed Development in AQMA No.4.

9.7.8 By 2031, there are not predicted to be any significantly adverse impacts on annual mean NO_2 or PM_{10} at any location within Northampton or South Northamptonshire.

9.8 CUMULATIVE EFFECTS

Construction Phase

9.8.1 There are proposals for another SRFI terminal (Rail Central) on the land directly west of the main Northampton Gateway development. If both schemes progress it is likely that there would be some overlap in the construction of both developments and as such there would be potential for cumulative effects.

9.8.2 Figure 9.18 shows the 350m buffer lines of the two developments. The two highlighted green areas in Figure 9.18 are sensitive areas that both buffer lines overlap. The area to the north includes residential dwellings in the village of Milton Malsor while the area to the south includes residential dwellings and the Roade Cutting SSSI. However, as shown in Plate 9.1, the predominant wind direction is from the south west and as such, it is unlikely that construction generated dust from the Proposed Development and Rail Central will be blown into these areas. Therefore, the overall cumulative effects from construction are considered to be Negligible.

Operational Phase

9.8.3 As referred to above, the Transport Model used to prepare the data which forms the basis of the air quality assessments takes account of all of the commitments and allocations to deliver the growth planned by the Joint Core Strategy (and beyond). Therefore, in using the projected future traffic levels from the model, this assessment has already considered the cumulative effects of the Proposed Development and committed developments, including the urban extensions at Collingtree, and South of Brackmills.

9.8.4 However, the transport model included another scenario (J3) which separated out the impact of the Rail Central Development. Appendix 9.9 presents the impacts of the Proposed Development in a scenario in which both the Northampton Gateway and Rail Central Schemes are consented and operational. Any current assessment is in the absence of a highway mitigation scheme developed specifically to accommodate both developments. However, assumptions can be made about a possible combined package of highways improvements (as in this assessment using the March 2018 emerging information about the developing Rail Central proposals).

9.8.5 There was no change in significance at any receptor due to the combined operation of the Rail Central and Northampton Gateway schemes; as such, the conclusions reached for the scheme in the absence of Rail Central remain valid and the cumulative impact of both schemes are also considered ***Negligible*** in significance, based on current assumptions.

9.9 CONCLUSIONS

9.9.1 This chapter contains information about the assessment of the potential air quality impacts of the Northampton Gateway project.

9.9.2 The Proposed Development is not within an AQMA, but there are several AQMAs on the road network close to the site. Existing air quality data held by the local authorities has been used to help establish a baseline position, with additional monitoring data also collected to validate and further advance the evidence base regarding local air quality.

9.9.3 The existing air quality in the location of the Proposed Development has been shown to be within the standards and objectives set out in the UKAQS, and in the vast majority of the local area the monitoring data confirms that air quality is good. There are, however, pockets of poor air quality in both South Northamptonshire and Northampton where AQMAs have been declared.

9.9.4 The Main Site consists of the strategic rail freight interchange (SRFI) site and access from the A508. Given the nature of the Proposed Development, as an SRFI, it is expected to have wide reaching effects in traffic movements affecting many parts of the UK as a result of the transfer of freight from road to rail. Overall the development could lead to nationwide HGV reductions of 969 loads per day equivalent to 92 million HGV miles reduced per year based on a worked example of realistic changes to existing distribution patterns.

9.9.5 Standard best practice measures associated with the operation of the proposed Aggregates Terminal will also be deployed to reduce the potential for significant off-site effects from dust.

9.9.6 The construction of the Proposed Development could give rise to emissions of dust. However, by adopting appropriate mitigation measures to reduce any such emissions within the CEMP, there should be no significant effects caused by dust.

9.9.7 The likely impacts on AQMAs and other receptors have been assessed using the Transport modelling data. Future impacts have been assessed assuming that background air quality and emissions fall in line with the predictions made by Defra. However, there has been no consideration of the potential improvements due to the Proposed Development's Travel Plan which in practice will also help reduce reliance on car travel and therefore reduce transport emissions further. This is pertinent to the central Northampton AQMAs as the proposed highways improvements will reduce emissions from private cars and increase the use of cleaner busses, thereby reducing emissions from these transport modes which are the current cause of the most significant air quality impacts in the AQMAs.

9.9.8 The Proposed Development is anticipated to have an overall *Negligible* impact on local annual mean PM_{10} concentrations in all years assessed.

9.9.9 The Proposed Development is anticipated to have a *Negligible* impact on annual mean NO_2 concentrations in all years, in most study areas. However, some locally significant, but temporary, impacts are predicted in 2021 and the interim period ahead of key mitigation measures being in place.

9.9.10 The Proposed Development is predicted to have a *Slight Adverse* impact on annual mean NO_2 concentrations in AQMA No.4, in 2021 and the interim period and a *Slight Beneficial* impact in AQMA No.3 in 2021.

9.9.11 By 2031, impacts on annual mean NO_2 in both of these AQMA are predicted to be *Negligible* in significance, reflecting the temporary nature of these impacts.

9.9.12 However, upon implementation of the proposed bypass in Roade in the interim period, impacts are predicted to be overall *Slight Beneficial.* This beneficial impact is predicted to remain significant in 2031, reflecting a more permanent significant beneficial impact. It is worth noting that the absolute reduction in pollution concentrations in Roade is large, and impacts are only considered of *Slight* benefit as baseline air quality is already good.

9.9.13 In 2031, when considering the cumulative impact of the Proposed Development and Rail Central (based on the available emerging information and in the absence of a highway mitigation scheme developed specifically to accommodate both developments) there was no change in significance at any receptor. As such, the impact of the Proposed Development on the local area is unlikely to change in a scenario where Rail Central is also operational.

9.9.14 The National Plan SL-PCM model was used to determine that the Proposed Development will not result in an exceedance of the EU limit value for annual mean NO_2. As such, the Proposed Development will not result in the non-compliance, or delay the compliance, of the East Midlands zone with regard to the current UK National Plan and EU legislation.

9.9.15 The Proposed Development is predicted to result in a 469.1 tonne reduction in emissions of oxides of nitrogen (NO_x) and a 122.9 tonne reduction in fine particulate matter (PM_{10}) emissions over a 15 year period beginning in 2021. Using the damage cost approach; this could have a benefit to society of up to £24 million.

9.9.16 Local impacts during the operational phase will be minimised through the implementation of a Travel Plan which will encourage a modal shift away from private cars and towards public transport and low emissions vehicles. However, no account has been taken for this in the traffic data used in this air quality assessment. This was in order to ensure a robust assessment. Considering the above, the Proposed Development will meet the requirements of the NPSNN and as such, air quality effects do not represent a barrier to the planning process.

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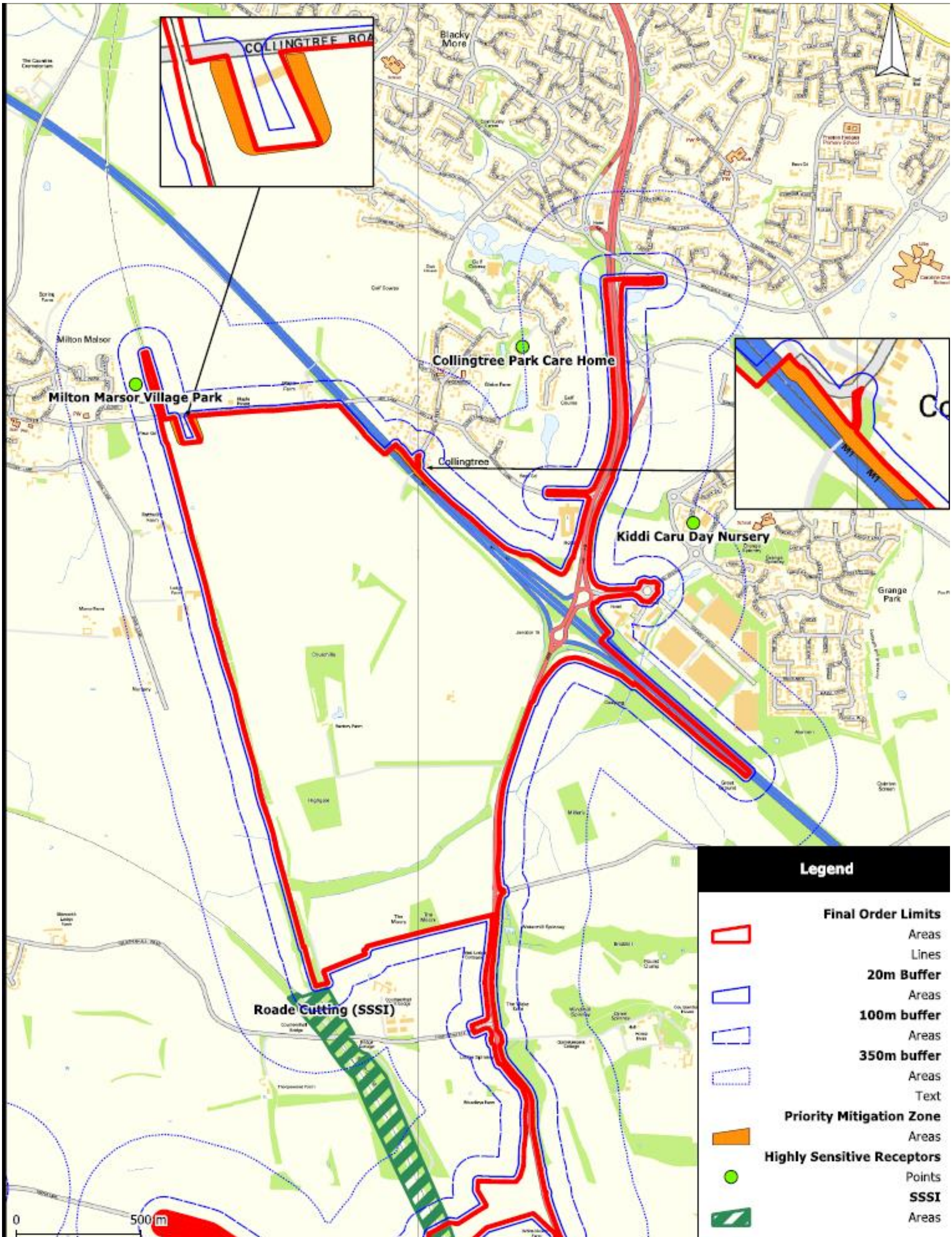

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Figure 9.1: Northampton Gateway Construction Phase Receptors

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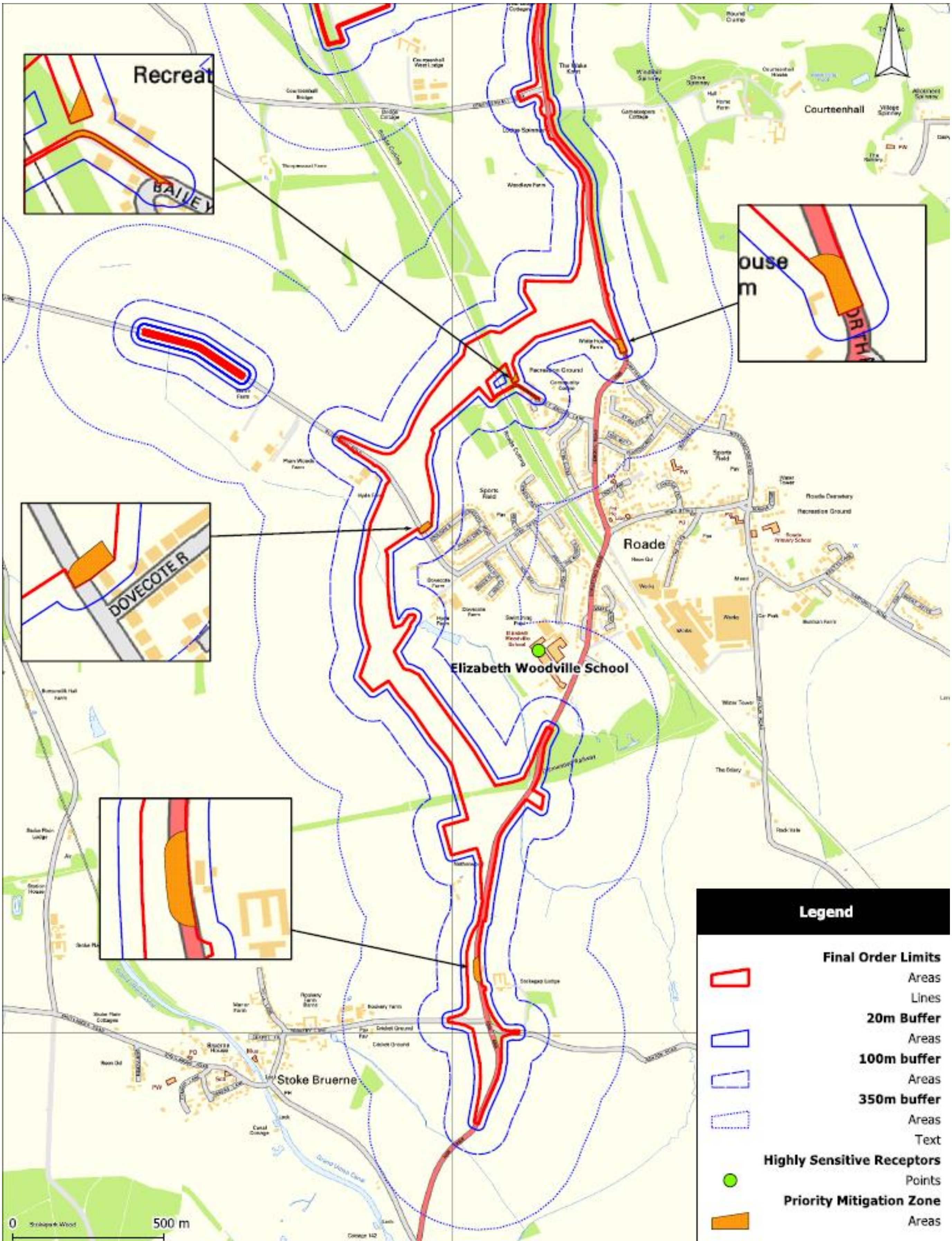

Figure 9.2: Roade Bypass Construction Phase Receptors

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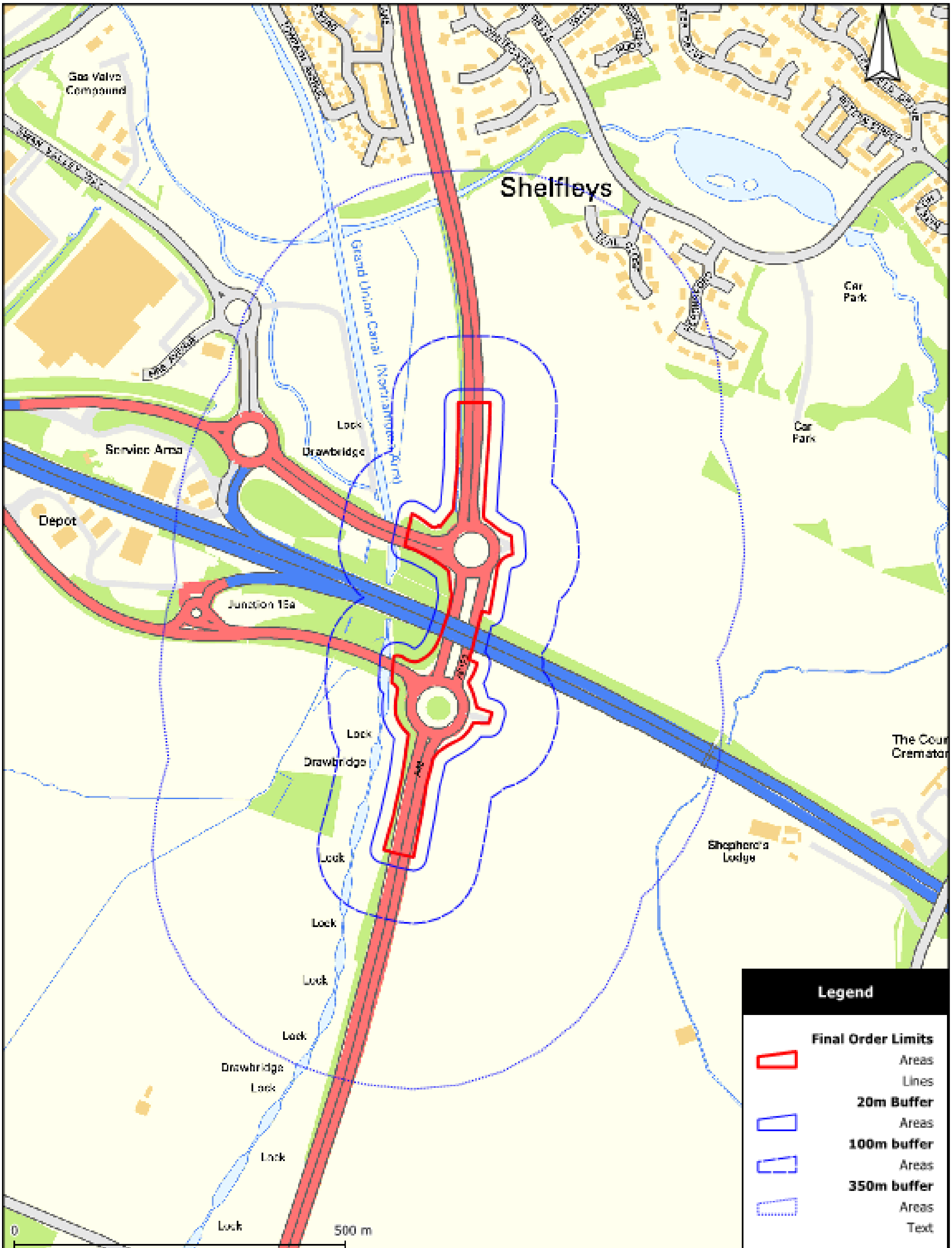

Figure 9.3: J15a Construction Phase Receptors

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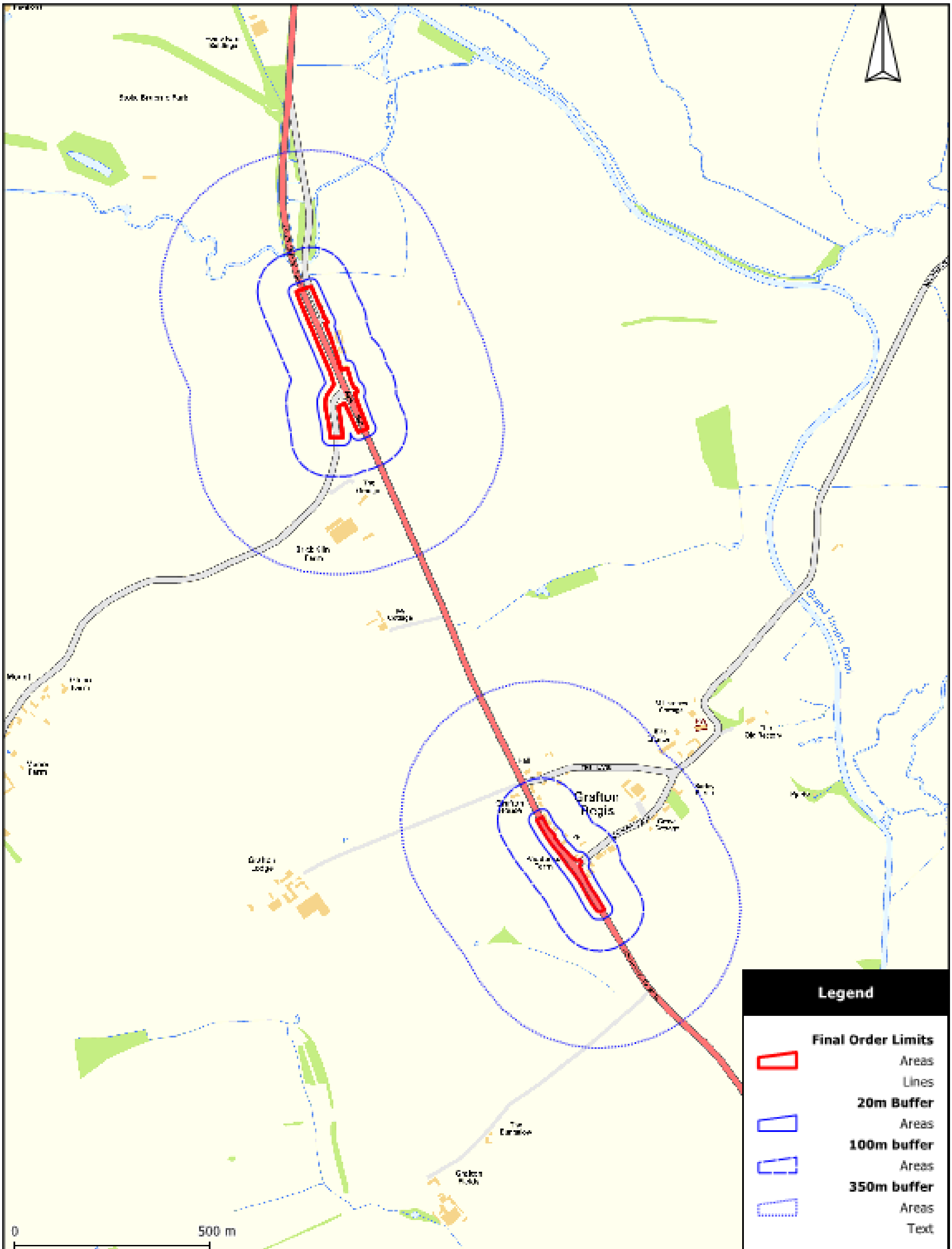

Figure 9.4: A508 Corridor Construction Phase Receptors

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Figure 9.5: Aggregate Terminal Operational Dust Receptors

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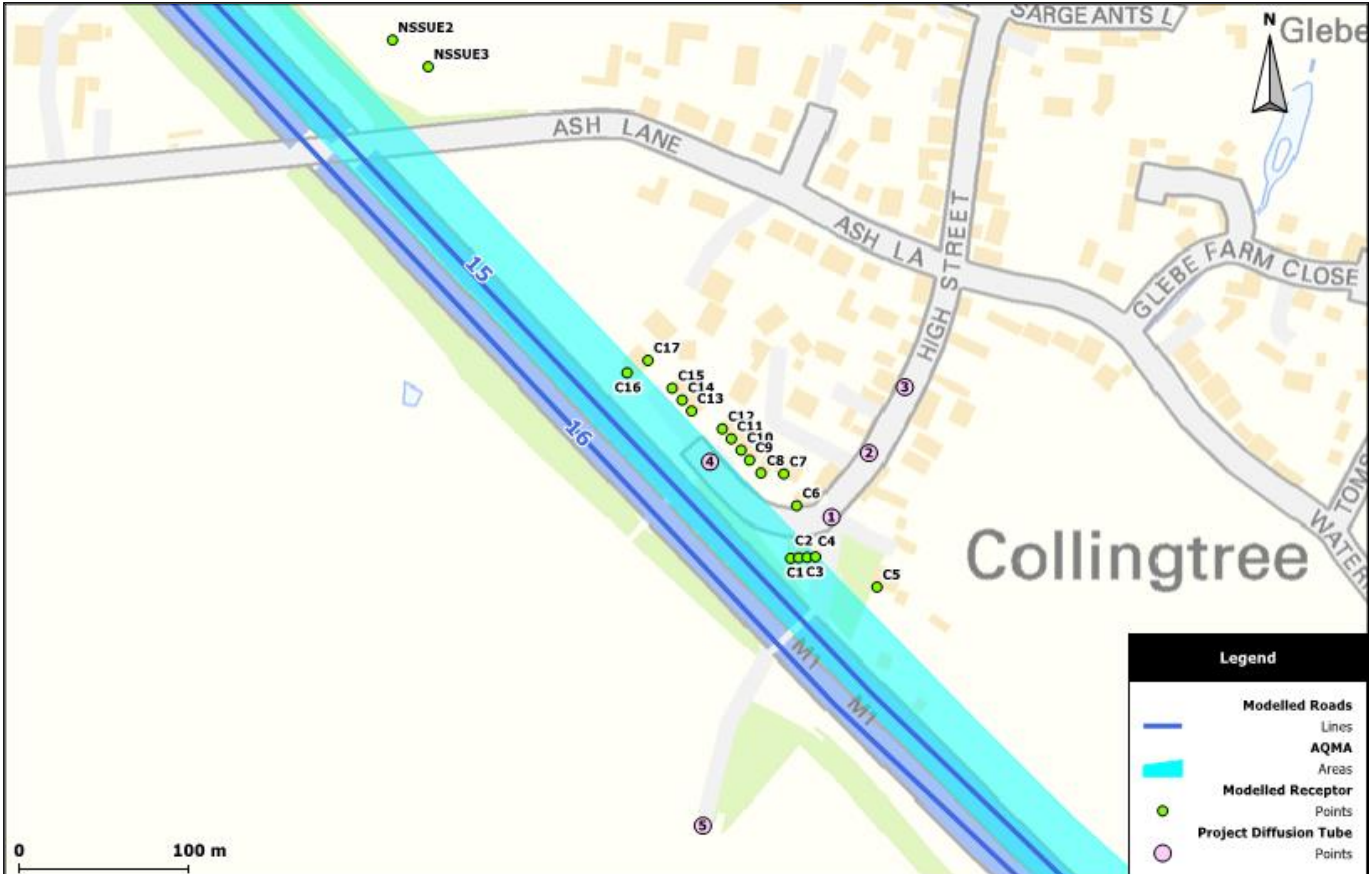

Figure 9.6: Local Operational Impacts - Northampton AQMA No.1 and NSSUE

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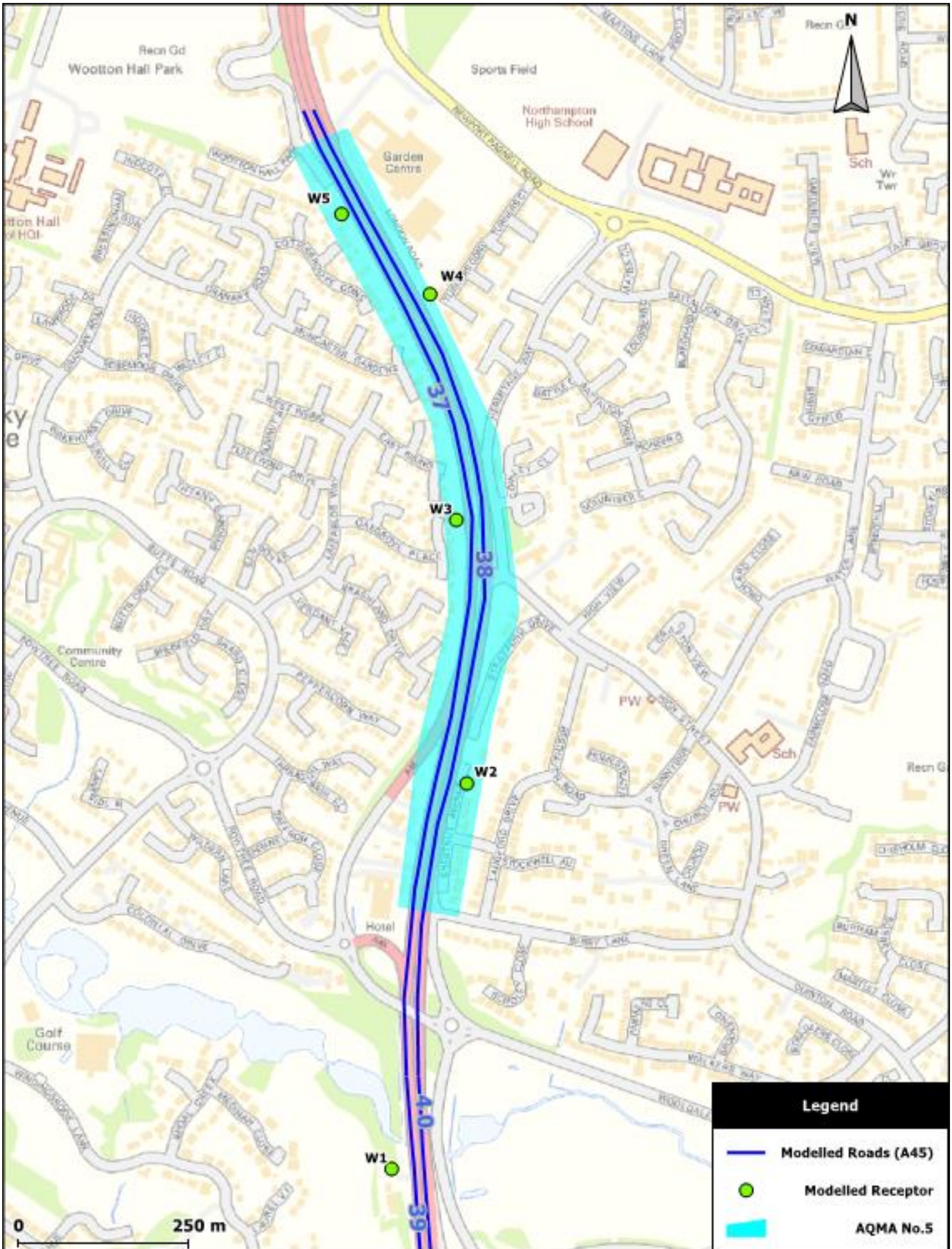

Figure 9.7: Local Operational Impacts - Northampton AQMA No.5, Wootton

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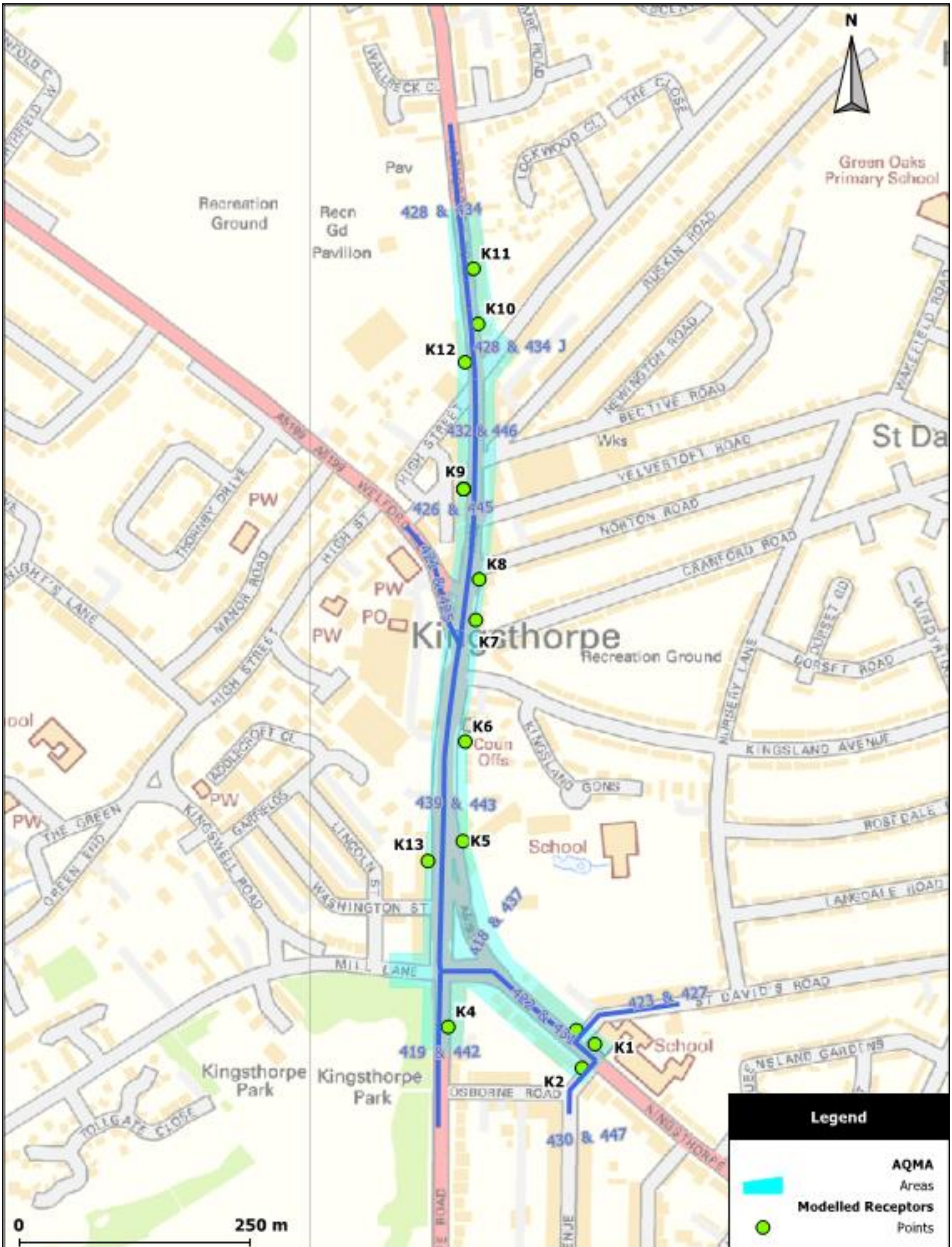

Figure 9.8: Local Operational Impacts - Northampton AQMA No.4, Kingsthorpe

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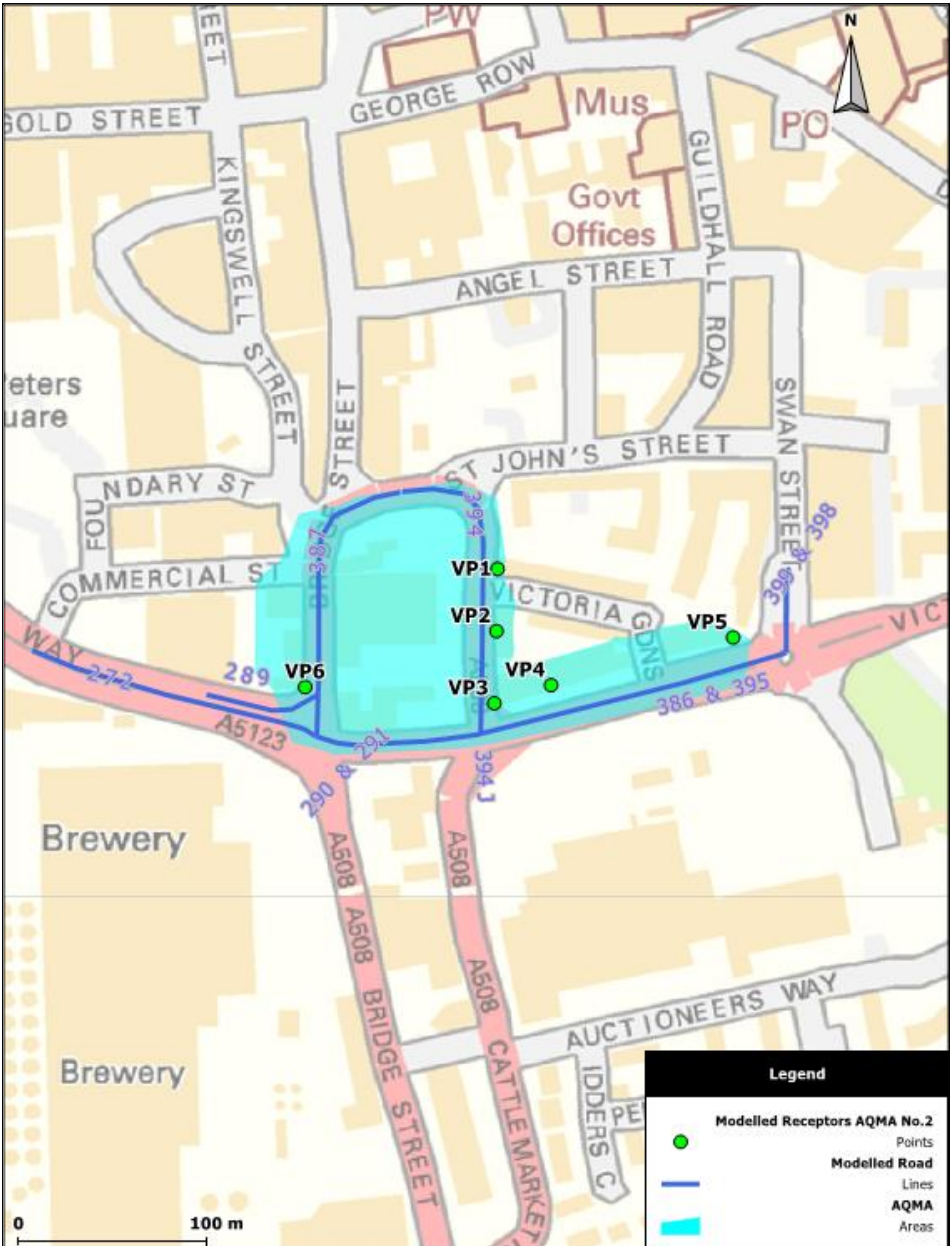

Figure 9.9: Local Operational Impacts - Northampton AQMA No.2, Victoria Promenade

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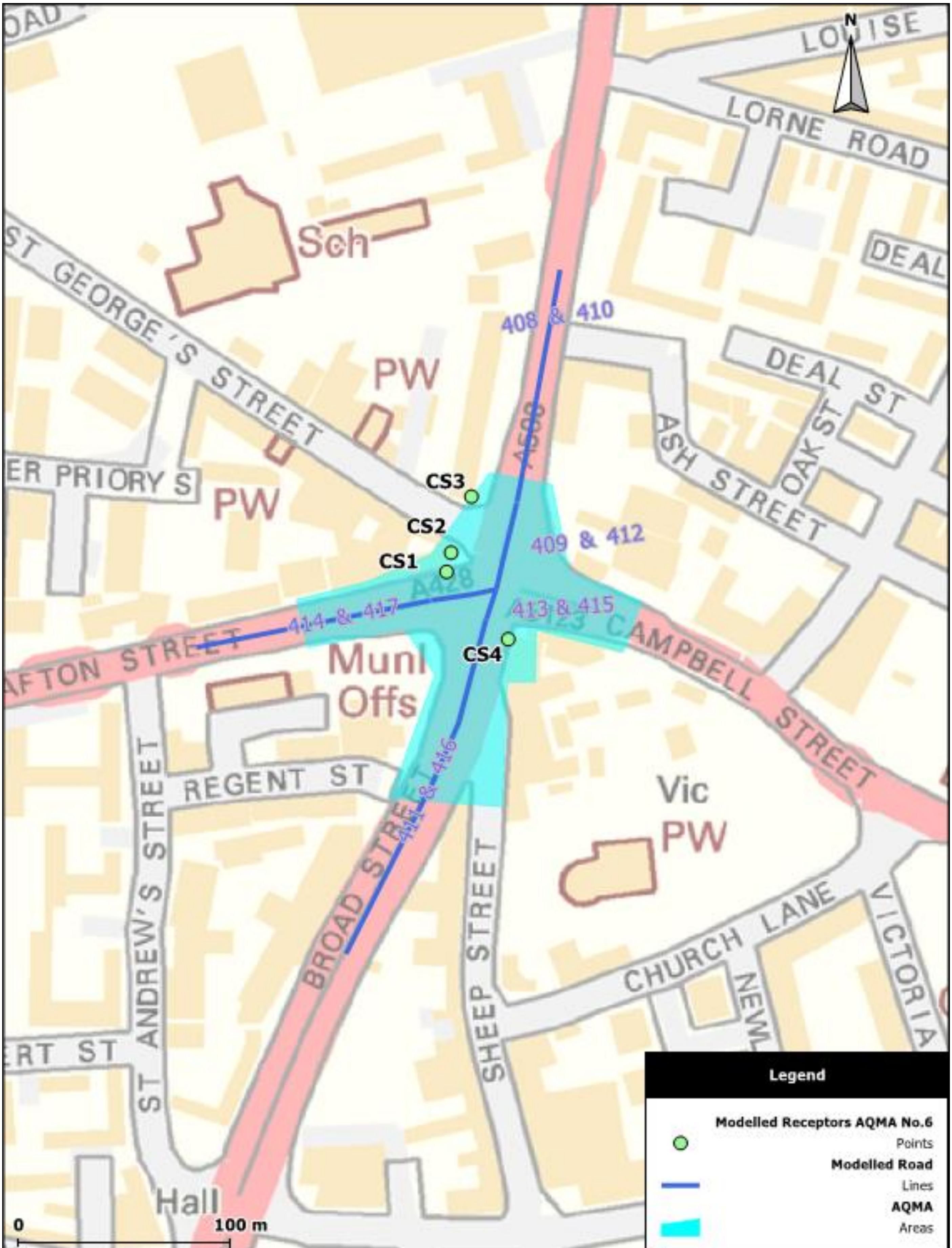

Figure 9.10: Local Operational Impacts - Northampton AQMA No.6, Campbell Square

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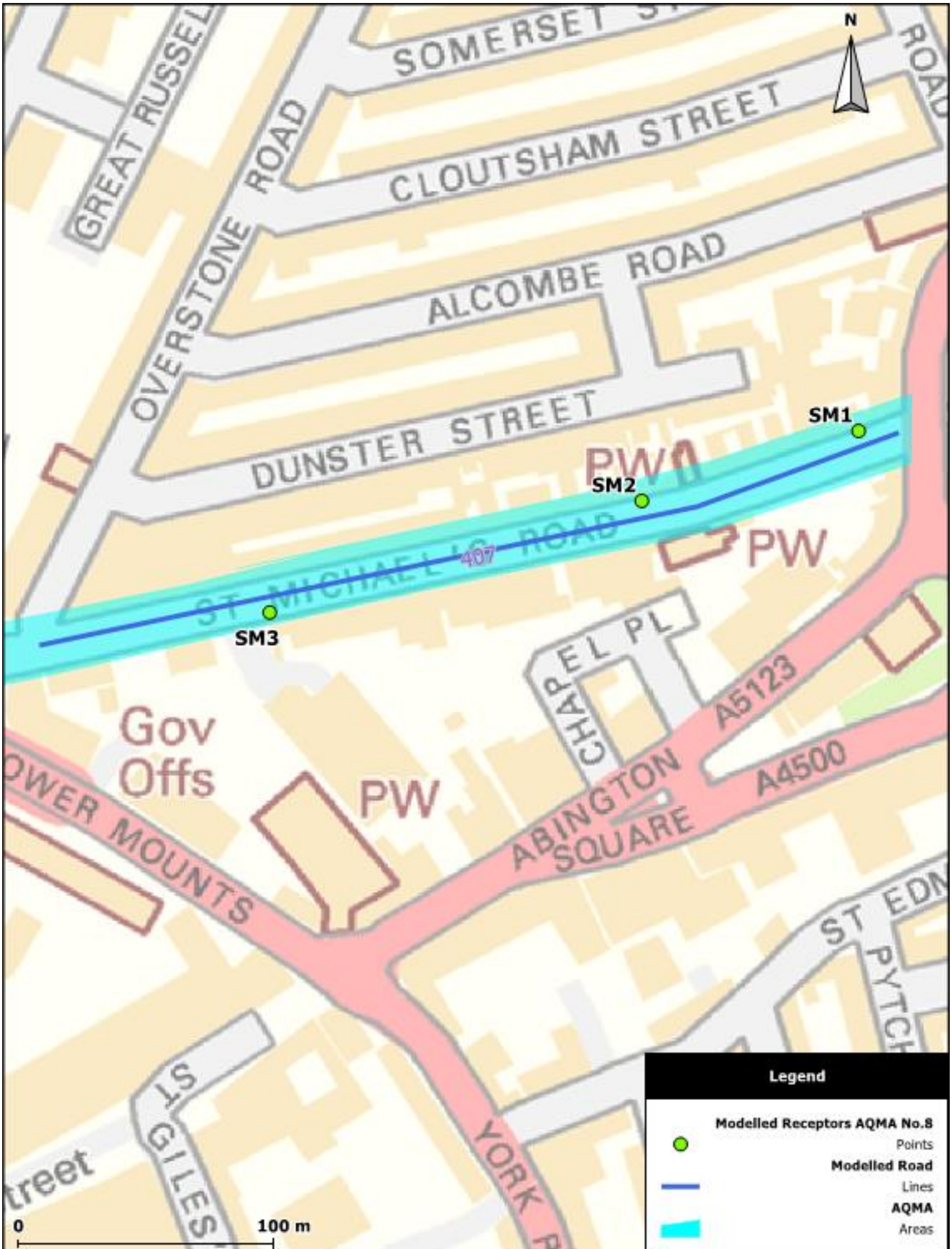

Figure 9.11: Local Operational Impacts - Northampton AQMA No.8, St Michaels Road

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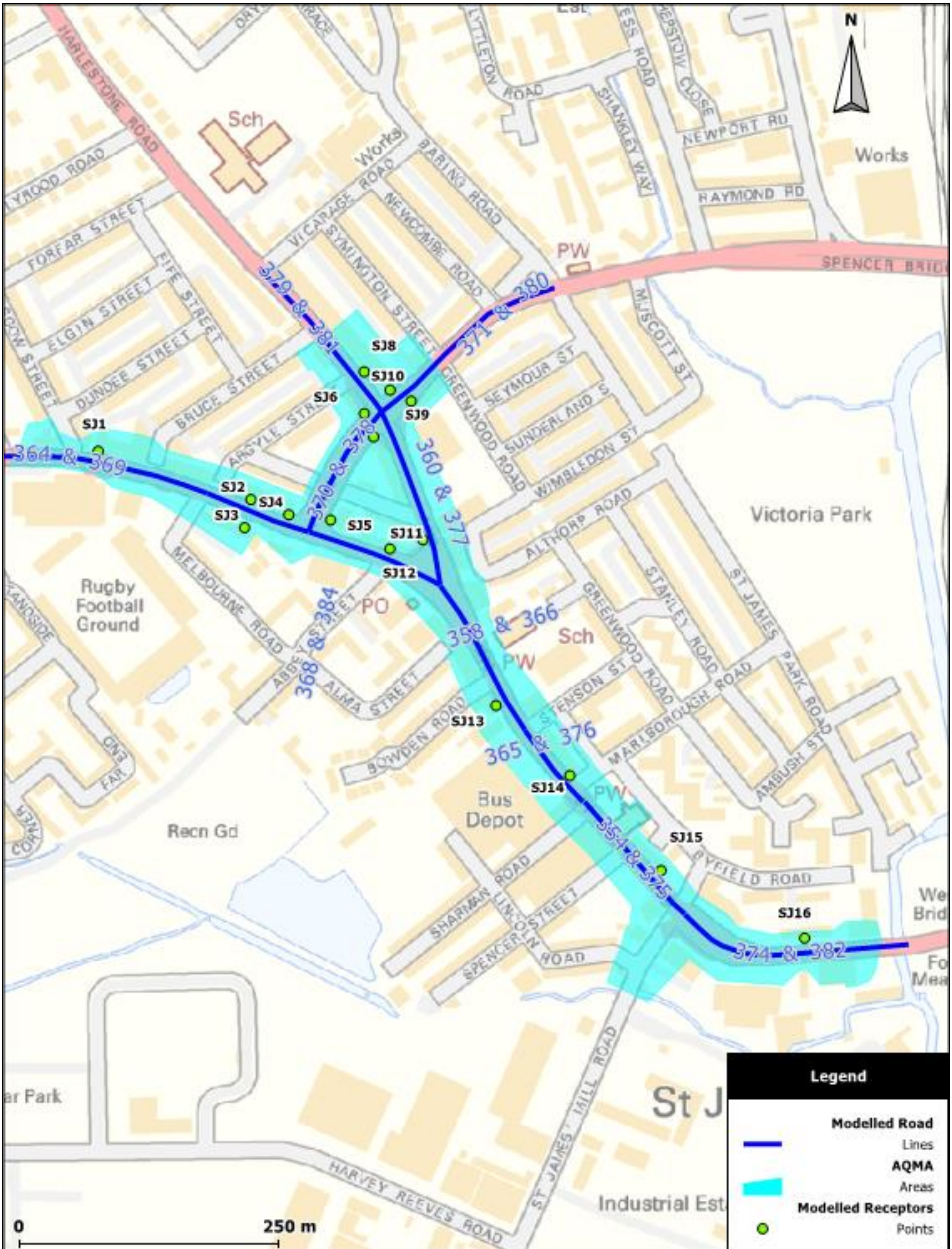

Figure 9.12: Local Operational Impacts - Northampton AQMA No.3, St James

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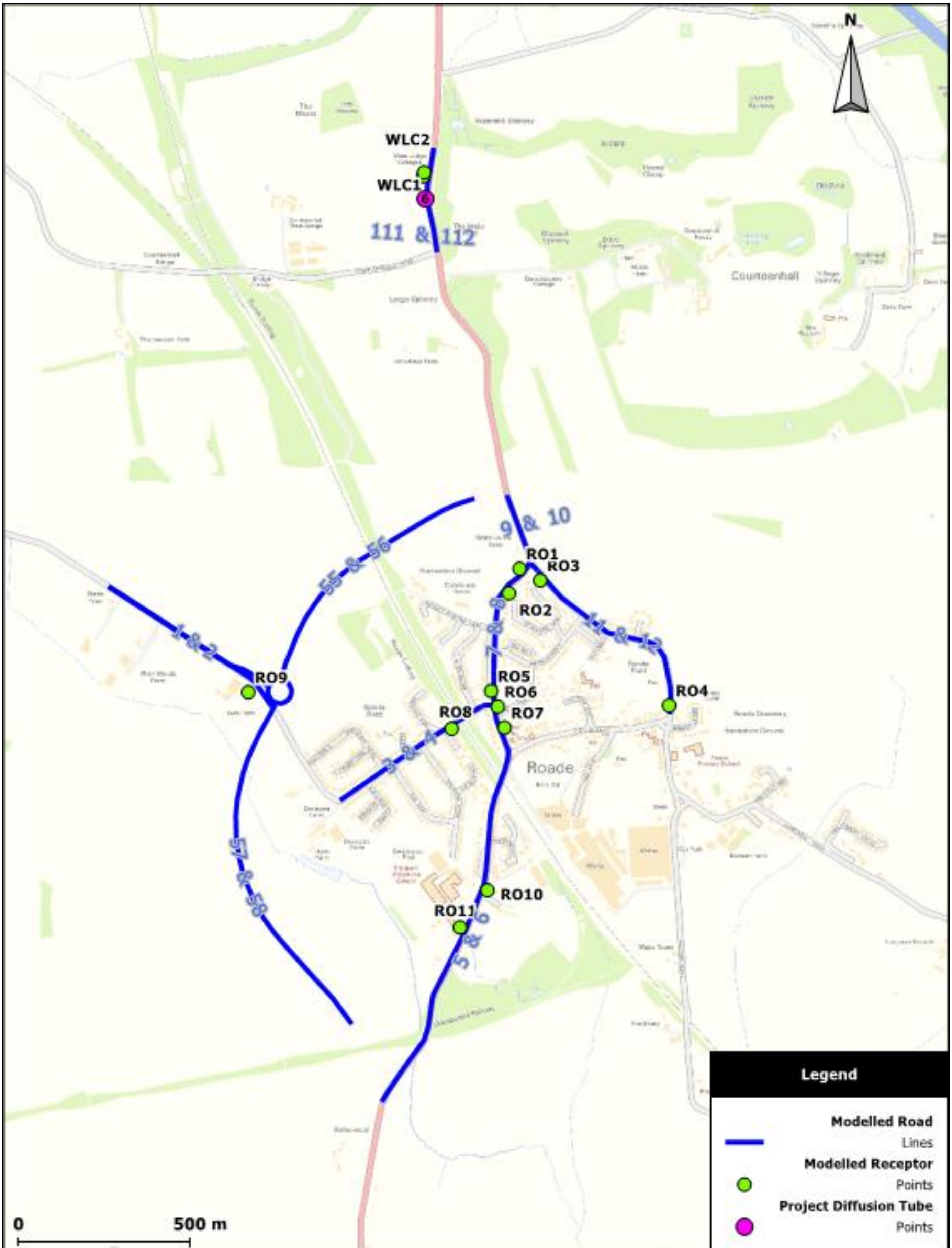

Figure 9.13: Local Operational Impacts - Roade and West Lodge Cottages

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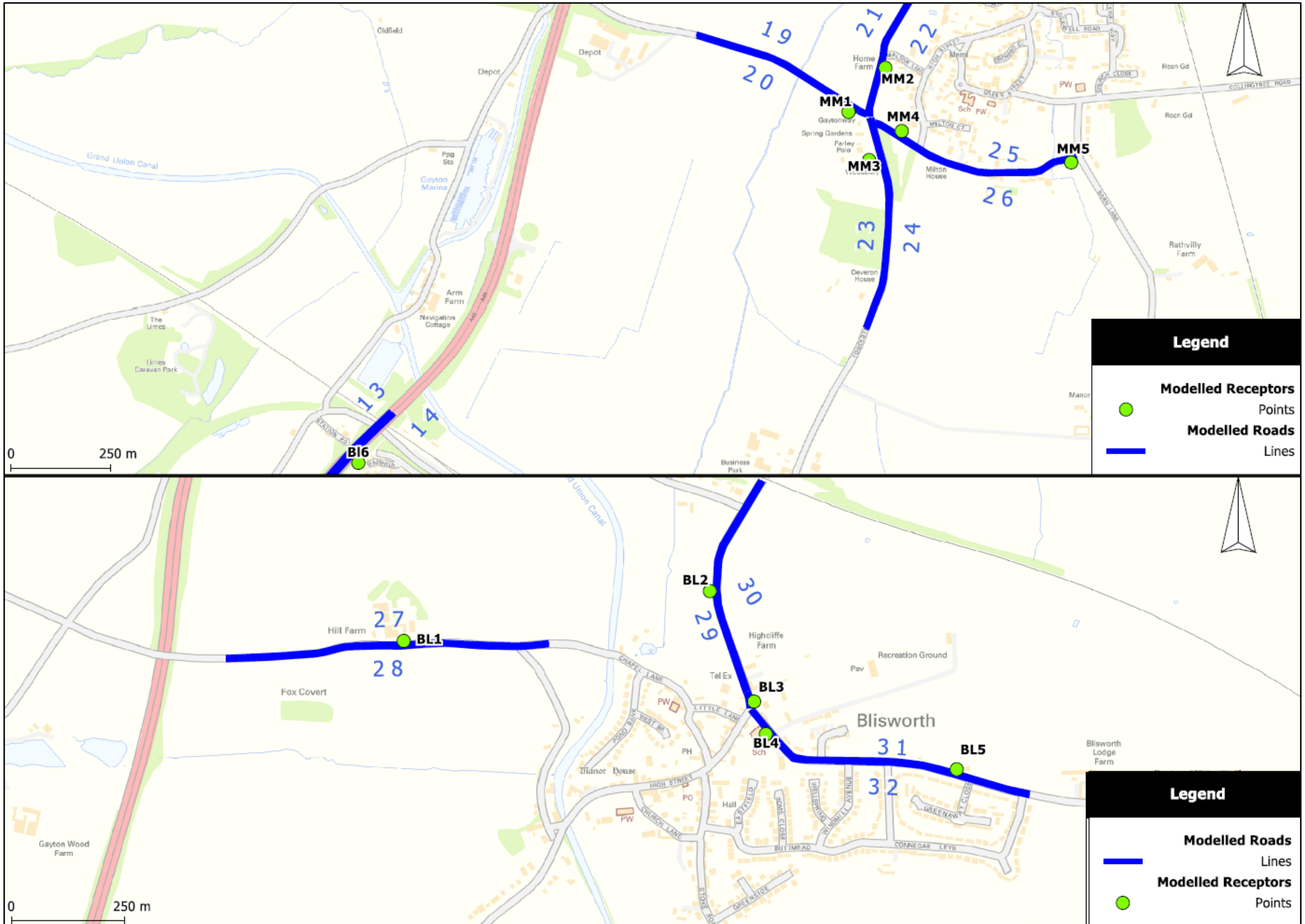

Figure 9.14: Local Operational Impacts - Blisworth & Milton Malsor

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Figure 9.15: Local Operational Impacts - Towcester AQMA

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Figure 9.16: Local Operational Impacts - Hartwell

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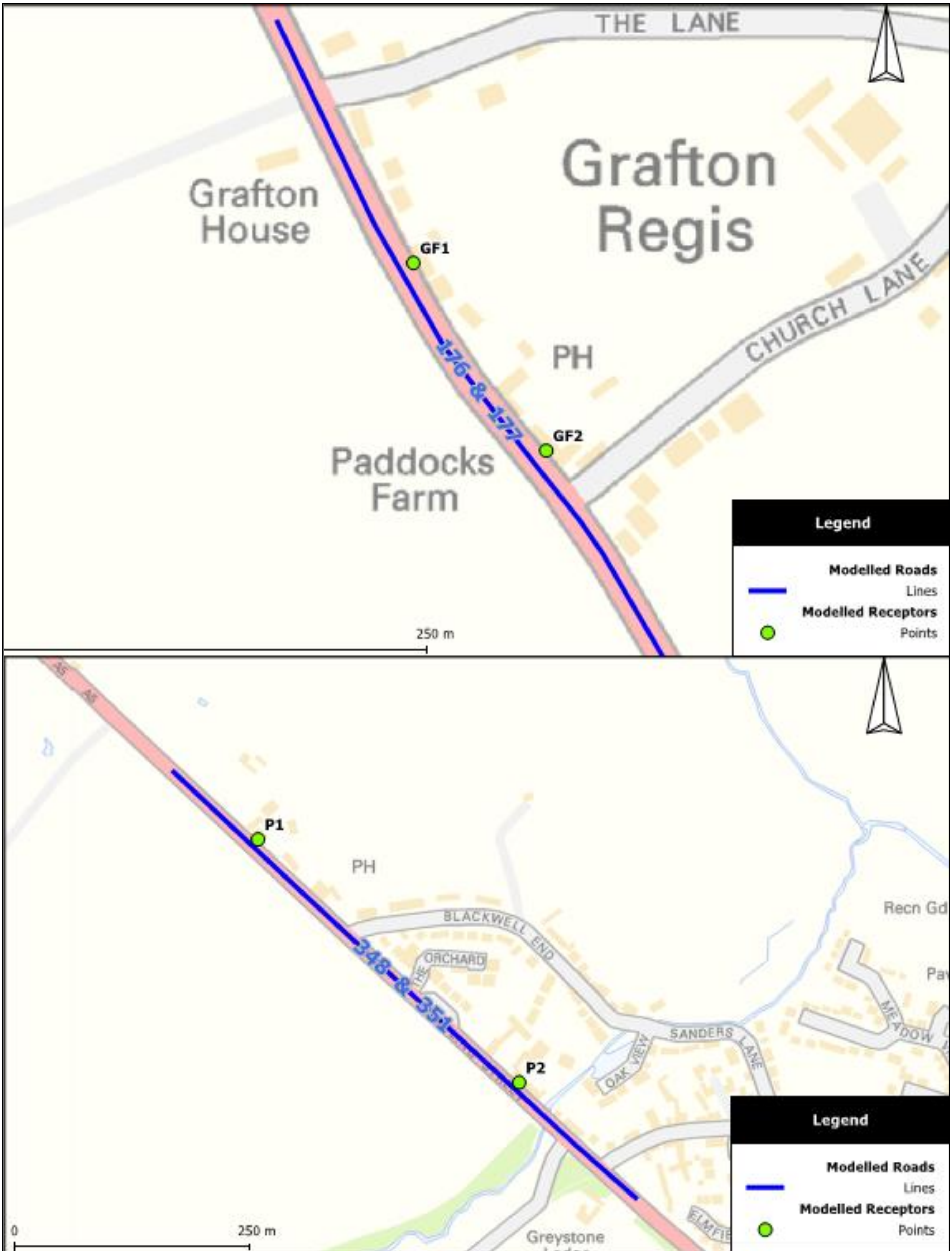

Figure 9.17: Local Operational Impacts - Grafton Regis & Pottersbury

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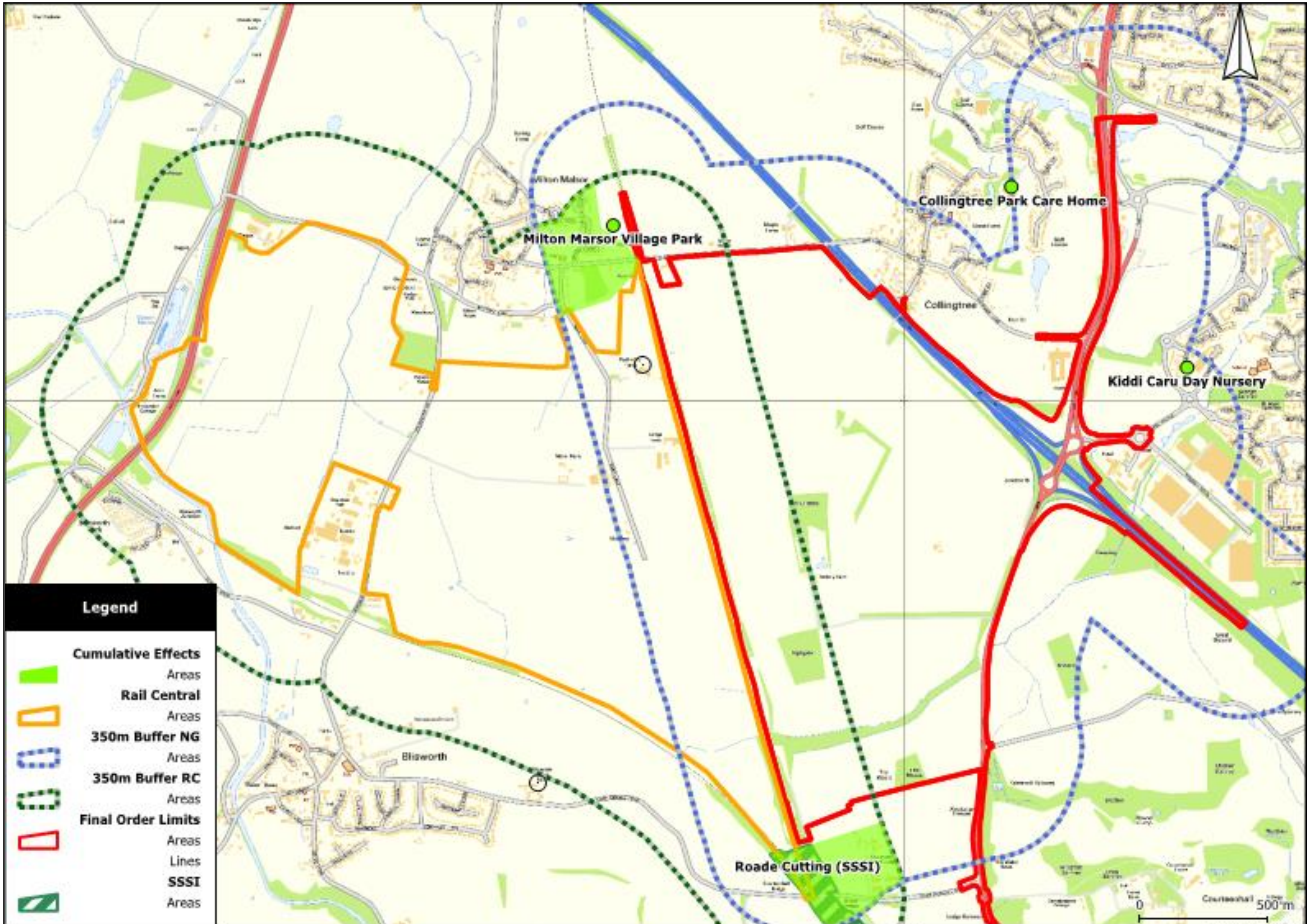

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Figure 9.18 Northampton Gateway & Rail Central Construction Phase Receptors

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