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# Air Quality Assessment

## Land West of Storrington Road, Thakeham

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# Air Quality Assessment

**Project:** LAND WEST OF STORRINGTON ROAD, THAKEHAM

**Report reference:** RP02-23295-R4

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## Document control:

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| 4 | 05 February 2026 | Hazel Swinfen BSc (Hons), MIAQM, AMIEnvSc, Senior Air Quality Consultant | Paul Hayward, BSc (Hons) MSc MIAQM MIEnvSc, Technical Director - Air Quality | Revised Red Line |

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# 1. EXECUTIVE SUMMARY

1.1 Cass Allen has been instructed by Bellway Strategic to assess the potential air quality impact of a proposed residential-led development at Land West of Storrington Road, Thakeham in West Sussex. The assessment was carried out in accordance with relevant local and national planning policy and guidance.

1.2 The site is located approximately 2.9km northeast of Horsham Air Quality Management Area (AQMA) No.1, declared due to exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide ($NO_2$). Air quality in the vicinity is primarily influenced by vehicle emissions along the adjacent Storrington Road (B2139) and the local road network.

1.3 Emissions of construction phase dust and particulate matter ($PM_{10}$) were assessed in accordance with Institute of Air Quality Management (IAQM) guidance. A High Risk and Medium Risk of dust soiling and $PM_{10}$ health effects has been identified, respectively, in the absence of mitigation. Suitable best practice mitigation measures have been recommended, and no significant residual air quality impacts are expected.

1.4 A detailed atmospheric dispersion model was utilised to predict $NO_2$ and particulate matter ($PM_{10}$ and $PM_{2.5}$) concentrations at relevant sensitive receptor locations within the study area during the operation of the development. This followed Department for Environment, Food and Rural Affairs (Defra) and Environmental Protection UK (EPUK) & IAQM guidance.

1.5 The results indicate that pollutant concentrations at proposed sensitive receptors will be below the relevant AQOs during the operational phase, with no requirement for additional mitigation. Furthermore, no significant impacts on local air quality as a result of development-generated traffic are anticipated. Accordingly, the overall effect of the proposed development is considered 'not significant' regarding air quality.

1.6 In summary, it is our view that the site is suitable for the development in terms of air quality and that there are no air quality constraints with respect to planning consent.

## 2. INTRODUCTION

2.1 Cass Allen has been instructed by Bellway Strategic to assess the potential air quality impact of a proposed residential-led development at Land West of Storrington Road, Thakeham in West Sussex.

2.2 Cass Allen prepared an Air Quality Assessment report (reference: RP02-23295) to accompany an earlier planning application for the site (reference: DC/24/0021; January 2024). Permission was refused by Horsham District Council (HDC) in July 2024, for reasons unrelated to air quality. An appeal was subsequently submitted and was ultimately rejected by HDC (reference: APP/Z3825/W/24/3350094) for reasons unrelated to air quality.

2.3 This updated Air Quality Assessment is based on a revised scheme, and this report has been prepared to accompany a new planning application for a proposed residential development at the site. HDC Environmental Health Team provided a number of comments on the original report. It is our view that the assessment outlined in this report addresses all previous HDC comments relating to air quality.

2.4 The aim of the assessment is to consider air quality conditions, and their potential to influence the development in terms of its design, scale and layout, taking into account the following aspects:

- Dust and PM emissions generated by construction phase activities;
- Exhaust emissions from construction plant and traffic;
- The exposure of new sensitive receptors to elevated pollutant concentrations; and
- Emissions from traffic generated by the operation of the development.

2.5 Subsequently, where required, appropriate measures have been identified to minimise the impacts.

2.6 This report contains technical terminology; a glossary of terms can be found at www.cassallen.co.uk/glossary.

## 3. PROJECT DESCRIPTION AND SITE CONTEXT

3.1 The site is located in a rural area and currently contains the vacant Thakeham Mushrooms farm, bounded to the north and east by Duke's Hill / Storrington Road (B2139), which have the potential to contribute to pollutant concentrations at the site. The site is further surrounded by fields, farmland and residential areas which have the potential to be affected by emissions associated with both the construction and operational phases of the development.

3.2 The site location is shown in Figure 1.

**Figure 1 Site Location and Surrounding Area**


3.3 The proposal is for the demolition of existing buildings and redevelopment of the site as a residential-led development including flexible non-residential floorspace (Use Class E), with associated landscaping, open space and infrastructure.

3.4 Air quality in the vicinity is primarily influenced by vehicle emissions along the adjacent Storrington Road (B2139) and the local road network.

# 4. PLANNING POLICY

### Air Quality Legislation

4.1 The wider air quality legislation which underpins national, regional and local planning policy, is summarised in Appendix 1.

4.2 The National AQOs and Air Quality Standards Regulations limit and target values for the UK are summarised in the Air Quality Strategy. These limits, for ten key air pollutants, are based on both European Union directives and World Health Organization (WHO) guidelines. They are periodically updated, informed by the latest scientific evidence, to protect public health, vegetation and ecosystems. The Local Air Quality Management (LAQM) regime requires local authorities to regularly evaluate the air quality in their areas based on these AQOs.

4.3 As a regional pollutant, many sources of $PM_{2.5}$ are beyond local authority control therefore, it does not form part of the LAQM regime. However, long-term (2040) targets for ambient $PM_{2.5}$ concentrations are set in 'The Environmental Targets (Fine Particulate Matter) (England) Regulations' (2023), and an interim (2028) target is published in the 'Environmental Improvement Plan' (2023). $PM_{2.5}$ is a key air pollutant for health impacts, and local authorities must monitor progress towards meeting these reduced levels.

4.4 The National AQOs for the pollutants most associated with vehicle emissions, and therefore applicable to this assessment, are detailed in Table 1.

**Table 1 UK National Air Quality Objectives**

| Pollutant | Objective | Averaging Period |
|---|---|---|
| Nitrogen Dioxide ($NO_2$) | 40µg/m$^3$ | Annual mean |
| | 200µg/m$^3$ not to be exceeded more than 18 times per year | 1-hour mean |
| Particulate Matter ($PM_{10}$) | 40µg/m$^3$ | Annual mean |
| | 50µg/m$^3$ not to be exceeded more than 35 times per year | 24-hour mean |
| Particulate Matter ($PM_{2.5}$) | 20µg/m$^3$ | Annual mean |

4.5 The above AQOs are typically applied where there is 'relevant exposure', i.e. where members of the public are likely to be present for the relevant averaging periods, or regularly exposed, and not in workplaces where relevant provisions concerning health and safety at work apply.

### National Policy

4.6 Outline guidance for the assessment of air quality affecting new developments is given in the 'National Planning Policy Framework' (NPPF) (December 2024; as amended February 2025). Relevant sections in this case are included in Appendix 1.

**Local Policy**

4.7 The Horsham District Planning Framework (2015) is the current Local Plan for the area and outlines the policies which shape development in the area. A review of this document has highlighted the following policies as relevant to this assessment:

> *Policy 24*
>
> *Strategic Policy: Environmental Protection*
>
> *The high quality of the district's environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to and the emission of pollutants including … odour [and] air … pollution and ensure that they:*
>
> *…*
>
> *4. Minimise the air pollution … emissions in order to protect human health and the environment;*
>
> *5. Contribute to the implementation of local Air Quality Action Plans and do not conflict with its objectives;*
>
> *6. Maintain or reduce the number of people exposed to poor air quality including odour. Consideration should be given to development that will result in new public exposure …*
>
> *Policy 33*
>
> *Development Principles*
>
> *In order to conserve and enhance the natural and built environment developments shall be required to:*
>
> *…*
>
> *2. Ensure that it is designed to avoid unacceptable harm to the amenity of occupiers/users of nearby property and land… whilst having regard to the sensitivities of surrounding development;*

4.8 The Horsham District Council (HDC) Local Plan (2021-2038), when adopted, will become the main planning document for Horsham District. The Regulation 19 Draft Copy of this document includes the following policies relevant to air quality:

*Strategic Policy 25: Air Quality*

*The Council recognises the direct effects air quality has on public health, natural habitats and biodiversity, including its contribution to climate change, and the importance of the management of air quality. Taking into account any relevant Planning Guidance Documents and / or policies within this plan, proposals will be required to:*

*1. Adhere to the Air Quality and Emissions Mitigation Guidance for Sussex (2020), or any future updates, to identify if an Air Quality Impact Assessment and / or an Emissions Mitigation Statement is required;*

*2. Contribute to the implementation of local Air Quality Action Plans, and not conflict with the set objectives;*

*3. Minimise traffic generation and congestion through access to sustainable transport modes, maximising the provision for cycling and pedestrian facilities;*

*4. Encourage the use of cleaner transport fuels, including through the provision of electric car charging points.*

*5. Take into account habitats or biodiversity designations that are sensitive to air quality changes, including ancient woodland...*

*6. Mitigate the impact on the amenities of users of the site and surrounding land to an appropriate level, where development creates or results in pollution including particulates, dust, smoke, pollutant gases or odour, as outlined in the Air Quality and Emissions Mitigation Guidance for Sussex (2020), or any future updates; and*

*7. Ensure that the cumulative impact of all relevant permitted and allocated developments, including associated traffic impacts is appropriately assessed.*

4.9 To address the requirements of the national and local policies, the following key air quality matters have been considered:

- Construction phase fugitive emissions of dust and PM impacts at existing receptors;
- Construction phase plant and vehicle emissions impacts at existing receptors;
- Operational phase vehicle emissions exposure at proposed receptors; and
- Operational phase vehicle emissions impacts at existing receptors.

# 5. ASSESSMENT METHODOLOGY

5.1 The scope and methodology for this assessment has been determined with regard to Defra Local Air Quality Technical Guidance, May 2025 (LAQM.TG22), EPUK & IAQM, 'Land Use Planning & Development Control: Planning for Air Quality', January 2017 (LUPDC) and the Sussex Air Quality Partnership (SAQP) 'Air Quality and Emissions Mitigation Guidance for Sussex' (2021). Reference has also been made to other relevant technical guidance, where applicable.

5.2 Feedback was received from the *Environmental Protection Officer (Air Quality)* at HDC regarding the original assessment report. Their advice on the methodology was taken into account within this revision.

**Construction Phase**

5.3 The assessment of potential air quality impacts during the construction phase has focused on the generation and dispersion of dust and $PM_{10}$ by onsite activities following the IAQM 'Guidance on the Assessment of Dust from Demolition and Construction' (January 2024) methodology, summarised as follows:

- Step 1 – screen the need for an assessment: impacts to sensitive human and ecological receptors should be considered where they are located within 250m or 50m of the site boundary, respectively (as shown on Figure 2). These receptors should also be considered if they are within 50m of a route used by construction vehicles up to 250m from the site entrance.
- Step 2A – estimate the dust emission magnitude for each of the main construction activities – demolition, earthworks, general construction, and trackout.
- Step 2B – determine the sensitivity of the receiving environment, through consideration of factors such as meteorological conditions, the number of nearby receptors, their proximity and their sensitivity. Other factors to consider are detailed in Box 9 of the guidance. A wind rose for nearby Charlwood (Gatwick) meteorological station is included in Appendix 2.
- Step 2C – define the risk of impacts.
- Step 3 – identify site-specific mitigation requirements (in addition to basic project controls).

5.4 As indicated within the guidance, the use of professional judgment is necessary, due to the diverse range of projects that are subject to dust impact assessment, meaning that it is not possible to be prescriptive as to how to assess the impacts.

5.5 In addition, exhaust emissions from construction vehicles and plant may impact local air quality. The potential for significant effects resulting from these emissions has also been considered with reference to screening and significance criteria in LUPDC.

5.6 A review of the Multi-Agency Geographic Information for the Countryside (MAGIC) website did not identify any statutory designated ecological sites within the relevant screening distances, and therefore these have been excluded from the construction phase assessment.

**Operational Phase**

5.7 LUPDC indicates that a change in Light Duty Vehicle (LDV - cars and small vans <3.5t gross vehicle weight) flows of 500 Annual Average Daily Traffic (AADT) and/or Heavy Duty Vehicle (HDV - goods vehicles + buses >3.5t gross vehicle weight) flows of 100 AADT or more is potentially significant, and likely to require further assessment. This also applies to a change in LDV flows of 100 AADT and/or HDV flows of 25 AADT or more on routes through or close to an AQMA. These criteria were used to determine the study area, in liaison with the project's Transport Consultant (Ardent).

5.8 Ardent has indicated that the development is expected to generate a traffic flow of approximately 999 AADT with 1.7% HDVs and therefore, has the potential to affect existing sensitive receptors in line with the above criteria.

5.9 Concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ have been considered in the operational phase assessment as road traffic is a major source of these pollutants and their concentrations are often close to, or in exceedance of, the relevant AQOs in urban locations. Cambridge Environmental Research Consultants' (CERC) ADMS-Roads (version 5.1.0.2) atmospheric dispersion model has been used to predict pollutant concentrations at the existing receptor (R) and proposed receptor (PR) locations detailed in Table 2.

**Table 2 Modelled Receptor Locations**

| ID | Description | Grid Reference (OSGB) | Height (m) |
|---|---|---|---|
| R1 | Bredhurst, The Street | 510491.8, 117386.6 | 1.5 |
| R2 | South Hill Farm, West Cottage, Duke's Hill | 510413.2, 117455.9 | 1.5 |
| R3 | 1 Massey Close, B2139 | 510304.7, 116968.8 | 1.5 |
| R4 | 8 Woodland Cottages, B2139 | 510363.7, 116992.5 | 1.5 |
| R5 | Stringers Cottage, B2139 | 510180.2, 116718.3 | 1.5 |
| R6 | Furzefield, B2139 | 510151.6, 116697.7 | 1.5 |
| R7 | Water Lane Farm, B2139 Storrington Road | 510011.5, 115028.0 | 1.5 |
| R8 | Juniper Cottage, B2139 Storrington Road | 510022.7, 115016.3 | 1.5 |
| R9 | Dunsfold, B2139 Thakeham Road | 509834.2, 114950.2 | 1.5 |
| R10 | Barford House, B2139 Thakeham Road | 509737.6, 114861.0 | 1.5 |
| R11 | Downsview, Fryern Road | 509076.3, 114502.7 | 1.5 |
| R12 | The Hollies, Thakeham Road | 509119.4, 114515.7 | 1.5 |
| R13 | 10 King House, B2139 School Hill | 508968.6, 114335.3 | 1.5 |
| R14 | 25 High Street A283, flat above Boots Pharmacy | 508913.3, 114292.3 | 4.5 |
| R15 | 40A High Street, A283, flat above The White Room | 508887.4, 114265.3 | 4.5 |
| R16 | 7 High Street, flat above Farncombe Butchers | 508739.2, 114272.0 | 4.5 |
| R17 | 18 West Street | 508675.1, 114305.4 | 1.5 |
| R18 | 23 West Street, flat above Cottage Tandoori | 508663.9, 114298.4 | 4.5 |
| R19 | 57 West Street | 508496.0, 114371.6 | 1.5 |
| R20 | 61 West Street | 508458.7, 114390.2 | 1.5 |
| R21 | Pear Tree House, 48 West Street | 508487.7, 114404.2 | 1.5 |
| R22 | Bramble Cottage, 2 Manley's Hill | 508943.4, 114268.7 | 1.5 |

| ID | Description | Grid Reference (OSGB) | Height (m) |
|---|---|---|---|
| R23 | Virginia Cottage, Manley's Hill | 508954.9, 114275.6 | 1.5 |
| PR1 | Eastern site boundary | 510364.2, 117203.0 | 1.5 |
| PR2 | | 510352.9, 117175.0 | 1.5 |
| PR3 | | 510344.7, 117155.6 | 1.5 |
| PR4 | | 510340.4, 117124.5 | 1.5 |
| PR5 | Site access road | 510270.7, 117086.5 | 1.5 |
| PR6 | | 510269.1, 117104.6 | 1.5 |
| PR7 | Potential Community Plaza building (robust) | 510312.7, 117071.7 | 1.5 |

5.10 A review of the MAGIC website did not identify any statutory designated ecological sites in the vicinity of roads expected to experience a significant change in traffic, and therefore these have been excluded from the operational phase assessment.

5.11 To assess the development impact on local air quality, the following scenarios have been modelled:

- 2024 – Model Verification;
- 2031 – Assumed Opening Year, Without Development; and
- 2031 – Assumed Opening Year, With Development.

5.12 The study area, including modelled road links and receptors, is shown in Figure 2, below.

5.13 Details of the traffic data used in the model are included in Appendix 3, and other model inputs such as emission factors, verification and adjustment, in Appendix 4.

**Significance Criteria**

5.14 Significance criteria applicable to the assessment of vehicle emissions impacts have been derived from LUPDC. Where the 'without' and 'with' development pollutant concentrations are predicted at an individual receptor, the guidance recommends expressing the magnitude of incremental change as a proportion of the Air Quality Assessment Level (normally the applicable AQO).

5.15 The LUPDC significance criteria applicable to the assessment of impacts at existing receptors are included in Appendix 5. It should be noted that, in line with LUPDC, *'the criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement… the objective is to identify situations where there is a possibility of a significant effect on local air quality.'*

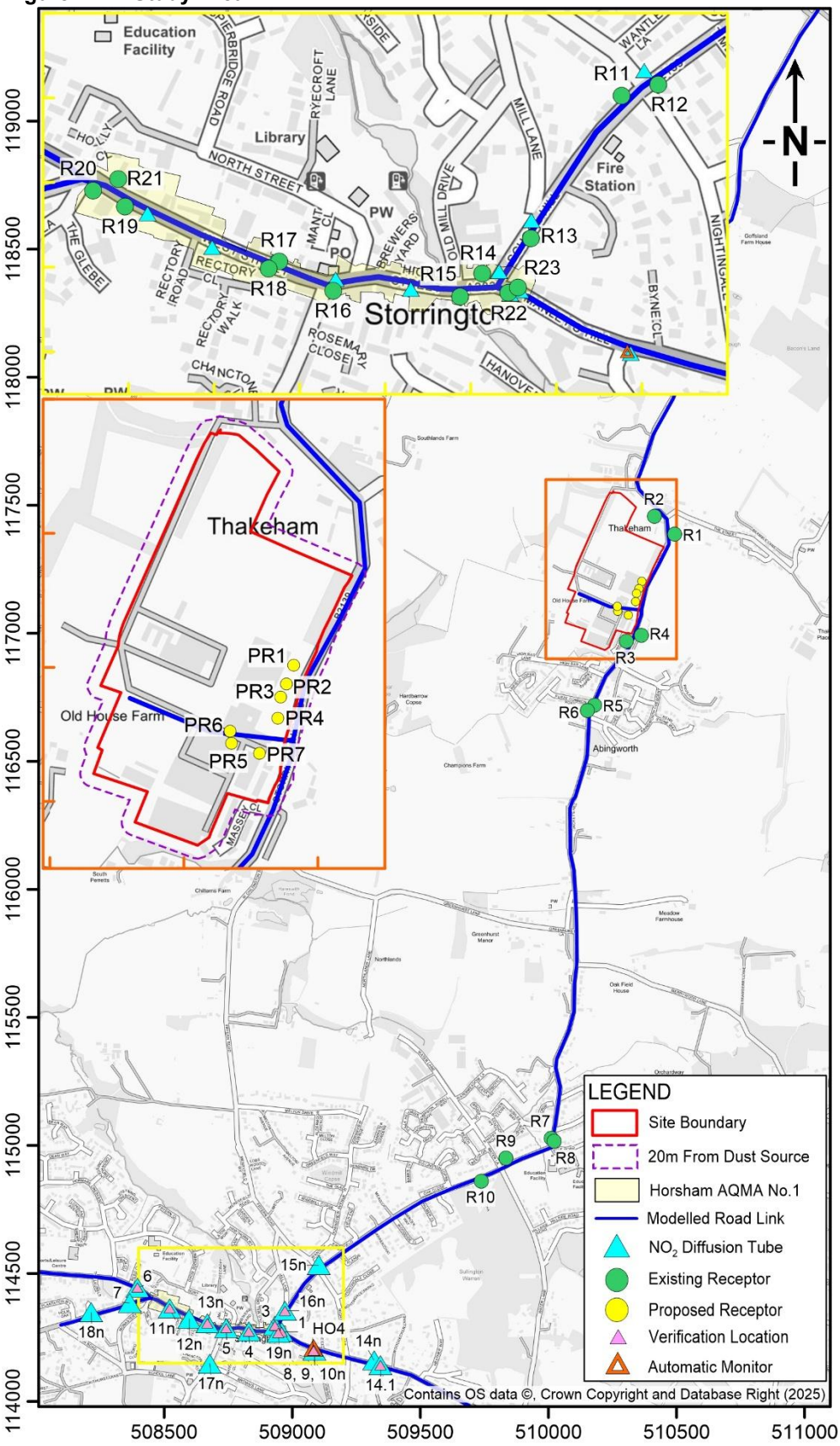
5.16 For proposed receptors, predicted pollutant concentrations have been compared to the relevant AQOs to determine the potential for exceedance, and therefore, the suitability of the site for the proposed use.

**Emissions Cost Calculation**

5.17 For 'Major' proposals, including development of 10 or more dwellings, the SAQP guidance requires an emissions cost calculation to identify the environmental 'damage' costs associated with the proposal and determine the amount (value) of mitigation (including intrinsic mitigation) that is appropriate to offset this cost. This has been undertaken following the Defra Interdepartmental Group on Costs and Benefits (IGCB) approach and the Defra Air Quality Damage Cost Appraisal Toolkit (December 2025), which utilises the following calculation:

Cost of Road Transport Emission Increase = ∑ [Estimated trip rate for 5 years × Emission rate per 10km per vehicle type × Damage Costs]

**Figure 2 Study Area**



## 6. BASELINE CONDITIONS

6.1 Air quality conditions in the vicinity of the site have been reviewed to provide a baseline for consideration. The collected data are included in the tables below and were obtained from the HDC Air Quality Annual Status Report (ASR) (2025), plus Defra background maps.

**Table 3 HDC Monitored Concentrations – $NO_2$**

| ID | Location | Type | Distance to site (km) | Monitored Annual Mean (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2020 | 2021 | 2022 | 2023 | 2024 |
| H04 | Storrington AURN | Roadside | 3.0 | 17.4 | 20.1 | 17.6 | 17.4 | 16.6 |
| 1 | Manley's Hill Roundabout (eastbound side) | Roadside | 3.0 | 31.6 | 24.3 | 32.9 | 32.9 | 28.6 |
| 3 | School Hill (Roundabout) | Roadside | 2.9 | 23.3 | 24.8 | 23.7 | 21.8 | 19.3 |
| 4 | High St (near Old Mill Dr) | Roadside | 3.0 | 25.5 | 25.9 | 26.7 | 24.5 | 23.3 |
| 5 | West St (Opp Church St) | Roadside | 3.0 | 18.7 | 19.9 | 19.0 | 19.2 | 16.4 |
| 6 | Pulborough Rd (near Reed Cl) | Roadside | 3.1 | 14.8 | 17.1 | 17.4 | 17.9 | 15.9 |
| 7 | Amberley Rd / The Willows | Roadside | 3.1 | 15.6 | 17.6 | 17.7 | 18.8 | 15.9 |
| 8, 9, 10n | Storrington AURN | Roadside | 3.0 | 20.5 | 21.7 | 21.7 | 19.8 | 17.3 |
| 11n | 53 West St | Roadside | 3.1 | 25.0 | 26.5 | 25.9 | 24.8 | 20.7 |
| 12n | West St / Rectory Rd | Roadside | 3.1 | 20.0 | 23.0 | 22.4 | 20.9 | - |
| 13n | 18 West St | Roadside | 3.1 | 21.4 | 23.1 | 23.0 | 21.1 | 18.4 |
| 14n | Cobden, Washington Rd | Kerbside | 2.9 | 27.8 | 25.8 | 26.3 | 23.5 | - |
| 14.1 | Moorings, Washington Rd | Roadside | 2.9 | - | - | - | - | 26.1 |
| 15n | Thakeham Rd / Fryern Rd | Roadside | 2.7 | 14.9 | 15.4 | 14.6 | 14.7 | - |
| 16n | School Hill (by Car Park) | Roadside | 2.9 | 18.9 | 19.2 | 18.4 | 17.5 | 15.1 |
| 17n | 33 Church St | Urban Background | 3.2 | 9.8 | 10.0 | 9.6 | 8.2 | 7.6 |
| 18n | Amberley Rd / Amberley Cl | Roadside | 3.3 | 13.4 | 18.1 | 15.4 | 13.7 | - |
| 19n | Manley's Hill Roundabout (westbound side) | Roadside | 3.0 | 38.4 | 39.6 | 38.1 | 37.0 | 32.7 |

Note: Data obtained from HDC ASR, 2025. Results from 2020 and 2021 are likely to be atypical due to COVID-19 travel restrictions.

**Table 4 HDC Monitored Concentrations – $PM_{10}$**

| ID | Location | Type | Distance to site (km) | Monitored Annual Mean (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2020 | 2021 | 2022 | 2023 | 2024 |
| HO4 | Storrington AURN | Roadside | 3.0 | - | - | 14.0 | 13.7 | 12.6 |

Note: Data obtained from HDC ASR, 2025.

**Table 5 HDC Monitored Concentrations – $PM_{2.5}$**

| ID | Location | Type | Distance to site (km) | Monitored Annual Mean (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2020 | 2021 | 2022 | 2023 | 2024 |
| HO4 | Storrington AURN | Roadside | 3.0 | - | - | 7.3 | 7.7 | 7.7 |

Note: Data obtained from HDC ASR, 2025.

6.2 As indicated in Table 3, Table 4 and Table 5 above, pollutant concentrations in the vicinity of the site were below the relevant AQOs during the five most recent monitoring years, 2020-2024. The general trend shows pollutant concentrations in the area decreasing with time and this is illustrated in Figures A.3 and A.7 of the ASR.

**Table 6 Defra Mapped Background Annual Mean Concentrations (µg/m³) – Study Area**

| 2024 (Model verification year) | | | | 2029 (Robust year for 2031 modelling scenarios) | | | |
|---|---|---|---|---|---|---|---|
| $NO_x$* | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $NO_x$* | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| 9.0 - 9.6 | 7.1 - 7.5 | 10.0 - 10.4 | 5.9 - 6.2 | 7.6 - 8.0 | 6.0 - 6.3 | 9.6 - 10.0 | 5.6 - 5.8 |

Note: Data obtained from https://uk-air.defra.gov.uk/data/laqm-background-home. A range is given as the study area spans multiple grid squares. *Nitrogen oxides (nitric oxide (NO) + $NO_2$)

6.3 Defra-predicted background concentrations for 2024 and 2029 shown above are also well below (defined by the IAQM as less than 75% of) the relevant AQOs. These background concentrations are later combined with roadside modelling results to provide total predicted environmental concentrations at receptor locations.

# 7. CONSTRUCTION PHASE ASSESSMENT

7.1 As sensitive receptors were identified within the relevant IAQM screening distances, the assessment progressed to Step 2, which has been summarised in the tables below.

**Table 7 Step 2A – Dust Emission Magnitude for Construction Activities**

| Activity | Magnitude | Explanation |
|---|---|---|
| Demolition | Large | Total building volume >75,000m$^3$. |
| Earthworks | Large | Total site area >110,000m$^2$, >10 heavy earth moving vehicles assumed. |
| Construction | Large | Total building volume >75,000m$^3$. |
| Trackout | Large | >50 outward HDV movements per day and >100m unpaved road length likely. |

**Table 8 Step 2B – Sensitivity of the Area**

| Potential Impact | Details | Construction Activity | | | |
|---|---|---|---|---|---|
| | | Demolition | Earthworks | Construction | Trackout |
| Dust Soiling | 10-100 receptors within 20m of site | High | High | High | High |
| Human Health | 10- 100 receptors within 20m of site; low background $PM_{10}$ concentration | Low | Low | Low | Low |
| Ecological | No designated sites within 50m | N/A | N/A | N/A | N/A |

**Table 9 Step 2C – Summary of Impact Risks to Define Site-Specific Mitigation**

| Potential Impact | Construction Activity | | | |
|---|---|---|---|---|
| | Demolition | Earthworks | Construction | Trackout |
| Dust Soiling | High Risk | High Risk | High Risk | High Risk |
| Human Health | Medium Risk | Low Risk | Low Risk | Low Risk |

7.2 It should be noted that the prevailing winds are south-westerly (as shown in Appendix 2) and thus, locations to the north-east, downwind of the site, are most at risk of construction dust impacts. Overall, as a worst case the development is considered High Risk for dust soiling effects and Medium Risk for $PM_{10}$ health effects in the absence of mitigation. Following implementation of the recommended mitigation measures for High-Risk sites in Appendix 6, it is anticipated that the residual effect of the construction phase will be not significant.

7.3 With regard to construction traffic, the construction phase flows are not expected to exceed the criteria detailed in Paragraph 5.7 and therefore, significant residual effects are not anticipated.

## 8. OPERATIONAL PHASE ASSESSMENT – SITE SUITABILITY

8.1 To consider the suitability of the site for the proposed use, the potential for future occupants of the development to be exposed to exceedances of the relevant AQOs has been assessed. Modelled predicted pollutant concentrations at proposed receptors are detailed in Table 10.

**Table 10 Predicted Pollutant Concentrations at the Development in 2031**

| Receptor | Annual Mean Concentration (µg/m$^3$) | | |
|---|---|---|---|
| | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| PR1 | 7.7 | 10.5 | 5.9 |
| PR2 | 7.5 | 10.5 | 5.9 |
| PR3 | 7.4 | 10.5 | 5.9 |
| PR4 | 7.5 | 10.6 | 5.9 |
| PR5 | 7.0 | 10.4 | 5.8 |
| PR6 | 7.8 | 10.8 | 6.0 |
| PR7 | 7.4 | 10.5 | 5.9 |

Note: Results are reported to the nearest 0.1µg/m$^3$. Any apparent discrepancies in results are due to rounding.

8.2 The data in Table 10 show that pollutant concentrations were predicted to be below the relevant annual AQOs at all proposed receptor locations. The highest predicted $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations were 7.8µg/m$^3$, 10.8µg/m$^3$ and 6.0µg/m$^3$, respectively, all at receptor PR6.

8.3 The annual mean $NO_2$ concentrations predicted by the model were all below 60µg/m$^3$. As indicated in LAQM.TG22, a breach of the hourly mean AQO for $NO_2$ is unlikely where this is the case. Equally, exceedances of the 24-hour mean AQO for $PM_{10}$ are not anticipated, as predicted annual mean concentrations are below the 32µg/m$^3$ proxy value.

8.4 Accordingly, it is not anticipated that proposed receptors would be exposed to exceedances of the relevant AQOs; therefore, the site is considered suitable for the proposed use, with no requirement for additional mitigation.

8.5 In addition to the above, Defra guidance requires consideration of how a development will reduce exposure to $PM_{2.5}$. In terms of selecting this development site, which is in an area where $PM_{2.5}$ concentrations are expected to be well below the AQO and where there is no requirement to reduce exposure further, exposure to $PM_{2.5}$ has been considered.

# 9. OPERATIONAL PHASE ASSESSMENT – AIR QUALITY IMPACTS

9.1 To assess the potential air quality impacts resulting from operational phase development-generated vehicle emissions at existing receptor locations, dispersion modelling has been undertaken to quantify pollutant concentrations in both 'without development' and 'with development' scenarios. A summary of the worst-case impacts is provided in Table 11, with full model results detailed in Appendix 7.

**Table 11 Worst-Case Predicted Operational Impacts at Existing Receptors in 2031**

| Pollutant | Receptor | Annual Mean Concentration (µg/m³) | | | Impact Descriptor |
|---|---|---|---|---|---|
| | | Without | With | Change | |
| *Highest Absolute Concentrations* | | | | | |
| $NO_2$ | R22 | 25.4 | 25.5 | 0.1 | Negligible |
| $PM_{10}$ | R17 | 17.6 | 17.6 | 0.1 | Negligible |
| $PM_{2.5}$ | R17 | 10.6 | 10.6 | <0.1 | Negligible |
| *Maximum Predicted Changes* | | | | | |
| $NO_2$ | R8 | 16.8 | 17.3 | 0.5 | Negligible |
| $PM_{10}$ | R8 | 12.1 | 12.4 | 0.3 | Negligible |
| $PM_{2.5}$ | R8 | 7.1 | 7.3 | 0.2 | Negligible |

Note: Results are reported to the nearest 0.1µg/m³. Any apparent discrepancies in results are due to rounding.

9.2 No existing receptors are expected to experience pollutant concentrations in excess of the relevant annual mean AQOs. Furthermore, the impact at all receptor locations is considered 'Negligible' in accordance with LUPDC.

9.3 Based on the extent of predicted population exposure to $NO_2$, $PM_{10}$ and $PM_{2.5}$ impacts, the overall effect of the development is considered not significant, with regard to air quality.

9.4 Nonetheless, in addition to the above, Defra guidance requires consideration of how a development will reduce emissions of $PM_{2.5}$. The development will include a Travel Plan intended to encourage the transition to more sustainable forms of transport, with lower emissions of $PM_{2.5}$ and other pollutants.

## 10. EMISSIONS COST CALCULATION

10.1 The inputs and outputs of the Defra emissions factors toolkit (EFT) v13.1 are shown in Table 12 and Table 13 below.

**Table 12 EFT Inputs**

| Input | Value |
|---|---|
| Development trip rate | 999 AADT (1.70% HDV) – obtained from Ardent |
| Average speed | 50km/hr |
| Emissions year | From 2031 to 2035 |
| Area / road type | England (not London) – Urban (not London) |
| Link Length | 10km – from SAQP guidance |

**Table 13 EFT Outputs – Annual Link Emissions for First 5 Operational Years**

| Year of Operation | $NO_x$ (tonnes/year) | $PM_{2.5}$ (tonnes/year) |
|---|---|---|
| 2031 | 0.307282716 | 0.062717982 |
| 2032 | 0.261672425 | 0.062137221 |
| 2033 | 0.223474351 | 0.061632083 |
| 2034 | 0.192697376 | 0.061192662 |
| 2035 | 0.168433062 | 0.060816233 |

10.2 The EFT predicts a consistent reduction in emissions each year, resulting from the anticipated transition to cleaner vehicles.

10.3 Defra's Air Quality Damage Cost Appraisal Toolkit (December 2025) was utilised to calculate the monetary value of air quality 'damage' caused by the development, and consequent cost of mitigation required. Using the annual link emissions above and *Road Transport - Urban Small* damage costs, the Toolkit estimated the emissions costs of $NO_x$ and $PM_{2.5}$ shown in Table 14.

**Table 14 Air Quality Damage Cost Appraisal Toolkit – Emissions Cost Calculation**

| Emissions Year | Calculated Cost by Pollutant (Discounted Central Benefit) | |
|---|---|---|
| | $NO_x$ | $PM_{2.5}$ |
| 2031 | £3,468 | £6,010 |
| 2032 | £2,910 | £5,866 |
| 2033 | £2,448 | £5,733 |
| 2034 | £2,080 | £5,608 |
| 2035 | £1,791 | £5,491 |
| **Central Present Value** | **£12,698** | **£28,708** |
| **Total Cost** | | **£41,406** |

10.4 The calculated emissions cost value in Table 14 gives an indication of the potential cost of the development to local air quality over a 5-year period. However, the development will include extensive measures intended to encourage the transition to more sustainable transport options and, therefore, minimise emissions during its operation. See Cass Allen Emissions Mitigation Plan (TN01-23295) for details.

## 11. CONCLUSIONS

11.1 Cass Allen has been instructed by Bellway Strategic to assess the potential air quality impact of a proposed residential-led development at Land West of Storrington Road, Thakeham in West Sussex. The assessment was carried out in accordance with relevant local and national planning policy and guidance.

11.2 Emissions of construction phase dust and $PM_{10}$ were assessed in accordance with IAQM guidance. A High Risk and Medium Risk of dust soiling and $PM_{10}$ health effects has been identified, respectively, in the absence of mitigation. Suitable best practice mitigation measures have been recommended, and no significant residual air quality impacts are expected.

11.3 A detailed atmospheric dispersion model was utilised to predict $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations at relevant sensitive receptor locations within the study area during operational phase. This followed Defra LAQM.TG22 and EPUK & IAQM LUPDC guidance.

11.4 The results indicate that pollutant concentrations at proposed sensitive receptors are expected to be below the relevant AQOs during the operational phase. Furthermore, no significant impacts on local air quality as a result of development-generated traffic are anticipated. Based on the extent of predicted population exposure to $NO_2$, $PM_{10}$ and $PM_{2.5}$ impacts, the overall effect of the development is considered to be 'not significant', with regard to air quality, with no requirement for additional mitigation.

11.5 In summary, it is our view that the site is suitable for the development in terms of air quality and that there are no air quality constraints with respect to planning consent.

# Appendix 1 Air Quality Legislation and Policy

## Legislation

### Defra and the Devolved Administrations (200–) - The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2):

The Air Quality Strategy provides a framework for reducing air pollution in the UK, with the aim of meeting the requirements of European Union (EU) legislation. This has been brought into UK law via the EU (Withdrawal) Act 2018 (as amended) and is referred to as 'retained EU law'.

The air quality standards set within the Air Quality Strategy are recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO), based on current scientific knowledge regarding the effects of each pollutant on health and the environment.

The AQOs are medium-term policy-based targets set by the government, taking into account economic efficiency, practicability, feasibility and timescales. Whilst some of the AQOs correspond with the EPAQS / WHO limits, others have a margin of tolerance, by specifying a number of permitted exceedances of the standard over a given period.

Many of the AQOs in the Air Quality Strategy have been made statutory in England via The Air Quality (England) Regulations, 2000,The Air Quality (England) Amendment Regulations, 2002 and The Air Quality Standards (Amendment) Regulations, 2016 – Statutory Instrument 2016 No. 1184.

### Environmental Protection Act (1990):

Section 79 of the Environmental Protection Act 1990 defines statutory nuisance relevant to dust and particles a':

> 'Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance'; and
>
> 'Any accumulation or deposit which is prejudicial to health or a nuisance'.

Furthermore, Section 80 states that where a statutory nuisance is shown to exist, the Local Authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the Local Authority may abate the nuisance and recover expenses. However, there are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist and nuisance is a subjective concept, its perception being highly dependent upon the existing conditions and the change which has occurred.

### Environment Act (2021):

The Act mandates that local authorities review and document local air quality within their jurisdiction by way of staged appraisals and respond accordingly, with the aim of meeting the AQOs defined in the Regulations. There is a requirement for local authorities to identify relevant sources of emissions that are likely to be responsible for any failure to achieve the AQOs, or to identify relevant sources within neighbouring authorities' areas. Where the objective(s) are not likely to be achieved within the relevant period(s), the authority is required to designate an AQMA. For each AQMA the Local Authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality, in order to work towards achieving air quality standards in the future.

### Defra (2019) Clean Air Strategy:

The UK Government's Clean Air Strategy sets out the comprehensive actions required to improve air quality, required from all parts of government and society.

The primary focus of previous iterations of the Clean Air Strategy has been $NO_2$, and its principal source – road traffic. The 2019 Strategy broadens the focus into other areas, including actions on clean growth and pollutant emissions from other sources such as industry, agriculture, and domestic wood-burning stoves.

## National Policy

NPPF sections relevant to air quality are stated below for planning policy context:

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

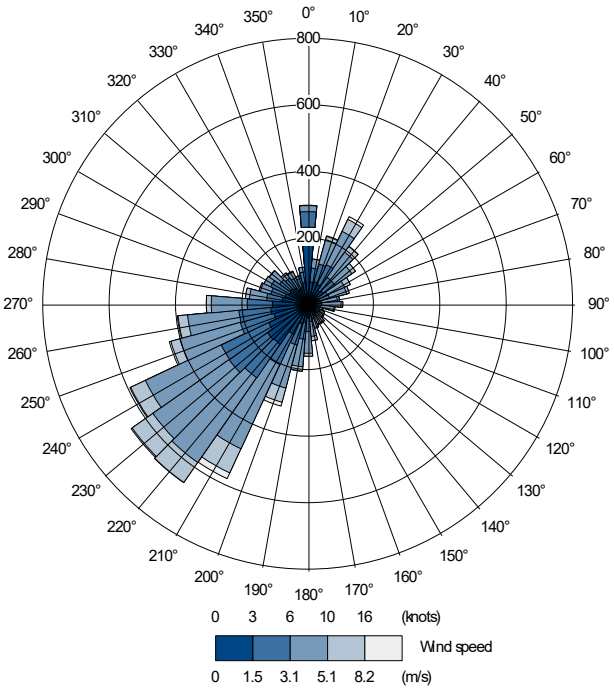
187. *Planning policies and decisions should contribute to and enhance the natural and local environment by: … preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of … air … pollution. Development should, wherever possible, help to improve local environmental conditions such as air … quality.*

198. *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*

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

201. *The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.*

# Appendix 2 Wind Rose for Charlwood (2024)



# Appendix 3 Traffic Data

Traffic data for the dispersion model were obtained from Ardent Consulting Engineers and supplemented with additional data from Department for Transport (DfT) Traffic Counts. Where necessary, traffic data were converted to the appropriate assessment years using a robust factor derived from Defra Trip End Model Presentation Program (TEMPro) (version 8.1).

**2024 Model Verification**

| ID | Description | Road Type | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|---|
| 1 | Site access road | Urban (not London) | - | - | - |
| 2 | B2139 Storrington Road, south of site access road, north of Abingworth Crescent | Urban (not London) | 10 | 3,423 | 8.94 |
| 3 | B2139 Storrington Road, south of Abingworth Crescent, north of Furze Common Road | Urban (not London) | 30 | 3,423 | 8.94 |
| 4 | B2139 Storrington Road, south of Furze Common Road, north of Abingworth Crescent | Urban (not London) | 5 | 3,423 | 8.94 |
| 5 | B2139 Storrington Road, south of Abingworth Crescent, north of Abingworth Hall | Urban (not London) | 30 | 3,423 | 8.94 |
| 6 | B2139 Storrington Road, south of Abingworth Hall | Urban (not London) | 45 | 3,423 | 8.94 |
| 7 | B2139 Storrington Road, north of Crescent Rise | Urban (not London) | 30 | 3,423 | 8.94 |
| 8 | B2139 Storrington Road, south of Crescent Rise, north of Thakeham and Rock Road, junction approach exits | Urban (not London) | 5 | 3,423 | 8.94 |
| 9 | B2139 Thakeham Road, west of Storrington Road junction, east of Water Lane crossroads traffic lights | Urban (not London) | 5 | 2,913 | 8.82 |
| 10 | B2139 Thakeham Road, west of Water Lane crossroads traffic lights, east of Knapweld Chase | Urban (not London) | 5 | 2,913 | 8.82 |
| 11 | B2139 Thakeham Road, west of Knapweld Chase, east of Wisborough Lane | Urban (not London) | 30 | 2,913 | 8.82 |
| 12 | B2139 Thakeham Road onto school hill, west of Wisborough Lane, north of High Street and Man'ey's Hill junction approach/exit | Urban (not London) | 5 | 2,913 | 8.82 |
| 13 | A283 Man'ey's Hill, east of High Street and School Hill junction approach/exit | Urban (not London) | 5 | 18,566 | 2.68 |
| 14 | A283 Man'ey's Hill, west of Heather Way western access | Urban (not London) | 30 | 18,566 | 2.68 |
| 15 | A283 High Street, west of Man'ey's Hill and School Hill junction approach/exit, east of pedestrian crossing | Urban (not London) | 5 | 18,007 | 1.45 |
| 16 | A283 High Street, west of pedestrian crossing, east of North Street/West Street junction | Urban (not London) | 5 | 18,007 | 1.45 |
| 17 | A283 West Street, west of North Street/West Street junction, east of West Street pedestrian crossing | Urban (not London) | 5 | 18,007 | 1.45 |
| 18 | A283 West Street, west of West Street pedestrian crossing, east of Rectory Road | Urban (not London) | 5 | 18,007 | 1.45 |
| 19 | A283 West Street, west of Rectory Road, east of Pulborough and Amberley Road pedestrian crossing | Urban (not London) | 15 | 18,007 | 1.45 |
| 20 | A283 West Street, west of Pulborough and Amberley Road junction crossing, east of Pulborough and Amberley Road junction | Urban (not London) | 5 | 18,007 | 1.45 |

| ID | Description | Road Type | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|---|
| 21 | A283 Pulborough Road, west of West Street and Amberley Road junction, east of Reed Close | Urban (not London) | 5 | 7,853 | 2.70 |
| 22 | A283 Pulborough Road, west of Reed Close, east of Spierbridge Road/Pulborough Road junction | Urban (not London) | 5 | 7,853 | 2.70 |
| 23 | A283 Pulborough Road, west of Spierbridge Road/Pulborough Road junction, east of The Laurels | Urban (not London) | 5 | 7,853 | 2.70 |
| 24 | A283 Pulborough Road, west of The Laurels, east of Hormare Cottage | Urban (not London) | 30 | 7,853 | 2.70 |
| 25 | B2139 Storrington Road, north of site access road | Urban (not London) | 5 | 3,423 | 8.94 |
| 26 | B2139 Storrington Road/Dukes Hill, north of The Street junction, south of National speed limit sign | Urban (not London) | 50 | 3,423 | 8.94 |
| 27 | B2139 Dukes Hill, north of National speed limit sign, south of B2133 Goosegreen Lane | Urban (not London) | 80 | 3,423 | 8.94 |
| 28 | B1239 Amberley Road, west of Monastery Lane, junction approach/exit, east of The Willows | Urban (not London) | 5 | 10,154 | 0.49 |
| 29 | B1239 Amberley Road west of The Willows, east of Fern Road | Urban (not London) | 30 | 10,154 | 0.49 |

**2031 Without Development**

| ID | Description | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|
| 1 | Site access road | - | - | - |
| 2 | B2139 Storrington Road, south of site access road, north of Abingworth Crescent | 10 | 3,620 | 8.95 |
| 3 | B2139 Storrington Road, south of Abingworth Crescent, north of Furze Common Road | 30 | 3,620 | 8.95 |
| 4 | B2139 Storrington Road, south of Furze Common Road, north of Abingworth Crescent | 5 | 3,620 | 8.95 |
| 5 | B2139 Storrington Road, south of Abingworth Crescent, north of Abingworth Hall | 30 | 3,620 | 8.95 |
| 6 | B2139 Storrington Road, south of Abingworth Hall | 45 | 3,620 | 8.95 |
| 7 | B2139 Storrington Road, north of Crescent Rise | 30 | 3,620 | 8.95 |
| 8 | B2139 Storrington Road, south of Crescent Rise, north of Thakeham and Rock Road, junction approach exits | 5 | 3,620 | 8.95 |
| 9 | B2139 Thakeham Road, west of Storrington Road junction, east of Water Lane crossroads traffic lights | 5 | 3,081 | 8.83 |
| 10 | B2139 Thakeham Road, east of Water Lane crossroads traffic lights, west of Knapweld Chase | 5 | 3,081 | 8.83 |
| 11 | B2139 Thakeham Road, east of Knapweld Chase, west of Wisborough Lane | 30 | 3,081 | 8.83 |
| 12 | B2139 Thakeham Road onto school hill, east of Wisborough Lane, north of High Street and Manley's Hill junction approach/exit | 5 | 3,081 | 8.83 |
| 13 | A283 Manley's Hill, east of High Street and School Hill junction approach/exit | 5 | 19,634 | 2.68 |
| 14 | A283 Manley's Hill, west of Heather Way western access | 30 | 19,634 | 2.68 |
| 15 | A283 High Street, west of Manley's Hill and School Hill junction approach/exit, east of pedestrian crossing | 5 | 19,044 | 1.45 |

| ID | Description | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|
| 16 | A283 High Street, west of pedestrian crossing, east of North Street/West Street junction | 5 | 19,044 | 1.45 |
| 17 | A283 West Street, west of North Street/West Street junction, east of West Street pedestrian crossing | 5 | 19,044 | 1.45 |
| 18 | A283 West Street, west of West Street pedestrian crossing, east of Rectory Road | 5 | 19,044 | 1.45 |
| 19 | A283 West Street, west of Rectory Road, east of Pulborough and Amberly Road pedestrian crossing | 15 | 19,044 | 1.45 |
| 20 | A283 West Street, west of Pulborough and Amberly Road junction crossing, east of Pulborough and Amberly Road junction | 5 | 19,044 | 1.45 |
| 21 | A283 Pulborough Road, west of West Street and Amberly Road junction, east of Reed Close | 5 | 8,175 | 2.70 |
| 22 | A283 Pulborough Road, west of Reed Close, east of Spierbridge Road/Pulborough Road junction | 5 | 8,175 | 2.70 |
| 23 | A283 Pulborough Road, west of Spierbridge Road/Pulborough Road junction, east of The Laurels | 5 | 8,175 | 2.70 |
| 24 | A283 Pulborough Road, west of The Laurels, east of Hormare Cottage | 30 | 8,175 | 2.70 |
| 25 | B2139 Storrington Road, north of site access road | 5 | 3,620 | 8.95 |
| 26 | B2139 Storrington Road/Dukes Hill, north of The Street junction, south of National speed limit sign | 50 | 3,620 | 8.95 |
| 27 | B2139 Dukes Hill, north of National speed limit sign, south of B2133 Goosegreen Lane | 80 | 3,620 | 8.95 |
| 28 | B1239 Amberley Road, west of Monastery Lane, junction approach/exit, east of The Willows | 5 | 10,570 | 0.49 |
| 29 | B1239 Amberley Road west of The Willows, east of Fern Road | 30 | 10,570 | 0.49 |

**2031 With Development**

| ID | Description | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|
| 1 | Site access road | 5 | 999 | 1.7 |
| 2 | B2139 Storrington Road, south of site access road, north of Abingworth Crescent | 10 | 4,149 | 8.03 |
| 3 | B2139 Storrington Road, south of Abingworth Crescent, north of Furze Common Road | 30 | 4,149 | 8.03 |
| 4 | B2139 Storrington Road, south of Furze Common Road, north of Abingworth Crescent | 5 | 4,149 | 8.03 |
| 5 | B2139 Storrington Road, south of Abingworth Crescent, north of Abingworth Hall | 30 | 4,149 | 8.03 |
| 6 | B2139 Storrington Road, south of Abingworth Hall | 45 | 4,149 | 8.03 |
| 7 | B2139 Storrington Road, north of Crescent Rise | 30 | 4,149 | 8.03 |
| 8 | B2139 Storrington Road, south of Crescent Rise, north of Thakeham and Rock Road, junction approach exits | 5 | 4,149 | 8.03 |
| 9 | B2139 Thakeham Road, west of Storrington Road junction, east of Water Lane crossroads traffic lights | 5 | 3,413 | 8.12 |
| 10 | B2139 Thakeham Road, east of Water Lane crossroads traffic lights, west of Knapweld Chase | 5 | 3,413 | 8.12 |
| 11 | B2139 Thakeham Road, east of Knapweld Chase,west of Wisborough Lane | 30 | 3,413 | 8.12 |

| ID | Description | Speed (km/h) | AADT | %HDV |
|---|---|---|---|---|
| 12 | B2139 Thakeham Road onto school hill, east of Wisborough Lane, north of High Street and Manley's Hill junction approach/exit | 5 | 3,413 | 8.12 |
| 13 | A283 Manley's Hill, east of High Street and School Hill junction approach/exit | 5 | 19,650 | 2.68 |
| 14 | A283 Manley's Hill, west of Heather Way western access | 30 | 19,650 | 2.68 |
| 15 | A283 High Street, west of Manley's Hill and School Hill junction approach/exit, east of pedestrian crossing | 5 | 19,185 | 1.45 |
| 16 | A283 High Street, west of pedestrian crossing, east of North Street/West Street junction | 5 | 19,185 | 1.45 |
| 17 | A283 West Street, west of North Street/West Street junction, east of West Street pedestrian crossing | 5 | 19,185 | 1.45 |
| 18 | A283 West Street, west of West Street pedestrian crossing, east of Rectory Road | 5 | 19,185 | 1.45 |
| 19 | A283 West Street, west of Rectory Road, east of Pulborough and Amberly Road pedestrian crossing | 15 | 19,185 | 1.45 |
| 20 | A283 West Street, west of Pulborough and Amberly Road junction crossing, east of Pulborough and Amberly Road junction | 5 | 19,185 | 1.45 |
| 21 | A283 Pulborough Road, west of West Street and Amberly Road junction, east of Reed Close | 5 | 8,236 | 2.70 |
| 22 | A283 Pulborough Road, west of Reed Close, east of Spierbridge Road/Pulborough Road junction | 5 | 8,236 | 2.70 |
| 23 | A283 Pulborough Road, west of Spierbridge Road/Pulborough Road junction, east of The Laurels | 5 | 8,236 | 2.70 |
| 24 | A283 Pulborough Road, west of The Laurels, east of Hormare Cottage | 30 | 8,236 | 2.70 |
| 25 | B2139 Storrington Road, north of site access road | 5 | 4,090 | 8.12 |
| 26 | B2139 Storrington Road/Dukes Hill, north of The Street junction, south of National speed limit sign | 50 | 4,090 | 8.12 |
| 27 | B2139 Dukes Hill, north of National speed limit sign, south of B2133 Goosegreen Lane | 80 | 4,090 | 8.12 |
| 28 | B1239 Amberley Road, west of Monastery Lane, junction approach/exit, east of The Willows | 5 | 10,650 | 0.49 |
| 29 | B1239 Amberley Road west of The Willows, east of Fern Road | 30 | 10,650 | 0.49 |

# Appendix 4 Dispersion Model Details

**Model Details and Input Parameters**

| Parameter | Value |
|---|---|
| Emissions Factors | Defra Emissions Factors Toolkit (EFT) v13.1 using the traffic data in Appendix 3 |
| Emissions Year | 2024 for verification, 2029* for future scenarios |
| Background Concentrations | Defra maps – 2024 for verification, 2029* for future scenarios |
| Surface Roughness | Site – 0.5m; Meteorological Station – 0.2m |
| Monin-Obukhov Length | Site – 10m; Meteorological Station – 10m |
| Meteorological Data | Hourly sequential, Charlwood (2024) |
| Road-contribution Adjustment Factor | $NO_x$: 1.38<br>$PM_{10}$: 2.23<br>$PM_{2.5}$: 2.50<br>See Model Verification, below |
| $NO_x$ to $NO_2$ conversion | Defra $NO_x$ to $NO_2$ Calculator v9.1 and Defra-mapped background concentrations |

* Robust 2029 data were used for the 2031 future scenarios to account for uncertainty with a more distant opening year. It is expected that emission rates and background concentrations will improve with time, therefore using an earlier future year provides robust estimates within the modelling exercise.

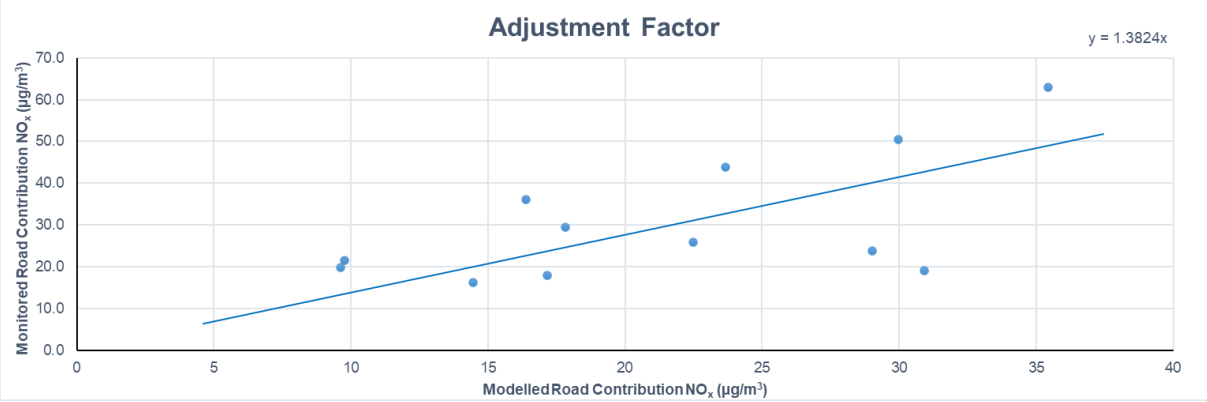
**$NO_x$ Model Verification**

The model has been verified using the LAQM.TG22 methodology. The model has been used to predict 2024 annual mean road-$NO_x$ contributions at roadside monitoring locations within the study area. The modelled road-$NO_x$ concentrations have been compared with the 'measured' road-$NO_x$ utilising the Defra $NO_x$ to $NO_2$ Calculator. As the model was shown to underpredict, this verification factor has been applied to the assessment results.

2024 Model Verification (all concentrations in µg/m$^3$)

| Monitor ID | Monitored $NO_2$ | Background $NO_2$ | Monitored Road $NO_x$ | Modelled Road $NO_x$ | Ratio |
|---|---|---|---|---|---|
| 1 | 28.6 | 7.5 | 50.5 | 30.0 | 1.686 |
| 3 | 19.3 | 7.5 | 26.0 | 22.5 | 1.155 |
| 4 | 23.3 | 7.5 | 36.0 | 16.4 | 2.197 |
| 5 | 16.4 | 7.5 | 19.1 | 30.9 | 0.618 |
| 6 | 15.9 | 7.5 | 18.0 | 17.2 | 1.047 |
| 8, 9, 10n AURN | 17.3 | 7.4 | 21.5 | 9.8 | 2.199 |
| 11n | 20.7 | 7.5 | 29.4 | 17.8 | 1.648 |
| 13n | 18.4 | 7.5 | 23.8 | 29.0 | 0.820 |
| 14.1 | 26.1 | 7.4 | 43.8 | 23.7 | 1.851 |
| 16n | 15.1 | 7.5 | 16.2 | 14.4 | 1.118 |
| 19n | 32.7 | 7.5 | 62.9 | 35.4 | 1.776 |
| HO4 | 16.6 | 7.4 | 19.9 | 9.6 | 2.064 |

Comparison of Measured Road-$NO_x$ with Modelled Road $NO_x$




Calculation of Model Uncertainty

To assess model uncertainty, the Root Mean Square Error (RMSE) of the above data was calculated to provide an estimate of the average error of the model. The overall weighted RMSE value calculated following model verification was 4.54µg/m$^3$ (11.35%) which is within the acceptable range specified in LAQM.TG22.

**PM Model Verification**

The model has been verified using the LAQM.TG22 methodology. The model has been used to predict 2024 annual mean road-$PM_{10}$ and $PM_{2.5}$ contributions at the HO4 automatic monitor. The modelled PM results have been compared with the 'measured' PM concentrations. As the model was shown to underpredict for these pollutants, the verification factors have been applied to $PM_{10}$ and $PM_{2.5}$ assessment results, respectively.

Model Verification (all concentrations in µg/m$^3$)

| Pollutant | Monitor ID | Monitored PM | Background PM | Monitored Road PM | Modelled Road PM | Ratio |
|---|---|---|---|---|---|---|
| $PM_{10}$ | HO4 | 12.6 | 10.0 | 2.6 | 1.2 | 2.225 |
| $PM_{2.5}$ | | 7.7 | 6.1 | 1.6 | 0.6 | 2.504 |

# Appendix 5 Operational Phase Significance Criteria

| Long Term Average Concentration at Receptors in Assessment Year | % Change in Concentration Relative to Air Quality Objective (AQO) | | | |
|---|---|---|---|---|
| | 1 | 2 – 5 | 6 – 10 | >10 |
| 75% or less of AQO | Negligible | Negligible | Slight | Moderate |
| 76 - 94% of AQO | Negligible | Slight | Moderate | Moderate |
| 95 - 102% of AQO | Slight | Moderate | Moderate | Substantial |
| 103 - 109% of AQO | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQO | Moderate | Substantial | Substantial | Substantial |

**Notes:**

- The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
- The Table is only designed to be used with annual mean concentrations.
- Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
- The total concentration categories reflect the degree of potential harm by reference to the AQO value. At exposure less than 75% of this value, i.e. 'well below', the degree of harm is likely to be small. As the exposure approaches and exceeds the AQO, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQO.
- It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQO. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQO, rather than being exactly equal to it.
- When defining the concentration as a percentage of the AQO, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase. Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.
- LUPDC states that an assessment must reach a conclusion on the likely significance of the predicted effect. It should be noted that this is a binary judgement of either it is significant, or it is not significant.

# Appendix 6 Recommended Construction Phase Mitigation

**Mitigation Measures for High Risk Sites**

**General Communication**

- Prior to work commencing on each phase of development, the developer will inform the local community on works due to commence and a point of contact provided for construction-related queries.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.
- Display the head or regional office contact information, where applicable.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this Appendix. Further, 'desirable' measures from IAQM guidance should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time $PM_{10}$ continuous monitoring and/or visual inspections.

**Site Management**

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
- Make complaints log available to the Local Authority on request.
- Record any exceptional incidents that cause dust and/or air emissions, either on or off-site should be recorded, and the action taken to resolve the situation, in the logbook.
- Hold regular liaison meetings with other major / high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

**Monitoring**

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time $PM_{10}$ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

**Preparing and Maintaining the Site**

- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on-site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on-site. If they are being reused on-site cover as described below.

- Cover, seed or fence stockpiles to prevent wind whipping.

**Operating Vehicle/Machinery and Sustainable Travel**

- Ensure all vehicle operators switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

**Operations**

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply is available on the site for effective dust/PM suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes/conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on-site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

**Waste Management**

- Avoid bonfires and burning of waste materials.

**Measures Specific to Demolition**

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

**Measures Specific to Earthworks**

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

**Measures Specific to Construction**

- Avoid scabbling (roughening of concrete surfaces), if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case make sure that that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

**Measures Specific to Trackout**

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.

- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors, where possible.

# Appendix 7 Dispersion Model Results

**Annual Mean $NO_2$ Impacts**

| Receptor | Without (µg/m³) | With (µg/m³) | With % of AQO | Change (µg/m³) | Change (% AQO) | Impact Descriptor |
|---|---|---|---|---|---|---|
| R1 | 10.8 | 11.1 | 27.8 | 0.3 | 0.6 | Negligible |
| R2 | 8.3 | 8.5 | 21.2 | 0.1 | 0.4 | Negligible |
| R3 | 7.8 | 8.0 | 20.0 | 0.2 | 0.5 | Negligible |
| R4 | 8.4 | 8.6 | 21.5 | 0.2 | 0.6 | Negligible |
| R5 | 13.4 | 13.9 | 34.6 | 0.4 | 1.1 | Negligible |
| R6 | 8.2 | 8.3 | 20.8 | 0.2 | 0.4 | Negligible |
| R7 | 12.1 | 12.4 | 30.9 | 0.3 | 0.8 | Negligible |
| R8 | 16.8 | 17.3 | 43.3 | 0.5 | 1.3 | Negligible |
| R9 | 8.6 | 8.7 | 21.9 | 0.1 | 0.2 | Negligible |
| R10 | 9.4 | 9.6 | 23.9 | 0.2 | 0.4 | Negligible |
| R11 | 8.7 | 8.8 | 21.9 | 0.1 | 0.3 | Negligible |
| R12 | 9.2 | 9.3 | 23.4 | 0.2 | 0.4 | Negligible |
| R13 | 19.1 | 19.4 | 48.5 | 0.3 | 0.9 | Negligible |
| R14 | 11.2 | 11.2 | 28.0 | <0.1 | 0.1 | Negligible |
| R15 | 10.3 | 10.3 | 25.8 | <0.1 | 0.1 | Negligible |
| R16 | 9.7 | 9.7 | 24.3 | <0.1 | 0.1 | Negligible |
| R17 | 23.2 | 23.3 | 58.2 | 0.1 | 0.2 | Negligible |
| R18 | 9.3 | 9.3 | 23.2 | <0.1 | <0.1 | Negligible |
| R19 | 14.6 | 14.7 | 36.8 | 0.1 | 0.1 | Negligible |
| R20 | 15.9 | 16.0 | 39.9 | 0.1 | 0.2 | Negligible |
| R21 | 17.2 | 17.2 | 43.1 | 0.1 | 0.2 | Negligible |
| R22 | 25.4 | 25.5 | 63.7 | 0.1 | 0.2 | Negligible |
| R23 | 25.3 | 25.4 | 63.6 | 0.1 | 0.2 | Negligible |

Note: Results are reported to the nearest 0.1µg/m³. Any apparent discrepancies in results are due to rounding.

**Annual Mean $PM_{10}$ Impacts**

| Receptor | Without (µg/m³) | With (µg/m³) | With % of AQO | Change (µg/m³) | Change (% AQO) | Impact Descriptor |
|---|---|---|---|---|---|---|
| R1 | 11.1 | 11.2 | 28.0 | 0.1 | 0.3 | Negligible |
| R2 | 10.6 | 10.6 | 26.5 | 0.1 | 0.1 | Negligible |
| R3 | 10.7 | 10.8 | 26.9 | 0.1 | 0.3 | Negligible |
| R4 | 10.9 | 11.0 | 27.5 | 0.1 | 0.3 | Negligible |
| R5 | 12.0 | 12.2 | 30.6 | 0.2 | 0.6 | Negligible |
| R6 | 10.6 | 10.7 | 26.7 | 0.1 | 0.2 | Negligible |
| R7 | 11.1 | 11.2 | 28.0 | 0.2 | 0.4 | Negligible |
| R8 | 12.1 | 12.4 | 30.9 | 0.3 | 0.7 | Negligible |
| R9 | 10.3 | 10.3 | 25.8 | 0.1 | 0.1 | Negligible |
| R10 | 10.7 | 10.8 | 27.0 | 0.1 | 0.2 | Negligible |
| R11 | 11.0 | 11.1 | 27.7 | 0.1 | 0.2 | Negligible |

| Receptor | Without (µg/m³) | With (µg/m³) | With % of AQO | Change (µg/m³) | Change (% AQO) | Impact Descriptor |
|---|---|---|---|---|---|---|
| R12 | 11.5 | 11.6 | 29.0 | 0.1 | 0.3 | Negligible |
| R13 | 13.2 | 13.4 | 33.5 | 0.2 | 0.5 | Negligible |
| R14 | 11.6 | 11.6 | 29.0 | <0.1 | 0.1 | Negligible |
| R15 | 11.2 | 11.3 | 28.2 | <0.1 | <0.1 | Negligible |
| R16 | 11.1 | 11.1 | 27.7 | <0.1 | <0.1 | Negligible |
| R17 | 17.6 | 17.6 | 44.0 | 0.1 | 0.1 | Negligible |
| R18 | 10.9 | 10.9 | 27.3 | <0.1 | <0.1 | Negligible |
| R19 | 13.6 | 13.6 | 34.0 | <0.1 | 0.1 | Negligible |
| R20 | 14.0 | 14.1 | 35.1 | <0.1 | 0.1 | Negligible |
| R21 | 14.6 | 14.6 | 36.6 | <0.1 | 0.1 | Negligible |
| R22 | 17.3 | 17.4 | 43.4 | 0.1 | 0.1 | Negligible |
| R23 | 17.2 | 17.2 | 43.1 | 0.1 | 0.1 | Negligible |

Note: Results are reported to the nearest 0.1µg/m³. Any apparent discrepancies in results are due to rounding.

**Annual Mean $PM_{2.5}$ Impacts**

| Receptor | Without (µg/m³) | With (µg/m³) | With % of AQO | Change (µg/m³) | Change (% AQO) | Impact Descriptor |
|---|---|---|---|---|---|---|
| R1 | 6.2 | 6.3 | 31.5 | 0.1 | 0.3 | Negligible |
| R2 | 5.9 | 5.9 | 29.7 | <0.1 | 0.2 | Negligible |
| R3 | 6.1 | 6.1 | 30.6 | 0.1 | 0.3 | Negligible |
| R4 | 6.2 | 6.3 | 31.3 | 0.1 | 0.4 | Negligible |
| R5 | 6.9 | 7.0 | 35.0 | 0.1 | 0.7 | Negligible |
| R6 | 6.0 | 6.1 | 30.3 | <0.1 | 0.2 | Negligible |
| R7 | 6.5 | 6.6 | 32.9 | 0.1 | 0.4 | Negligible |
| R8 | 7.1 | 7.3 | 36.3 | 0.2 | 0.8 | Negligible |
| R9 | 6.2 | 6.2 | 31.1 | <0.1 | 0.2 | Negligible |
| R10 | 6.5 | 6.5 | 32.5 | 0.1 | 0.3 | Negligible |
| R11 | 6.6 | 6.7 | 33.3 | 0.1 | 0.3 | Negligible |
| R12 | 6.9 | 7.0 | 34.9 | 0.1 | 0.4 | Negligible |
| R13 | 8.0 | 8.2 | 40.8 | 0.1 | 0.5 | Negligible |
| R14 | 7.0 | 7.1 | 35.3 | <0.1 | 0.1 | Negligible |
| R15 | 6.8 | 6.8 | 34.2 | <0.1 | 0.1 | Negligible |
| R16 | 6.7 | 6.7 | 33.6 | <0.1 | <0.1 | Negligible |
| R17 | 10.6 | 10.6 | 53.1 | <0.1 | 0.2 | Negligible |
| R18 | 6.6 | 6.6 | 33.2 | <0.1 | <0.1 | Negligible |
| R19 | 8.2 | 8.2 | 41.2 | <0.1 | 0.1 | Negligible |
| R20 | 8.5 | 8.5 | 42.5 | <0.1 | 0.1 | Negligible |
| R21 | 8.8 | 8.8 | 44.2 | <0.1 | 0.1 | Negligible |
| R22 | 10.4 | 10.5 | 52.4 | <0.1 | 0.2 | Negligible |
| R23 | 10.4 | 10.4 | 52.1 | <0.1 | 0.2 | Negligible |

Note: Results are reported to the nearest 0.1µg/m³. Any apparent discrepancies in results are due to rounding.

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## Architectural & Environmental Consultants

## Noise | Vibration | Air Quality

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