Chapter 8: Air Quality

AIR QUALITY	
AUTHOR	Air Quality Consultants (AQC) Ltd
SUPPORTING APPENDIX	***ES Volume 3, Appendix: Air Quality***: Annex 1: EPUK & IAQM Planning for Air Quality Guidance; Annex 2: Professional Experience Annex 3: Modelling Methodology; Annex 4: Construction Dust Assessment Procedure; Annex 5: Energy Plant Specifications; Annex 6: Construction Mitigation; Annex 7: Legislative and Planning Policy Context; Annex 8: Technical Appendices References; Annex 9: Glossary.
KEY CONSIDERATIONS	Woking Borough Council (WBC) has declared two Air Quality Management Areas (AQMAs), one of which (AQMA Order 2) is located approximately 560m to the northwest of the Proposed Development. Woking AQMA Order 2 was declared due to the exceedances of the annual mean nitrogen dioxide (NO_2) objective. Activities associated with the demolition and construction works of the Proposed Development will give rise to a risk of dust impacts at existing sensitive receptors during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. A qualitative construction dust risk assessment has thus been carried out. In addition, the potential for construction vehicles to impact upon local air quality has been qualitatively considered. During the operational phase, the Proposed Development will lead to changes in vehicle flows on local roads, which may impact on air quality at existing sensitive properties. The proposed residential apartments will also be subject to the impacts of road traffic emissions from the adjacent road network. The main air pollutants of concern related to road traffic emissions are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$). The proposals include five gas-fired boiler plant units, as well as five emergency diesel generators, the emissions from which could impact upon air quality at existing sensitive properties, as well as at the residential apartments within the development itself. The main air pollutant of concern related to boiler plant is NO_2, whilst for diesel generators, the main pollutants of concern are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$). The Egley Road scheme will also lead to changes in vehicle flows on local roads both during the construction and operational phases, and will contain centralised energy plant (a gas-fired Combined Heat and Power (CHP) unit and three condensing gas-fired boilers), the emissions from which may also impact on air quality at existing sensitive properties in combination with the Proposed Development. The assessment therefore considers the impacts of NO_2, PM_{10} and $PM_{2.5}$ emissions associated with the Proposed Development both in isolation and in combination with emissions associated with the Egley Road scheme. In terms of the potential air quality effects, the assessment will consider: • The impacts of the demolition and construction phase of the Proposed Development on dust soiling and concentrations of PM_{10} at existing sensitive receptors during the construction period; • The impact of the construction of the Proposed Development, both in isolation and in combination with the Egley Road scheme, on concentrations of NO_2, PM_{10} and $PM_{2.5}$ from heavy duty construction traffic; • The impacts of the operation of the Proposed Development on concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of road traffic emissions, at existing local sensitive receptors, in the proposed year of opening; • The impacts of the operation of the Proposed Development energy plant on concentrations of NO_2 at existing local sensitive receptors in the proposed year of opening; • Operational impacts are considered both in isolation and in combination with the Egley Road scheme; and • The impacts of existing and proposed emission sources of NO_2, PM_{10} and $PM_{2.5}$ on future residents and users of the Proposed Development.
CONSULTATION	The EIA Scoping Opinion is presented in ***ES Volume 3, Appendix: EIA Methodology (Annex 3)*** which confirmed acceptability of the scope and method proposed for the air quality assessment.

ASSESSMENT METHODOLOGY

Assessment Criteria

8.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations 2000[1] and the Air Quality (England) (Amendment) Regulations 2002[2].

8.2 The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour NO_2 objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 [3]. Where relevant, this value has been used as an indication of the likelihood of the 1-hour mean NO_2 objective to be exceeded in the study area. Measurements have also shown that the 24-hour PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3 [3]. The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m^3 it is unlikely that the 24-hour mean objective will be exceeded.

8.3 The European Union has also set limit values for NO_2, PM_{10} and $PM_{2.5}$. The limit values for NO_2 are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one[4]. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

8.4 The relevant air quality criteria for this assessment are provided in Table 8.1.

Table 8.1 Air Quality Criteria for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40 µg/m^3 [a]
Fine Particles (PM_{10})	24-hour mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40 µg/m^3 [b]
Fine Particles ($PM_{2.5}$)[c]	Annual mean	25 µg/m^3

[a] A proxy value of 60 µg/m^3 as an annual mean can be used to assess the likelihood of the 1-hour mean NO_2 objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 1-hour mean NO_2 objective are possible[3]

[b] A proxy value of 32 µg/m^3 as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible[3]

[c] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Screening Criteria

Road Traffic

8.5 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)[5] recommend a two-stage screening approach to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in ***ES Volume 3, Appendix: Air Quality (Annex 1)***, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m^2 of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking

[1] The Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000), HMSO, Available: http://www.legislation.gov.uk/uksi/2000/928/contents/made.
[2] The Air Quality (England) (Amendment) Regulations, 2002, Statutory Instrument 3043 (2002), HMSO, Available: https://www.legislation.gov.uk/uksi/2002/3043/contents/made.
[3] Defra (2018) Review & Assessment: Technical Guidance LAQM.TG16 February 2018 Version, Defra, Available: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf.
[4] European Parliament and the Council of the European Union (2008) Directive 2008/50/EC of the European Parliament and of the Council, Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0050.
[5] Moorcroft and Barrowcliffe et al (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2, IAQM, London, Available: http://iaqm.co.uk/guidance/.

spaces, then there is no need to progress to a detailed assessment. The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. Where these criteria are exceeded, a detailed assessment is required, although the guidance advises that "*the criteria provided are precautionary and should be treated as indicative*", and "*it may be appropriate to amend them on the basis of professional judgement*".

Point Source

8.6 EPUK and the IAQM have developed an approach[5] to determine whether emissions from point sources, such as energy plant, have the potential for significant air quality impacts. The first step of the approach, as described in ***ES Volume 3, Appendix: Air Quality (Annex 1)***, is to screen the emissions and the emissions parameters to determine whether an assessment is necessary:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

8.7 This screening approach requires professional judgement, and the experience of the consultants preparing the assessment is set out in ***ES Volume 3, Appendix: Air Quality (Annex 2)***.

8.8 If it is determined that an assessment of the point source emissions is required then there is a further stage of screening that can be applied to the model outputs. The approach is that any change in concentration smaller than 0.5% of the long-term environmental standard will be *negligible*, regardless of the existing air quality conditions. Any change smaller than 1.5% of the long-term environmental standard will be *negligible* so long as the total concentration is less than 94% of the standard and any change smaller than 5.5% of the long-term environmental standard will be *negligible* so long as the total concentration is less than 75% of the standard. The guidance also explains that:

"Where peak short-term concentrations (those averaged over periods of an hour or less) from an elevated source are in the range 11-20% of the relevant Air Quality Assessment Level (AQAL), then their magnitude can be described as small, those in the range 21-50% medium and those above 51% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other local sources".

8.9 As a first step, the assessment of the emissions from the energy plant within the Proposed Development has considered the predicted process contributions using the following criteria:

- Is the long-term (annual mean) process contribution less than 0.5% of the long-term environmental standard?; and
- Is the short-term (24-hour mean or shorter) process contribution less than 10% of the short-term environmental standard?

8.10 Where both of these criteria are met, then the impacts are negligible and thus 'not significant'. Where these criteria are breached then a more detailed assessment, considering total concentrations (incorporating local baseline conditions), has been provided.

Defining the Baseline

Current Baseline Conditions

8.11 Existing sources of emissions within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register[6]. Local sources have also been identified through examination of the WBC's Air Quality Review and Assessment reports.

8.12 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. Background concentrations have been defined using the national pollution maps published by Defra[7]. These cover the whole country on a 1x1 km grid.

8.13 Exceedances of the annual mean EU limit value for NO_2 in the study area have been identified using the maps of roadside concentrations published by Defra[8]. These are the maps used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to EU data quality standards AURN results, to report exceedances of the limit value to the EU. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations[9], which are available for the years 2009 to 2017, show no exceedances of the limit values anywhere in the UK in 2017.

8.14 Current baseline concentrations have also been modelled using the ADMS-Roads dispersion model. Details of the model inputs, assumptions and the verification are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***, together with the method used to derive baseline year background concentrations. Where assumptions have been made, a realistic worst-case approach has been adopted.

Future Baseline Conditions

8.15 Future baseline concentrations have been predicted using the ADMS-Roads dispersion model. Details of the model inputs, assumptions and the verification are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***, together with the method used to derive future year background concentrations. Where assumptions have been made, a realistic worst-case approach has been adopted.

Likely Evolution of the Baseline Conditions

8.16 If the Proposed Development was not to come forward, it is expected that the site would remain in its current state. Air quality is generally expected to improve with time, due for example to more stringent emissions standards for motor vehicles. The likely evolution of the baseline conditions if the Proposed Development did not come forward has been considered in this assessment.

Impact Assessment Methodology

8.17 The Applicant, in addition to the Proposed Development, is seeking detailed planning application for a separate scheme known as the Egley Road site. This scheme consists of a David Lloyd Leisure Centre and residential properties, and is situated approximately 1.3 km to the southwest of the Proposed Development site. Although two separate planning applications are submitted, this assessment has also considered the combined impacts that the Proposed Development and Egley Road scheme would have on air quality during their construction and operational phases. The Egley Road scheme will lead to additional construction vehicles on local roads, as well as to additional road traffic and energy plant emissions when operational. Such emissions have the potential to affect existing sensitive receptors also affected by the Proposed Development (for example, alongside roads where both developments lead to an increase in traffic). Therefore, in addition to considering the impacts associated with the Proposed Development in isolation, this assessment has also considered or quantified the combined impacts of Egley Road scheme's emissions with those associated with the Proposed Development.

Demolition and Construction

8.18 The demolition and construction dust assessment considers the potential for impacts within 350 m of the site boundary; or within 50 m of roads used by construction vehicles. The assessment methodology follows the IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction'[10]. This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there

[6] Defra (2019) UK Pollutant Release and Transfer Register, [Online], Available: prtr.defra.gov.uk.
[7] Defra (2019) Local Air Quality Management (LAQM) Support Website, [Online], Available: http://laqm.defra.gov.uk/.
[8] Defra (2019) 2019 NO_2 projections data (2017 reference year), [Online], Available: https://uk-air.defra.gov.uk/library/no2ten/2019-no2-pm-projections-from-2017-data
[9] Defra (2019) UK Ambient Air Quality Interactive Map, [Online], Available: https://uk-air.defra.gov.uk/data/gis-mapping.
[10] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1, Available: http://iaqm.co.uk/guidance/.

should be no significant effects. ***ES Volume 3, Appendix: Air Quality (Annex 4)*** explains the approach in more detail.

8.19 It has been confirmed that the demolition and construction works associated with the Proposed Development will generate a maximum of 78 Heavy Duty Vehicle (HDV) Annual Average Daily Traffic (AADT) along roads within the study area, and these vehicles will not pass through the nearby AQMA (AQMA Order 2). When construction traffic generated by both the Proposed Development and the Egley Road scheme are considered, the maximum additional HDVs along any one road within the study area is still 78 AADT (none of which will pass through the AQMA), as the traffic generated by the two sites will disperse along different roads within the study area. EPUK & IAQM[5] consider that a detailed assessment is required where a development leads to an increase in HDVs of more than 100 AADT outside an AQMA, or 25 AADT within an AQMA; this will not be the case for the Proposed Development, either in isolation or in combination with the Egley Road scheme, therefore, the increase in HDV traffic associated with the construction works is not anticipated to lead to significant air quality effects, and does not warrant further assessment.

Assumptions and Limitations

8.20 Assumptions regarding the magnitude of construction dust emissions have been made based on the size of the Proposed Development (including site area and the number, size and height of the proposed buildings), taking into consideration the IAQM guidance.

Completed Development

8.21 Once operational, the Proposed Development will lead to an increase in traffic on the local roads, which may affect air quality at existing sensitive properties. Emissions associated with road traffic on local roads may also impact on air quality for future occupants and users of the Proposed Development itself. The main air pollutants of concern related to traffic emissions are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$). Emissions associated with the proposed back-up boiler plant and emergency diesel generators could also impact on air quality at existing and new properties. The main air pollutant of concern related to gas-fired plant emissions is NO_2, whilst for diesel generators, the main pollutants of concerns are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$). An assessment of the operational impacts that the Proposed Development will have on concentrations of these pollutants has been carried-out following the methodology presented below.

8.22 The Proposed Development is predicted to be fully completed and operational in 2025, with Block 1 completed and occupied from mid-2021, the stadium completed and operational from mid-2023, Blocks 2 and 3 completed and occupied in the second half of 2024 and Blocks 4 and 5 completed and occupied in 2025. However, to present a conservative assessment, emissions associated with a fully completed and operational development were modelled for the year of first occupation (2021). This would have over-predicted impacts and concentrations presented in this Chapter, as vehicle emission factors and background concentrations are projected to improve with time, and are thus greater in 2021 than in 2025.

8.23 The Egley Road scheme will be fully completed in 2023, with the David Lloyd Leisure Centre becoming operational in 2021, and residential properties completed and occupied in 2023. Following the same approach as described above, impacts associated with the full operation of the Egley Road scheme were assessed in combination with those associated with the Proposed Development for the year of opening (2021). This, again, would have led to a conservative assessment.

Road Traffic Impacts

Screening Stage

8.24 The first step in considering the road traffic impacts of the Proposed Development has been to screen the development and its traffic generation, both in isolation and also in combination with traffic generated by the Egley Road scheme, against the criteria set out in the EPUK/IAQM guidance[5], as described in ***ES Volume 3, Appendix: Air Quality (Annex 1)***. Where impacts can be screened out there is no need to progress to a more detailed assessment. The following sections describe the approach to dispersion modelling of road traffic emissions, which has been required for this project, as the Proposed Development leads to an increase in traffic greater than the screening criteria on several roads within the study area, both alone and when considered in combination with traffic generated by the Egley Road scheme. The modelling of road traffic emissions also provides context to the assessment of energy plant impacts.

Assessment Scenarios

8.25 NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted for a base year of 2018 (the most recent full calendar year of monitoring data available) and the proposed year of opening (2021). For 2021, predictions have been made assuming the following three possible scenarios:

1. The future baseline, in the absence of the Proposed Development and Egley Road scheme;
2. With the Proposed Development; and
3. The Proposed Development in combination with the Egley Road scheme.

8.26 In addition to the set of 'official' predictions, a sensitivity test has been carried out for NO_2 that involves assuming higher nitrogen oxides emissions from some diesel vehicles than have been predicted by Defra, using AQC's Calculator Using Realistic Emissions for Diesels (CURED V3A) tool[11].

Modelling Methodology

8.27 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's latest Emission Factor Toolkit (EFT) (v9.0)[7]. Details of the model inputs, assumptions and the verification are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***. Where assumptions have been made, a realistic worst-case approach has been adopted.

Traffic Data

8.28 Traffic data for the assessment have been provided by Vectos, who have undertaken the Transport Assessment (TA) for the Proposed Development and Egley Road scheme. Further details of the traffic data used in this assessment are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

Uncertainties, Assumptions and Limitations

8.29 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

8.30 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see ***ES Volume 3, Appendix: Air Quality (Annex 3)***). This can only be done for the road traffic model. Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2018) concentrations. LAQM.TG16[3] provides guidance on the evaluation of model performance.

8.31 For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

8.32 To account for potential uncertainties in future emissions, and assuming that improvements are not delivered as rapidly as expected, AQC has provided an alternative sensitivity test which assumes slightly higher NOx emissions from certain vehicles. A full description of the derivation of the sensitivity test, and the rationale behind the predictions, are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

8.33 It must also be borne in mind that the predictions in 2021 are based on worst-case assumptions regarding the increase in traffic flows, such that all identified committed developments (including Egley Road scheme) and the Proposed Development are assumed to be fully operational. This will have overestimated the traffic emissions and hence the concentrations in 2021.

Impacts of the Proposed Back-Up Boiler Plant

8.34 The main source of energy for the residential element of the Proposed Development will be air source heat pumps (ASHPs), which will not have any on-site emissions associated with them; as such, the ASHPs will not be considered by the assessment. However, the residential element of the Proposed Development will also include five back-up condensing natural gas-fired boiler plant units (one per residential apartment block) and five emergency diesel generators. These plants will generate emissions of NO_x (and PM_{10}/$PM_{2.5}$ for the diesel generators) and, therefore, have the potential to impact on air quality at existing and proposed sensitive receptors.

[11] AQC (2017) CURED V3A, [Online], Available: http://www.aqconsultants.co.uk/Resources/Download-Reports.aspx

8.35 The assessment of the Proposed Development in combination with the Egley Road scheme, has also considered the emissions from the CHP and boiler plant proposed as part of Egley Road scheme.

8.36 Further details of the plant to be installed within the Proposed Development and Egley Road scheme are provided in ***ES Volume 3, Appendix: Air Quality (Annexes 3 to 5)***.

Screening Stage

8.37 The first step in considering the impacts of the plant proposed as part of the Proposed Development has been to screen the pollutant emissions of the proposed plant, both in isolation and also in combination with pollutant emissions associated with the plant proposed as part of the Egley Road scheme, against the criteria set out in the EPUK/IAQM guidance[5], as described in ***ES Volume 3, Appendix: Air Quality (Annex 1)***. Where plant impacts cannot be screened out against these criteria, a further stage of screening is required, whereby the modelled contributions of the plant are compared to further screening criteria. Where impacts can be screened out there is no need to progress to a more detailed assessment. The following sections describe the approach to dispersion modelling of the plant emissions, which has been required for this project.

Assessment Scenarios

8.38 Predictions of NO_2 concentrations have been carried out assuming that all of the proposed boiler plant units are installed and operational in 2021. Predictions have been made for two scenarios:

1. With the Proposed Development ; and
2. With the Proposed Development in combination with the Egley Road scheme.

Modelling Methodology

8.39 The impacts of emissions from the boiler plant at the Proposed Development and the CHP and boiler plant at the Egley Road scheme have been modelled using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. The model input parameters are set out in ***ES Volume 3, Appendix: Air Quality (Annex 3)***. The air quality modelling has been carried out based on a number of necessary assumptions, detailed further in ***ES Volume 3, Appendix: Air Quality (Annex 3)***. Where possible, a realistic worst-case approach has been adopted.

8.40 Entrainment of the plume into the wake of buildings has been simulated within the model. ADMS 5 takes a relatively simplistic approach to modelling building downwash effects, thus additional uncertainty is introduced when using the buildings module. In order to ensure a worst-case assessment, the following sensitivity tests have been carried out, with the maximum predicted process contributions (for each of the schemes' energy plant emissions) being used throughout this assessment to ensure a reasonable worst-case assessment:

- Proposed Development back-up boiler plant (used for both assessment scenarios i.e. with the Proposed Development and with the Proposed Development in combination with the Egley Road scheme):
  1. Without buildings
  2. With on-site buildings (i.e. the proposed five residential apartment blocks and the new football stadium);
- Egley Road scheme CHP and boiler plant:
  1. Without buildings
  2. With on-site buildings (i.e. the proposed leisure centre).

Emissions Data

8.41 The emissions data input into the model for the proposed plant have been predominantly provided by Elementa Consulting, with some data input being determined using the data set out in the technical datasheets for the plant to be installed and based upon the fuel consumption, fuel composition, typical operating conditions and combustion chemistry. Further details of the emissions data used in this assessment are provided in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

Uncertainties, Assumption and Limitations

8.42 The point source dispersion model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which in reality are variable as the plant will operate at different loads at different times. The assessment has, however, addressed this by applying worst-case assumptions where necessary, and provided that the actual plant installed adheres to the restrictions set out in ***ES Volume 3, Appendix: Air Quality (Annexes 3 and 5)***, the conclusions of this assessment will remain valid.

8.43 There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified, and it is not possible to verify the point-source model outputs. Where parameters have been estimated the approach has been to use reasonable worst-case assumptions.

Impacts of the Proposed Life-Safety Generator Plant

8.44 The Proposed Development will be equipped with five emergency life-safety generators (one per residential apartment block). These plant will emit NO_x and PM during testing and could thus impact air quality at existing and proposed sensitive receptors.

8.45 Emissions from the proposed emergency diesel generators have not been specifically modelled, but their impacts on concentrations of NO_2 and PM have been considered qualitatively, taking into consideration the size of the generators, the frequency of anticipated operation (under non-emergency conditions), the location of the exhaust and baseline pollutant concentrations.

Methodology for Defining Significance

Identification of Receptors and Receptor Sensitivity

Demolition and Construction

8.46 The IAQM, in their guidance on construction dust[10], provides criteria to define receptor sensitivity to dust soiling or health effects of PM_{10} (See Table A3.2 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***). Residential properties are considered as high sensitivity receptors to both dust soiling and health effects of PM_{10}.

Completed Development

8.47 The Air Quality Strategy[12] explains that air quality standards and objectives were determined based on expert recommendations, and represent *"levels at which no significant health effects would be expected in the population as a whole"*. The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance[3]. The annual mean objectives for NO_2 and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for NO_2 applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

8.48 Within this chapter, all receptors where the air quality objectives apply are considered to be of high sensitivity. Locations where the objectives do not apply must be considered not to be sensitive, therefore there are no medium or low sensitivity receptors within the context of this assessment.

Magnitude of Impact

Demolition and Construction

8.49 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the IAQM has been used. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2 consists in determining the risk of dust impacts for each activity (i.e. demolition, earthworks, construction and the trackout of material from the site onto the local road network). First, the 'dust emission magnitude' is determined for each of the four activities listed above, and is defined as 'small', 'medium' or 'large' (Step 2A, see Table A4.2 ***ES Volume 3, Appendix: Air Quality (Annex 4)***). Then, the sensitivity of the area to dust soiling and human health effects is determined based on the number of receptors located within certain distances from the site, and their sensitivity (Step 2B, see Tables A4.3 and A4.4 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***). Area sensitivities are defined for each type of effect (dust soiling or human health) and are described as 'low', 'medium' or 'high'. The dust emission magnitudes determined at Step 2A are combined with the sensitivities of the area determined at

[12] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra.

Step 2B to determine the risk of dust soiling and human health impacts for each activity, with no mitigation applied. Risks are defined as 'negligible', 'low', 'medium' or 'high'. Full details of this approach are provided in ***ES Volume 3, Appendix: Air Quality (Annex 4)***.

Completed Development

8.50 There is no official guidance in the UK in relation to development control on how to describe air quality impacts and effects, nor how to assess their significance. The approach developed jointly by EPUK and the IAQM[5] has therefore been used. This includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective.

8.51 Table 8.2 sets out how impact descriptors have been determined within this assessment, being an adapted version of the table presented in ***ES Volume 3, Appendix: Air Quality (Annex 1)***. Impacts can be beneficial or adverse in nature. Generally, impacts that are 'Major' and 'Moderate' in scale are likely to lead to a judgement that the overall effects will be 'significant', while 'Negligible' or 'Minor' impacts are likely to lead to a judgement that the overall effects will be 'not significant'.

Table 8.2 Air Quality Impact Scale Descriptors for Individual Receptors for All Pollutants [a]

Long-term average concentration at receptor in assessment year[b,c]				Change in concentration relative to AQAL[c,d]				
% of AQAL	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Less than 30.2	Less than 30.2	Less than 18.9	Negligible	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	30.2 – 37.8	30.2 – 37.8	18.9 – 23.6	Negligible	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	37.8 – 41.0	37.8 – 41.0	23.6 – 25.6	Negligible	Minor	Moderate	Moderate	Major
103-109% of AQAL	41.0 – 43.8	41.0 – 43.8	25.6 – 27.4	Negligible	Moderate	Moderate	Major	Major
110% or more of AQAL	More than 43.8	More than 43.8	More than 27.4	Negligible	Moderate	Major	Major	Major

[a] Values are rounded to the nearest whole number

[b] This is the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme' concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

[d] Minor and Major are used as standard EIA terminology, and correspond to Slight and Substantial respectively in relevant guidance[5]

8.52 EPUK & IAQM[5] explains that "Where peak short-term concentrations (those averaged over periods of an hour or less) from an elevated source are in the range 11-20% of the relevant Air Quality Assessment Level (AQAL), then their magnitude can be described as small, those in the range 21-50% medium and those above 51% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations." As such, by definition, where the peak plant contribution to the 1-hour mean NO_2 is 10% or less of the objective (i.e. ≤20 $\mu g/m^3$ for 1-hour mean NO_2), then impacts can be discounted as negligible.

Scale, Nature and Significance of Effect

Demolition and Construction

8.53 Guidance from IAQM[10] is that, with appropriate mitigation in place, the effects of construction dust will be 'not significant'. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be 'not significant'.

Completed Development

8.54 It is important to differentiate between the terms impact and effect with respect to the assessment of air quality. The term impact is used to describe a change in pollutant concentration at a specific location. The term effect is used to describe an environmental response resulting from an impact, or series of impacts. Within this chapter, the air quality assessment has used published guidance and criteria to determine the likely air quality impacts at a number of sensitive locations (See Table 8.2). The overall significance of the air quality effects is then determined using professional judgement, giving consideration to various factors including the magnitude of the predicted impacts and the presence of any objective exceedances; full details of the EPUK/IAQM approach are provided in ***ES Volume 3, Appendix: Air Quality (Annex 1)***. The experience of the consultants who have prepared this chapter is set out in ***ES Volume 3, Appendix: Air Quality (Annex 2)***.

Geographic Extent of Effects

Demolition and Construction

8.55 Dust generated by the Proposed Development during demolition and construction has the potential to cause effects at a local and borough level (up to 350m from the site boundary).

Completed Development

8.56 Emissions of pollutants from traffic generated by the Proposed Development during operation, both in isolation and in combination with the Egley Road scheme, have the potential to cause air quality effects at a local and borough level (refer to receptor locations in Table 8.3, Table 8.4, Figure 8.1, Figure 8.2, Figure 8.3, Figure 8.4 and Figure 8.5 which define the study area).

Effect Duration

Demolition and Construction

8.57 Dust generated by the Proposed Development during demolition and construction has the potential to cause temporary medium-term effects.

Completed Development

8.58 Emissions of pollutants from traffic generated by the Proposed Development during operation, both in isolation and in combination with the Egley Road scheme, have the potential to cause permanent long-term effects.

Direct and Indirect, Reversible or Irreversible Effects

Demolition and Construction

8.59 Dust generated by the Proposed Development during demolition and construction has the potential to cause direct and reversible effects.

Completed Development

8.60 Emissions of pollutants from traffic generated by the Proposed Development during operation, both in isolation and in combination with the Egley Road scheme, have the potential to cause direct and irreversible effects.

RECEPTORS AND RECEPTOR SENSITIVITY

Existing

Demolition and Construction

8.61 The guidance followed when carrying out the construction dust assessment requires the number of receptors within certain distance bands to be established in order to determine the sensitivity of the surrounding area, rather than focussing on impacts at individual receptors. It is, therefore, not necessary to set out specific receptors for the assessment of impacts during the construction and demolition works.

Completed Development

8.62 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a number of locations close to the Proposed Development. Receptors have been identified to represent worst-case exposure within these locations, being located on the façades of the residential properties closest to the sources. When selecting roadside receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, where there is a combined effect of several road links and roads which experience the greatest increases in traffic flows as a result of the Proposed Developments. Attention has also been paid to selecting receptors at locations where the impacts of the proposed back-up boiler emissions are likely to be greatest, to ensure that the combined effects of road traffic and plant emissions are considered. All receptors considered in the operational impact assessment are of high sensitivity, as set out in paragraph 8.48.

Selected receptor locations are displayed on Figures 9.1 to 9.4. Where modelled, receptors have been modelled at heights of 1.5 m, 4.5 m, 7.5 m, 10.5 m and 13.5 to represent ground, 1st, 2nd, 3rd and 4th floor levels respectively, unless stated otherwise.

Table 8.3 Description of Existing Receptor Locations

Receptor	Description	Storey(s) Modelled
E1	Residential property located adjacent to the north-eastern Kingfield Road site boundary, set back from Kingfield Road (A247).	Ground & 1st floors
E2	Residential property located adjacent to the north-eastern Kingfield Road site boundary, set back from Kingfield Road (A247).	Ground floor
E3	Residential property set back from Kingfield Road (A247).	Ground floor
E4	Residential property located adjacent to an unnamed minor road, set back from the junction with Kingfield Road (A247)	Ground floor
E5	Residential property located adjacent to Kingfield Road (A247) opposite the junction with Kingfield Drive.	Ground floor
E6	Residential property set back from Kingfield Green (a footpath) and the eastern Kingfield Road site boundary.	Ground & 1st floors
E7	Residential property set back from Kingfield Green (a footpath) and the eastern Kingfield Road site boundary.	Ground & 1st floors
E8	Residential property set back from Kingfield Close and the eastern Kingfield Road site boundary.	Ground & 1st floors
E9	Residential property located adjacent to Kingfield Road (A247).	Ground floor
E10	Residential property located adjacent to Kingfield Road (A247) close to the junction with Gables Close.	Ground floor
E11	Residential property located adjacent to Kingfield Road (A247) close to the junction with Beaconsfield Road.	Ground floor
E12	Residential property located adjacent to Kingfield Road (A247).	Ground floor
E13	Kingfield School (primary school and nursery), located adjacent to Kingfield Road (A247).	Ground floor [a]
E14	Residential property located adjacent to Kingfield Road (A247), set back from the junction with High Street (A247) and Vicarage Road.	Ground floor
E15	Residential property located adjacent to Kingfield Road (A247), set back from the junction with Vicarage Road and High Street (A247).	1st floor
E16	Residential property located adjacent to High Street (A247) close to the junction with Gloster Road.	Ground floor
E17	Residential property located adjacent to High Street (A247).	Ground floor
E18	Residential property located adjacent to High Street (A247).	Ground floor
E19	Residential property set back from the junction between Wych Hill Lane (A247) and Claremont Avenue (A247).	Ground, 1st, 2nd & 3rd floors
E20	Residential property located adjacent to the junction between Wych Hill Lane (A247) and Claremont Avenue (A247).	Ground, 1st, 2nd & 3rd floors
E21	Residential property located opposite the junction between Wych Hill Lane (A247) and Claremont Avenue (A247).	Ground floor
E22	Residential property located adjacent to Turnoak Lane close to the junction with Wych Hill Lane (A247).	Ground floor
E23	Residential property set back from the roundabout that connects Egley Road (A320), Guildford Road (A320), Wych Hill Lane and Wych Hill Lane (A247).	Ground floor
E24	Residential property located adjacent Turnoak Lane, set back from the roundabout that connects Egley Road (A320), Guildford Road (A320), Wych Hill Lane and Wych Hill Lane (A247).	Ground floor
E25	Residential property set back from the roundabout that connects Egley Road (A320), Guildford Road (A320), Wych Hill Lane and Wych Hill Lane (A247).	Ground floor
E26	Residential property located adjacent to the junction between Wych Hill Lane and West Hill Road.	Ground floor
E27	Residential property located adjacent to Wych Hill Lane, close to the junction with Mount Hermon Road.	Ground floor
E28	Residential property located adjacent to Wych Hill.	Ground floor
E29	Residential property located adjacent to Wych Hill.	Ground floor
E30	Residential property located adjacent to Westfield Avenue set back from the junction with Kingfield Road (A247), opposite the site.	1st, 2nd, 3rd & 4th floors
E31	Residential property located adjacent to Sycamore Avenue set back from the junction with Westfield Avenue, opposite the site.	Ground, 1st, 2nd, 3rd & 4th floors
E32	Residential property located adjacent to Westfield Avenue close to the junction with Sycamore Avenue, opposite the site.	Ground, 1st, 2nd & 3rd floors [b]
E33	Residential property located adjacent to Westfield Avenue close to the junction with Sycamore Avenue, opposite the site.	Ground floor
E34	Residential property located adjacent to Westfield Avenue and the site western boundary.	Ground floor
E35	Residential property located adjacent to Westfield Avenue and the site western boundary.	Ground floor
E36	Residential property located adjacent to Westfield Avenue, set back from the site western boundary.	Ground & 1st floors
E37	Residential property located adjacent to Westfield Avenue, set back from the site western boundary.	Ground & 1st floors
E38	Residential property located adjacent to Westfield Avenue opposite the junction with Westfield Grove.	Ground floor
E39	Residential property located adjacent to Westfield Grove set back from the junction with Westfield Avenue.	Ground floor
E40	Residential property located adjacent to Granville Road.	Ground & 1st floors
E41	Residential property located adjacent to Granville Road.	Ground & 1st floors
E42	Residential property located adjacent Turnoak Lane, set back from the roundabout that connects Egley Road (A320), Guildford Road (A320), Wych Hill Lane and Wych Hill Lane (A247).	Ground floor
E43	Residential property located adjacent to Turnoak Lane, set back from Egley Road (A320).	Ground floor
E44	The Fun Factory Nursery, located adjacent to Turnoak Lane, close to the junction with Egley Road (A320).	Ground floor [c]
E45	Residential property located adjacent to Evelyn Close, set back from Egley Road (A320).	Ground floor
E46	Residential property located adjacent to the junction between Acacia Avenue and Egley Road (A320).	Ground floor
E47	Residential property set back from Egley Road (A320).	Ground floor
E48	Residential property located adjacent to Egley Road (A320) close to the junction with Hillside.	Ground floor
E49	Barnsbury Primary School, setback from Egley Road (A320) and Almond Avenue.	Ground floor [c]
E50	Barnsbury Primary School outdoor space, set back from Egley Road (A320).	Ground floor [c]
E51	Residential property located adjacent to Egley Road, set back from Egley Road (A320).	Ground floor
E52	Residential property located adjacent to Drakes Way, set back from the junction with Egley Road (A320).	Ground floor
E53	Residential property located adjacent to Egley Road (A320), close to the junction with Egley Drive.	Ground floor
E54	Residential property set back from Mayford Roundabout.	Ground floor
E55	Residential property set back from Mayford Roundabout.	Ground floor
E56	Residential property located adjacent to Guildford Road (B380), set back from Mayford Roundabout.	Ground floor
E57	Residential property located adjacent to the mini-roundabout connecting Guildford Road (B380), Guildford Road and Westfield Road (B380).	Ground floor
E58	Residential property located adjacent to Westfield Road (B380) close to the mini-roundabout connecting Guildford Road (B380), Guildford Road and Westfield Road (B380).	Ground floor
E59	Residential property located adjacent to Westfield Road (B380).	Ground floor
E60	Residential property located adjacent to Egley Road (A320).	Ground floor

Receptor	Description	Storey(s) Modelled
E61	Residential property located adjacent to an unnamed minor road, set back from Mayford Roundabout.	Ground floor
E62	Freemantles School outdoor space, set back from an unnamed minor road, close to Mayford Roundabout.	Ground floor [c]
E63	Freemantles School outdoor space, set back from an unnamed minor road.	Ground floor [c]
E64	Residential property located adjacent to Midhope Road, set back from the junction with Guildford Road (A320).	Ground floor
E65	Greenfield School Co-educational Preparatory School, located adjacent to Brooklyn Road, set back from the junction with Guildford Road (A320).	Ground floor [c]
E66	Residential property located adjacent to Guildford Road (A320), close to the junction with Claremont Avenue (A247).	Ground floor
E67	Residential property located adjacent to the Blackness Lane, set back from the junction with Guildford Road (A320).	Ground floor
E68	Residential property located adjacent to Thorsden Court, set back from Guildford Road (A320).	Ground floor
E69	Residential property located adjacent to Guildford Road (A320), opposite the junction with Thorsden Court.	Ground floor
E70	Residential property located adjacent to the junction between Thorsden Court and Guildford Road (A320).	Ground floor
E71	Residential property located adjacent to Guildford Road (A320), opposite the junction with Thorsden Court.	Ground floor
E72	Residential property located adjacent to Guildford Road (A320), close to the junction with Constitution Hill.	Ground floor
E73	Residential property located adjacent to the junction between Guildford Road (A320) and York Road.	Ground floor
E74	Bright Horizons Woking Day Nursery, set back from the junction between Station Approach (A320) and Guildford Road (A320).	Ground floor [c]
E75	Residential property located adjacent to the junction between Guildford Road (A320) and Station Approach (A320).	Ground floor
E76	Residential property located adjacent to Guildford Road (A320) close to the junction with Station Approach (A320).	1st floor
E77	Residential property located adjacent to Guildford Road (A320).	1st floor
E78	Residential property located adjacent to Guildford Road (A320) close to the junction with Victoria Road (A320).	1st floor

[a] Receptors have been modelled at a height of 1.0 m to represent ground floor level for primary school-aged children.

[b] Receptors have been modelled at heights of 1.5 m, 5.5 m, 8.5 m and 11.5 m to represent ground, 1st, 2nd and 3rd floors levels respectively.

[c] Receptors have been modelled at a height of 0.5 m to represent ground floor level for infant school-aged children.

Figure 8.1 Existing Receptor Locations to the East of the Site Boundary

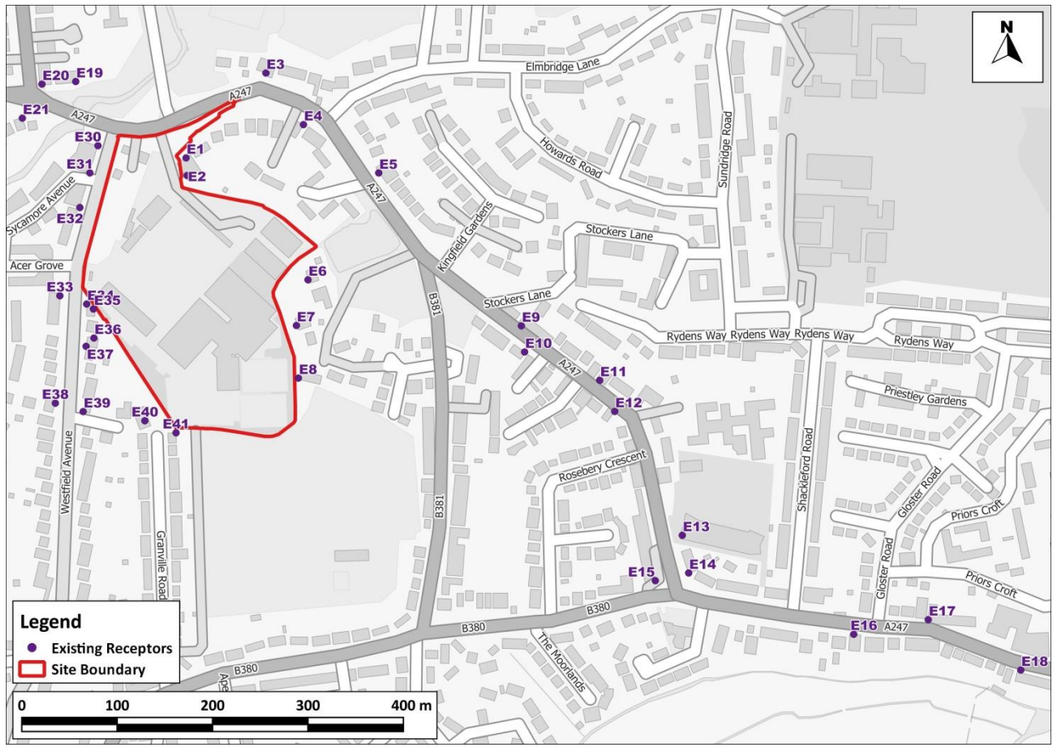

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Figure 8.2 Existing Receptor Locations to the West of the Site Boundary

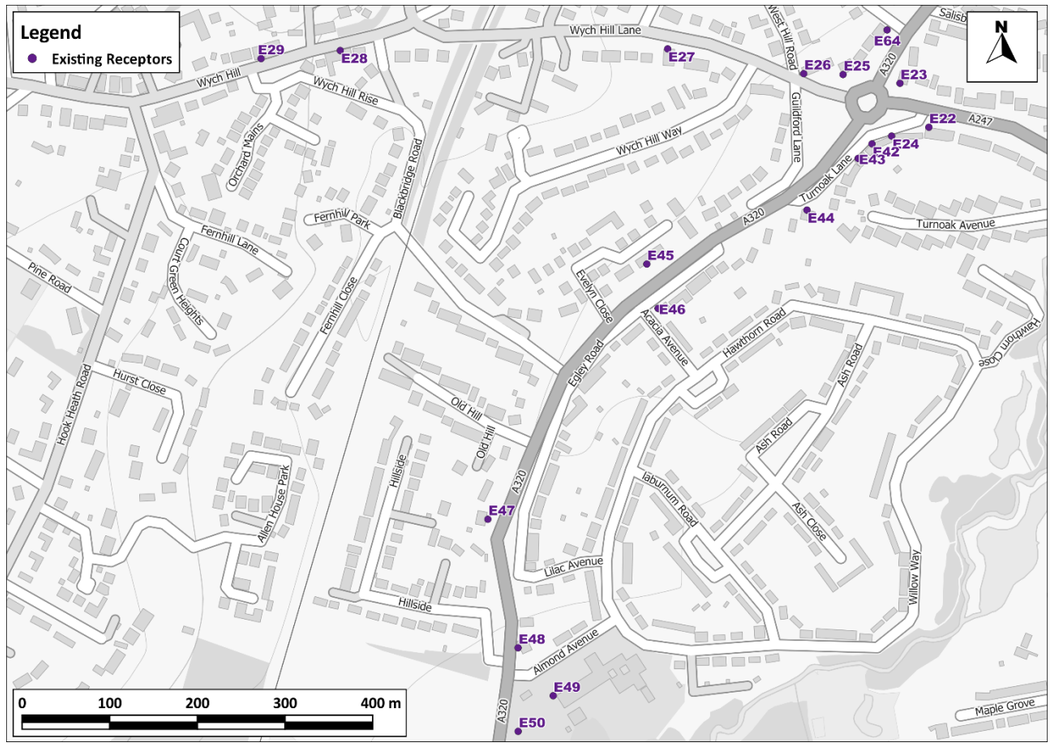

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Figure 8.3 Existing Receptor Locations to the South of the Egley Road Site Boundary

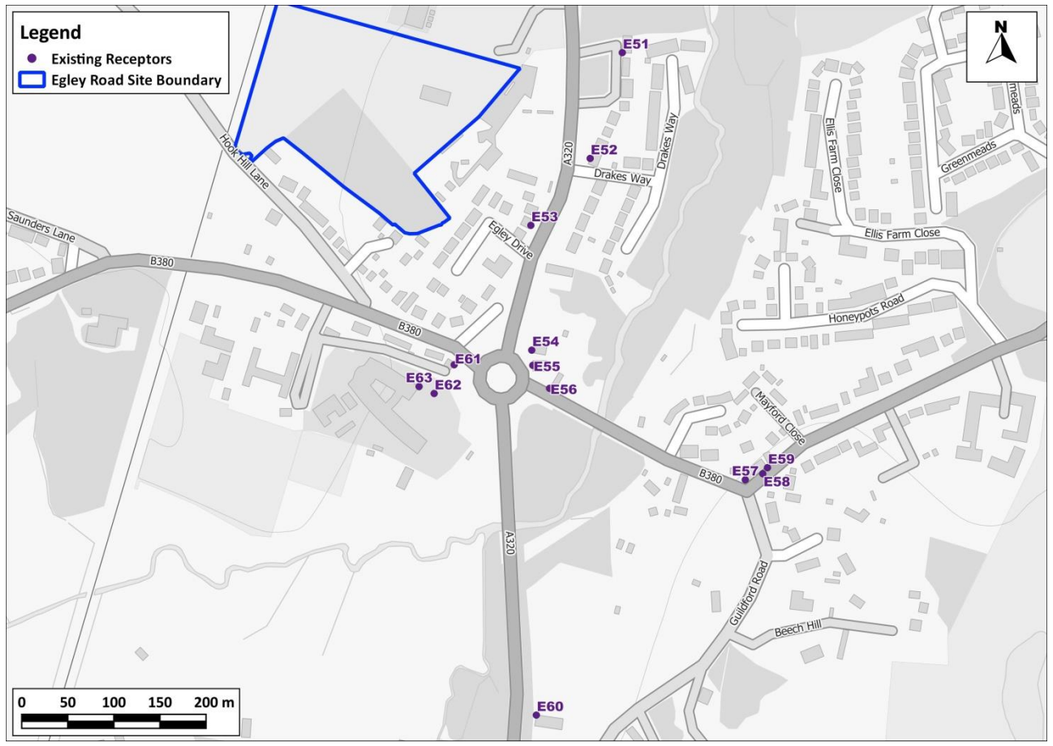

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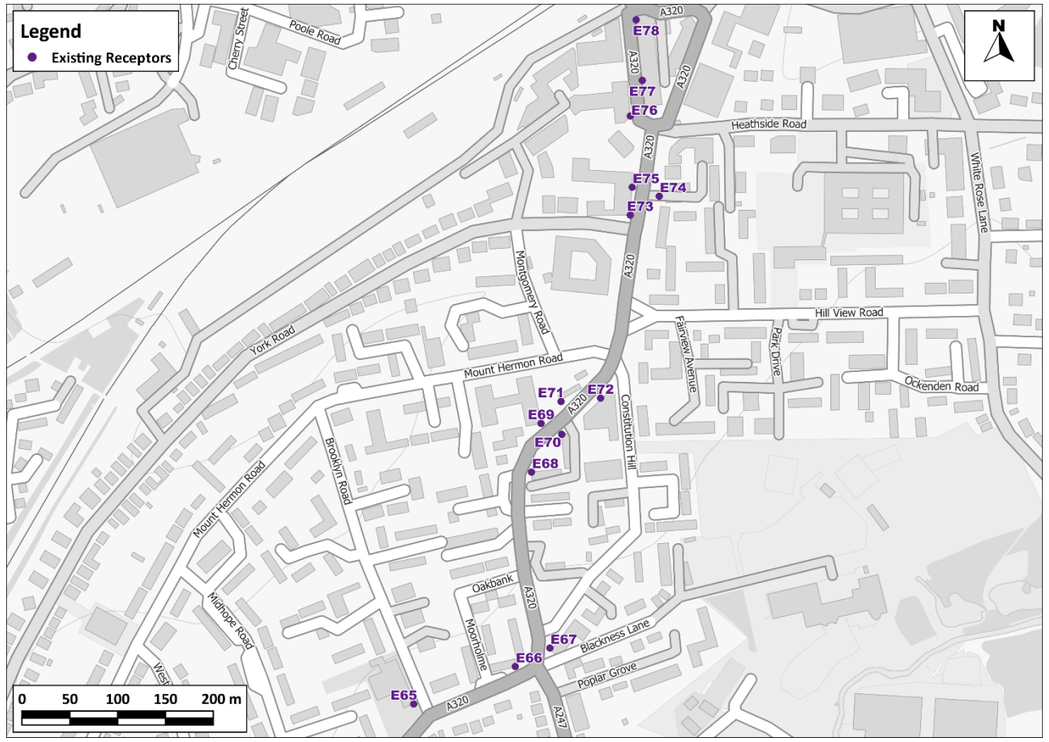
Figure 8.4 Existing Receptor Locations to the North of the Site Boundary



Introduced

Demolition and Construction

8.63 The construction dust assessment has given consideration to the potential for new receptors to be introduced within the Proposed Development while works are ongoing. As explained in paragraph 8.61, it is not necessary to set out specific receptors for the assessment of impacts during the construction and demolition works.

Completed Development

8.64 Twenty-seven receptor locations have been identified within the Proposed Development, which represent exposure to existing and proposed sources. These receptors are all of high sensitivity.

Table 8.4 Description of Introduced Receptor Locations

Receptor	Description	Storey(s) [a]
D1	Residential property located within Block 1 set back from Kingfield Road (A247)	Ground to 9th floors
D2	Residential property located within Block 1 set back from Kingfield Road.	Ground to 7th floors
D3	Residential property located within Block 1 set back from Kingfield Road.	Ground to 9th floors
D4	Residential property located within Block 1 located adjacent to the junction between Kingfield Road and Westfield Avenue.	Ground to 5th floors
D5	Residential property located within Block 1 located adjacent to Westfield Avenue opposite the junction with Sycamore Avenue.	Ground to 4th floors
D6	Residential property located within Block 1 set back from Westfield Avenue.	Ground to 4th floors
D7	Residential property located within Block 2 set back from Westfield Avenue.	Ground to 9th floors
D8	Residential property located within Block 2 located adjacent to Westfield Avenue.	Ground to 3rd floors
D9	Residential property located within Block 2 located adjacent to Westfield Avenue opposite the junction with Acer Grove.	Ground to 3rd floors
D10	Residential property located within Block 2 set back from Westfield Avenue.	Ground to 9th floors
D11	Residential property located within Block 2 set back from Westfield Avenue.	Ground to 9th floors
D12	Residential property located within Block 3 set back from Westfield Avenue.	Ground to 7th floors
D13	Residential property located within Block 3 set back from Westfield Avenue.	Ground to 7th floors
D14	Residential property located within Block 3 set back from Westfield Avenue.	Ground to 6th floors
D15	Residential property located within Block 3 set back from Westfield Avenue.	Ground to 5th floors
D16	Residential property located within the western part of Block 4.	Ground to 9th floors
D17	Residential property located within the central part of Block 4.	Ground to 4th floors
D18	Residential property located within the eastern part of Block 4.	Ground to 8th floors
D19	Residential property located within the eastern part of Block 4.	Ground to 8th floors
D20	Residential property located within the eastern part of Block 4.	Ground to 2nd floors
D21	Residential property located within the eastern part of Block 5.	Ground to 2nd floors
D22	Residential property located within the eastern part of Block 5.	Ground to 8th floors
D23	Residential property located within the central part of Block 5.	Ground to 4th floors
D24	The southern façade of the stadium.	Ground floor
D25	The southern façade of the stadium.	Ground and 2nd floors
D26	The western façade of the stadium.	Ground to 2nd floors
D27	The western façade of the stadium.	Ground to 2nd floors

[a] Receptors have been modelled at heights of 3 m, 6 m, 9 m, 12 m, 15 m, 18 m, 21 m, 24 m, 27 m and 30 m to represent the ground, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th floor storeys respectively.

Figure 8.5 Introduced Receptor Locations

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BASELINE CONDITIONS

Current Baseline Conditions

8.65 The Proposed Development site is located adjacent to Kingfield Road (A247) and Westfield Avenue. The site is bounded by Kingfield Road, Hoe Stream and green space to the north, existing residential properties and an area of green space to the east, Loop Road Sports Field to the southeast, existing residential properties to the southwest and by existing residential properties, Westfield Avenue and an existing commercial property to the west. The site currently consists of the existing Woking Football Club stadium, a David Lloyd leisure centre, a snooker centre, five residential properties and associated parking.

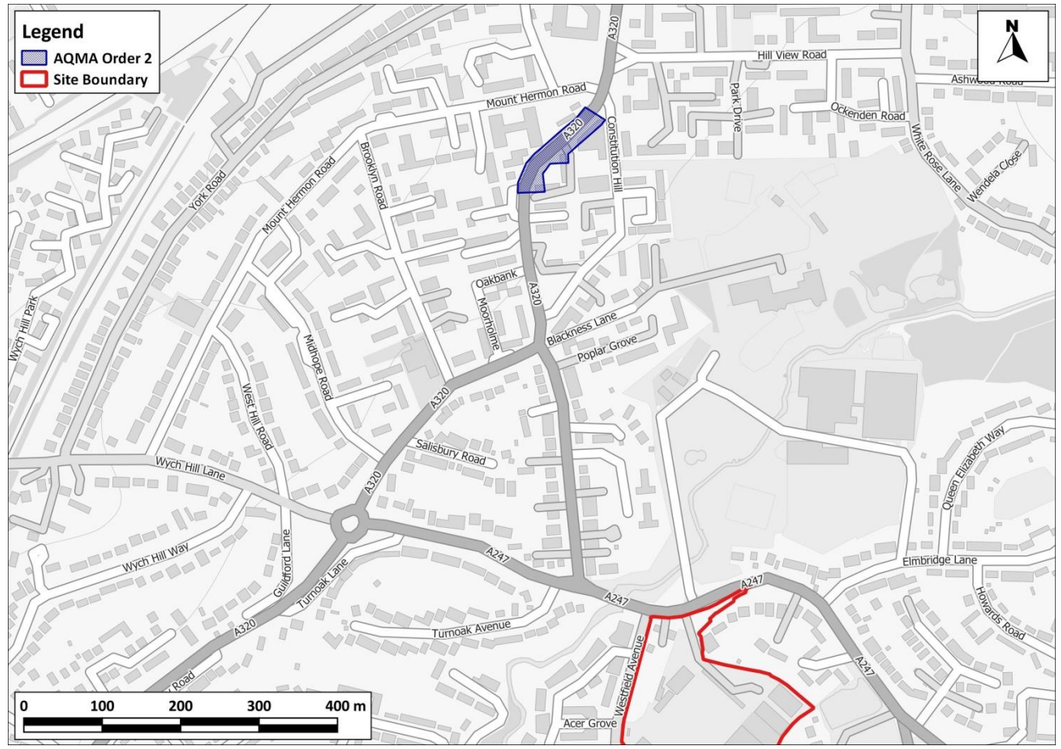
Industrial Sources

8.66 A search of the UK Pollutant Release and Transfer Register website[6] has not identified any significant industrial or waste management sources that are likely to affect the Proposed Development, in terms of air quality.

Air Quality Management Areas

8.67 WBC has investigated air quality within its area as part of its responsibilities under the LAQM regime, and has declared two AQMAs for exceedances of the annual mean NO_2 objective. The 'AQMA for Anchor Hill' is located a substantial distance (>4 km) from the Proposed Development and, as such, is not considered further within this assessment. 'AQMA Order 2' was declared by WBC in May 2017 and covers a small section of Guildford Road to the south of the Constitution Hill junction and to the north of the junction with Ashdown Close; this AQMA is located approximately 570 m to the northwest of the site (see Figure 8.6). It is noted that the existing receptors E68 – E72 (see Figure 8.4) are situated within the AQMA.

Figure 8.6 AQMA Order 2 and the Site Boundary



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Local Air Quality Monitoring

8.68 WBC does not operate any automatic monitoring stations within its area; however, WBC does operate a number of NO_2 monitoring sites using diffusion tubes prepared and analysed by Lambeth Scientific Services (using the 50% triethanolamine in acetone method). Nine of these sites are location in close proximity to the Proposed Development; results for the years 2014 to 2018 are summarised in Table 8.5 and the monitoring locations are shown in Figure 8.7.

8.69 Exceedances of the annual mean NO_2 objective were measured at two monitoring sites in 2018; sites CH and CH2 (both of which are located within an AQMA). Exceedances of the annual mean objective have also been measured at site CH between 2014 and 2016, at site CH2 between 2014 and 2017, at site CH3 between 2015 and 2017, at site CH4 in 2015 and at site LTK in 2015. Measured concentrations at all sites are well below 60 µg/m^3 between 2014 and 2018, indicating that it is unlikely that the 1-hour mean was exceeded at these locations during this time period. The monitored concentrations do not show any strong trends between 2015 and 2018.

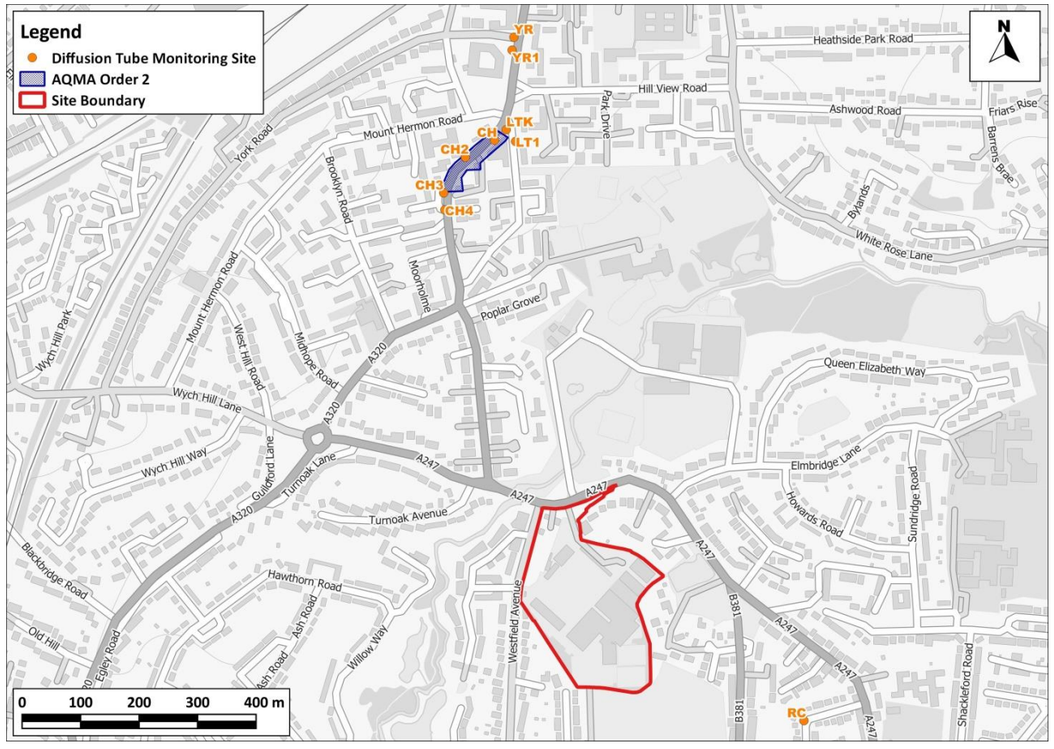
8.70 No monitoring of PM_{10} or $PM_{2.5}$ concentrations is undertaken in Woking.

Table 8.5 Summary of Diffusion Tube NO_2 Monitoring (µg/m^3) (2014-2018)[a,b]

Site No.	Site Type	Location	2014	2015	2016	2017	2018
CH	Roadside	Constitution Hill	34.2	**48.8**	**43.3**	36.5	**41.8**
CH2	Roadside	Constitution Hill	**40.6**	**51.6**	**47.6**	**41.3**	**43.5**
CH3	Roadside	Constitution Hill	37.9	**51.5**	**45.4**	**41.0**	38.6
CH4	Kerbside	Constitution Hill	34.5	**42.4**	40.0	37.6	38.5
LT1	Kerbside	Constitution Hill	17.8	24.9	33.9	33.9	35.0
LTK	Kerbside	Constitution Hill	31.0	**40.7**	23.6	24.3	28.3
RC	Kerbside	Rosebery Crescent	17.7	16.5	16.6	18.0	18.0
YR	Kerbside	York Road	-	-	-	23.9	30.0
YR1	Kerbside	York Road	-	-	-	25.0	31.2
Objective			40				

[a] Sourced from Woking Borough Council's 2019 Air Quality Annual Status Report (ASR)[13].
[b] Exceedances of the objectives are shown in bold.

Figure 8.7 Diffusion Tube Monitoring Locations



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Exceedances of EU Limit Values

8.71 There are no AURN monitoring sites within 1 km of the site with which to identify exceedances of the annual mean NO_2 limit value. Defra's roadside annual mean NO_2 concentrations[8], which are used to report exceedances of the limit value to the EU, do not identify any exceedances within 1 km of the site in 2017. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the Proposed Development by the time that it is operational.

Background Concentrations

8.72 In addition to the locally measured concentrations, estimated background concentrations at the identified sensitive receptors (see Table 8.6) have been determined for 2018 and the opening year 2021 using Defra's 2017-based background maps[7]. The background concentrations are set out in Table 8.6 and have been derived as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***. The background concentrations are all well below the objectives.

Table 8.6 Estimated Annual Mean Background Pollutant Concentrations in 2018 and 2021 (µg/m^3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2018	12.6 – 17.7	13.7 – 15.0	9.6 – 10.7
2021[a]	11.2 – 15.8	13.1 – 14.5	9.2 -10.2
2021 Sensitivity Test [b]	*10.0 – 15.2*	N/A	N/A
Objectives	40	40	25 [c]

N/A = not applicable. The range of values is for the different 1x1 km grid squares covering the study area.
[a] In line with Defra's forecasts.
[b] Assuming higher emissions from modern diesel vehicles as described in ***ES Volume 3, Appendix: Air Quality (Annex 6)***.
[c] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Future Baseline Conditions / Do Nothing Scenario

8.73 Baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled at each of the identified existing receptor locations (see Figures 9.1 to 9.4 and Table 8.3 for receptor locations). The results, which cover both the existing (2018) and future baseline (2021) (without the Proposed Development or Egley Road scheme), are set out in Table 8.7 and Table 8.8. The predictions for NO_2 include a sensitivity test which accounts for the potential under-performance of emissions control technology on future diesel cars and vans. In addition, the modelled road components of nitrogen oxides, PM_{10} and $PM_{2.5}$ have been increased from those predicted by the model based on a comparison with local measurements (see ***ES Volume 3, Appendix: Air Quality (Annex 3)*** for the verification methodology). Where concentrations have been predicted at more than one height, the worst-case (i.e. highest) predicted concentration has been presented.

[13] Woking Borough Council (2019) Air Quality Annual Status Report (ASR).

Table 8.7 Modelled Annual Mean Baseline Concentrations of NO_2 (µg/m³) at Existing Receptors [a]

Receptor	2018	2021 Future Baseline	
		'Official' Predictions [b]	Sensitivity Test [c]
E1	20.8	18.4	*17.6*
E2	19.4	17.3	*16.2*
E3	28.5	25.3	*25.1*
E4	24.8	22.0	*21.5*
E5	28.1	24.9	*24.7*
E6	17.1	15.2	*14.0*
E7	16.7	14.9	*13.6*
E8	16.5	14.6	*13.3*
E9	32.2	28.6	*28.7*
E10	22.5	19.9	*19.2*
E11	28.6	25.4	*25.2*
E12	26.1	23.2	*22.7*
E13	26.8	23.8	*23.4*
E14	32.6	28.8	*29.0*
E15	24.8	22.0	*21.4*
E16	29.0	25.8	*26.0*
E17	32.8	29.2	*29.7*
E18	29.9	26.6	*26.9*
E19	26.5	23.5	*23.1*
E20	36.1	32.0	*32.5*
E21	25.3	22.4	*22.0*
E22	28.5	25.3	*25.1*
E23	**41.6**	37.0	*38.1*
E24	29.4	26.0	*26.0*
E25	37.6	33.4	*34.1*
E26	**41.3**	36.8	*37.8*
E27	25.7	22.7	*22.5*
E28	32.6	28.9	*29.3*
E29	36.4	32.4	*33.2*
E30	24.0	21.3	*20.7*
E31	24.2	21.5	*20.9*
E32	22.1	19.6	*18.9*
E33	20.1	17.9	*17.0*
E34	21.6	19.2	*18.4*
E35	20.1	17.9	*16.9*
E36	19.7	17.5	*16.5*
E37	21.1	18.8	*17.9*
E38	19.6	17.5	*16.4*
E39	20.9	18.7	*17.8*
E40	17.0	15.1	*13.8*
E41	16.6	14.8	*13.5*
E42	31.5	28.0	*28.1*
E43	30.0	26.6	*26.6*
E44	25.5	22.7	*22.3*
E45	25.6	22.8	*22.5*
E46	23.8	21.2	*20.8*
E47	25.9	23.1	*22.9*
E48	36.2	32.6	*33.5*
E49	18.7	16.6	*16.1*
E50	24.9	22.3	*22.3*
E51	20.3	18.1	*17.8*
E52	24.8	22.3	*22.3*
E53	26.5	23.8	*24.0*
E54	37.0	33.0	*34.2*
E55	**43.6**	38.9	***40.7***
E56	39.8	35.4	*36.8*
E57	33.4	29.5	*30.3*
E58	39.8	35.3	*36.7*
E59	36.1	32.0	*33.1*
E60	23.1	20.6	*20.4*
E61	29.8	26.4	*27.0*
E62	20.1	17.8	*17.4*
E63	19.1	16.9	*16.5*
E64	30.4	27.0	*27.1*
E65	27.4	24.4	*24.2*
E66	34.5	30.8	*31.2*
E67	37.2	33.2	*33.8*
E68	35.7	31.9	*32.8*
E69	36.2	32.3	*33.3*
E70	34.5	30.7	*31.6*
E71	32.7	29.2	*29.9*
E72	36.0	32.1	*33.1*
E73	30.2	26.9	*27.4*
E74	36.1	32.2	*33.2*
E75	36.6	32.6	*33.6*
E76	26.8	23.8	*24.0*
E77	28.1	24.9	*25.3*
E78	29.0	25.8	*26.2*
Objective	40		

[a] Exceedances of the objective are shown in bold.
[b] In line with Defra's forecasts.
[c] Assuming higher emissions from future diesel cars and vans as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

Table 8.8 Modelled Annual Mean Baseline Concentrations of PM_{10} and $PM_{2.5}$ ($\mu g/m^3$) at Existing Receptors

Receptor	PM_{10}		$PM_{2.5}$	
	2018	2021 Future Baseline	2018	2021 Future Baseline
E1	15.8	15.3	11.1	10.7
E2	15.5	15.0	11.0	10.5
E3	17.3	16.9	12.0	11.6
E4	16.7	16.2	11.6	11.2
E5	17.3	16.8	12.0	11.5
E6	15.1	14.6	10.7	10.3
E7	15.0	14.5	10.7	10.2
E8	15.0	14.5	10.7	10.2
E9	18.1	17.7	12.5	12.0
E10	16.2	15.7	11.3	10.9
E11	17.5	17.1	12.1	11.6
E12	17.0	16.6	11.8	11.4
E13	16.7	16.2	11.6	11.2
E14	17.6	17.1	12.2	11.7
E15	16.4	15.9	11.4	11.0
E16	17.4	17.0	11.8	11.4
E17	18.2	17.8	12.2	11.8
E18	17.7	17.3	11.9	11.5
E19	16.8	16.4	11.7	11.3
E20	18.6	18.2	12.8	12.3
E21	16.6	16.1	11.6	11.2
E22	17.1	16.6	11.9	11.4
E23	19.1	18.7	13.1	12.7
E24	17.1	16.6	11.9	11.5
E25	18.5	18.0	12.7	12.3
E26	19.8	19.4	13.5	13.1
E27	16.7	16.2	11.7	11.2
E28	18.0	17.6	12.5	12.0
E29	19.0	18.6	13.0	12.6
E30	16.3	15.8	11.4	11.0
E31	16.4	15.9	11.5	11.0
E32	16.1	15.6	11.3	10.8
E33	15.7	15.2	11.1	10.6
E34	16.0	15.5	11.2	10.8
E35	15.7	15.2	11.1	10.6
E36	15.6	15.1	11.0	10.6
E37	15.9	15.4	11.2	10.7
E38	15.6	15.1	11.0	10.6
E39	15.9	15.4	11.2	10.7
E40	15.1	14.6	10.7	10.3
E41	15.0	14.5	10.7	10.2
E42	17.5	17.0	12.1	11.7
E43	17.3	16.9	12.0	11.6
E44	16.8	16.4	11.7	11.3
E45	16.7	16.4	11.7	11.3
E46	16.4	15.9	11.5	11.1
E47	16.9	16.5	11.8	11.4
E48	18.9	18.7	12.8	12.4
E49	15.0	14.6	10.5	10.1
E50	16.3	16.0	11.3	10.9
E51	15.1	14.7	10.6	10.2
E52	16.2	15.9	11.2	10.8
E53	16.6	16.3	11.4	11.0
E54	17.7	17.4	12.2	11.7
E55	18.9	18.6	12.8	12.4
E56	18.3	17.9	12.5	12.0
E57	16.9	16.5	11.6	11.1
E58	18.1	17.7	12.3	11.8
E59	17.4	17.0	11.9	11.5
E60	15.7	15.3	10.9	10.5
E61	16.6	16.2	11.5	11.1
E62	15.1	14.6	10.5	10.1
E63	14.9	14.5	10.5	10.0
E64	17.4	16.9	12.1	11.6
E65	17.1	16.7	11.9	11.5
E66	18.6	18.3	12.8	12.4
E67	19.1	18.8	13.1	12.7
E68	18.7	18.3	12.8	12.4
E69	18.8	18.4	12.9	12.5
E70	18.4	18.0	12.7	12.3
E71	18.0	17.6	12.5	12.0
E72	18.7	18.3	12.9	12.4
E73	17.4	16.9	12.1	11.6
E74	18.6	18.2	12.8	12.4
E75	18.7	18.3	12.9	12.4
E76	16.6	16.1	11.6	11.2
E77	16.8	16.3	11.8	11.3
E78	17.0	16.5	11.9	11.4
Objective	32 [a]		25 [b]	

[a] While the annual mean PM_{10} objective is 40 $\mu g/m^3$, 32 $\mu g/m^3$ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16[3]. A value of 32 $\mu g/m^3$ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance[5]

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

2018 Baseline

8.74 The predicted annual mean concentrations of NO_2 are above the annual mean objective at three existing receptors (E23, E26, E55) in 2018. It should be noted that none of these locations are within an AQMA and it is therefore likely that baseline concentrations at these receptors are over-predicted. The concentrations at receptors within the AQMA (E68 – E72) are all below the objective. This broadly accords with the monitoring sites in the AQMA, all but two of which are measuring concentrations below the objective and are located closer to the road than the receptors; therefore, slightly lower baseline concentrations at receptors E68 – E72 compared to the monitoring concentrations would be expected.

8.75 The annual mean NO_2 concentrations are below 60 µg/m^3 at all receptors; it is, therefore, unlikely that the 1-hour mean NO_2 objective is currently exceeded.

8.76 Annual mean concentrations of PM_{10} and $PM_{2.5}$ are predicted to be well below the objectives in 2018 at all receptors. The annual mean PM_{10} concentrations are below 32 µg/m^3 and it is, therefore, unlikely that the 24-hour mean PM_{10} objective is currently exceeded.

2021 Baseline

8.77 The 'official' scenario predicted annual mean concentrations of NO_2 are below the objective at all receptor locations. The 'sensitivity test' scenario predicts an annual mean concentration of NO_2 just above the objective at one receptor location (E55), and below the objective at all other receptors. The annual mean NO_2 concentrations are predicted to be below 60 µg/m^3 at all receptors for both the 'official' and the 'sensitivity test' scenarios; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded.

8.78 Annual mean concentrations of PM_{10} and $PM_{2.5}$ are predicted to be well below the objectives in 2021 at all receptors. The annual mean PM_{10} concentrations are below 32 µg/m^3 and it is, therefore, unlikely that the 24-hour mean PM_{10} objective will be exceeded.

POTENTIAL EFFECTS

Demolition and Construction Traffic

8.79 As explained in paragraph 8.19, the effects associated with construction traffic emissions for the Proposed Development in isolation and in combination with the Egley Road scheme are considered to be 'not significant'.

Demolition and Construction Works

8.80 The Proposed Development demolition and construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. Step 1 of the assessment procedure is to screen the need for a detailed assessment. There are receptors within the distances set out in the guidance (see ***ES Volume 3, Appendix: Air Quality (Annex 4)***), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

8.81 There will be a requirement to demolish the existing Woking Football Stadium, David Lloyd leisure centre, Woking Snooker Centre and five existing residential properties. Based on the example definitions set out in Table A4.1 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the dust emission class for demolition is considered to be large.

Earthworks

8.82 The characteristics of the soil at the development site have been defined using the British Geological Survey's UK Soil Observatory website[14] , as set out in Table 8.9. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 8.9 Summary of Soil Characteristics

Category	Record
Soil Layer Depth	Deep
Soil Parent Material Grain Size	Predominantly Arenaceous[a] – Rudaceous[b], with an area of Argillic[c] - Arenaceous
European Soil Bureau Description	Predominantly River Terrace Sand / Gravel, with an area of Riverine Clay and Floodplain Sands and Gravel
Soil Texture	Predominantly Sand to Sandy Loam[d], with an area of Clay to Sandy Loam

[a] grain size 0.06 – 2.0 mm.
[b] grain size > 2.0 mm.
[c] grain size <0.06 mm.
[d] a loam is composed mostly of sand and silt

8.83 The site covers approximately 5 hectares and most of this will be subject to earthworks. Dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials (such as dry soil). Based on the example definitions set out in Table A4.1 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the dust emission class for earthworks is considered to be large.

Construction

8.84 Construction activities will comprise the construction of a new football stadium and five residential apartment blocks. Based on the example definitions set out in Table A4.1 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the dust emission class for construction is considered to be large.

Trackout

8.85 The Proposed Development will generate an average of 39 outbound HDV movements per day. Based on the example definitions set out in Table A4.1 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the dust emission class for trackout is considered to be medium.

Summary of the Proposed Development Dust Emission Magnitude

8.86 Table 8.10 summarises the anticipated dust emission magnitude for the Proposed Development.

Table 8.10 Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	Large
Earthworks	Large
Construction	Large
Trackout	Medium

Sensitivity of the Area

8.87 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

Sensitivity of the Area to Effects from Dust Soiling

8.88 Residential properties are 'high' sensitivity receptors to dust soiling (Table A4.2 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***). There are approximately 30 existing residential properties located within 20 m of the site (see Figure 8.8). Furthermore, as Blocks 1, 2, 3 and 4 are anticipated to become occupied whilst the demolition and / or construction work is ongoing, then a large number of residences within the Proposed Development itself (which are also classed as being 'high' sensitive receptors) have the potential to be located within 20 m of demolition, earthworks and / or construction activities. Using the matrix set out in Table A4.3 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the area surrounding the onsite works is of 'high' sensitivity to dust soiling.

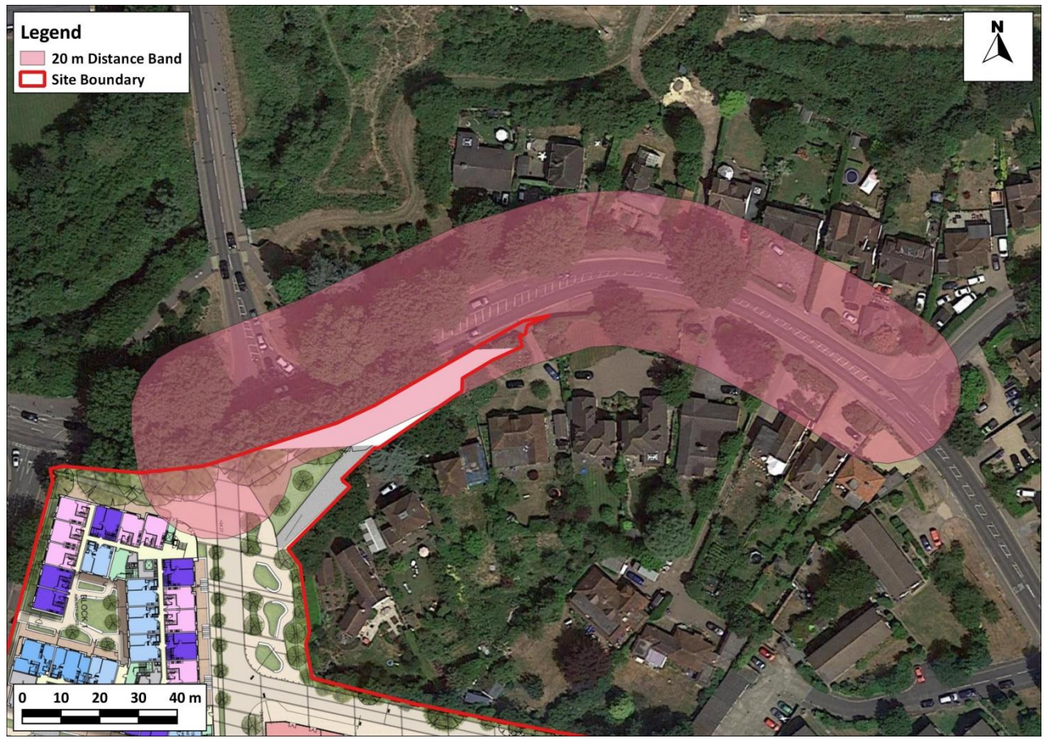
[14] British Geological Survey (2019) UK Soil Observatory Map Viewer, [Online], Available: http://mapapps2.bgs.ac.uk/ukso/home.html.

Figure 8.8 20m Distance Band around the Site Boundary

Imagery © 2019 Google, Imagery ©2019 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The Geoinformation Group, Map data ©2019.

8.89 Table 8.10 shows that the dust emission magnitude for trackout is medium and Table A4.3 in ***ES Volume 3, Appendix: Air Quality (Annex 4)*** thus explains that there is a risk of material being tracked 200m from the site exit(s). The HDVs exiting the site will travel eastwards along Kingfield Road (A247) and then on the High Street (A247). There are seven existing residential properties and a minimum of 18 proposed residential apartments within Block 1 (which may be occupied during demolition and construction activities) within 20m of the roads along which material could be tracked. Table A4.3 in ***ES Volume 3, Appendix: Air Quality (Annex 4)*** thus indicates that the area is of 'high' sensitivity to dust soiling due to trackout.

Figure 8.9 20m Distance Bands around Roads Used by Demolition and Construction Traffic Within 200m of the Site Exit



Imagery © 2019 Google, Imagery ©2019 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The Geoinformation Group, Map data ©2019. Contains data from Leach Rhodes Walker Architects drawing no. 7884-L(00)79L.

Sensitivity of the Area to any Human Health Effects

8.90 Residential properties are also classified as being of 'high' sensitivity to human health effects. The matrix in Table A4.4 in ***ES Volume 3, Appendix: Air Quality (Annex 4)*** requires information on the baseline annual mean PM_{10} concentration in the area. Existing sensitive receptors E1, E2, E3, E4, E7, E8, E30, E31, E32, E34, E35 and E41 are located within 20m of the Site boundary and / or the roads along which dust may be tracked out by construction vehicles; the maximum predicted baseline PM_{10} concentration at these receptors is 17.3 µg/m^3 in 2018 (see Table 8.8), and this value has been used. Using the matrix in Table A4.4 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, the area surrounding the onsite works is of 'medium' sensitivity to human health effects, while the area surrounding roads along which material may be tracked from the site is of 'low' sensitivity.

Summary of Area Sensitivity

8.91 Table 8.11 summarises the sensitivity of the area around the proposed construction works site.

Table 8.11 Summary of the Area Sensitivity

Effects associated with:	Sensitivity of the Surrounding Area	
	On-site works	Trackout
Dust Soiling	High	High
Human health	Medium	Low

Risk and Significance

8.92 The dust emission magnitudes in Table 8.10 have been combined with the sensitivities of the area in Table 8.11 using the matrix in Table A4.6 in ***ES Volume 3, Appendix: Air Quality (Annex 4)***, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 8.12. These risk categories have been used to determine the appropriate level of mitigation as set out in ***ES Volume 3, Appendix: Air Quality (Annex 6)*** (step 3 of the assessment procedure).

Table 8.12 Summary of Risk of Impacts Without Mitigation

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

8.93 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance[10] is clear that the residual effect will normally be 'not significant'.

Completed Development

Initial Screening Assessment of Proposed Development-Generated Road Traffic Emissions

8.94 The trip generation of the Proposed Development on local roads (as provided by Vectos) has initially been compared to the screening criteria set out in the EPUK/IAQM guidance[5] (see ***ES Volume 3, Appendix: Air Quality (Annex 1)***). The Proposed Development will increase AADT flows by more than 500 vehicles along numerous roads within the study area, both in isolation and in combination with the Egley Road scheme. As such, a detailed assessment of the impacts of traffic generated by the Proposed Development, both in isolation and in combination with the Egley Road scheme, is required. The assessment focusses on roads where traffic changes exceed this 500 AADT criterion.

Initial Screening Assessment of the Back-Up Boiler Plant

8.95 The calculated total NOx emission rate from the back-up boiler plant proposed as part of the Proposed Development (3.16 mg/s of NOx in total) is below the 5 mg/s screening threshold set out in the EPUK/IAQM guidance (see paragraph A1.11 in ***ES Volume 3, Appendix: Air Quality (Annex 1)***. As such, the potential for significant impacts at existing receptors as a result of emissions from the proposed energy plant can be discounted. However, the emissions from the proposed energy plant are considered in combination with the road traffic impacts later in this chapter, in order to ensure that the full impacts of development-related emissions on annual mean NO_2 concentrations are assessed.

8.96 For the assessment of the Proposed Development in combination with the Egley Road scheme the emissions associated with the energy plant proposed as part of the Egley Road scheme are also considered.

Combined Impacts of Proposed Development-Generated Road Traffic and Energy Plant Emissions at Existing Sensitive Receptors – Proposed Development in Isolation

8.97 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2021 for existing receptors are set out in Table 8.13 to Table 8.16 for both the future baseline (in the absence of the Proposed Development and Egley Road scheme) and with the Proposed Development. Predictions take account of emissions from the adjacent road network and, for the Proposed Development scenario, emissions from the Proposed Development boiler plant. These tables also describe the impacts at each receptor using the impact descriptors given in Table 8.2. For NO_2, results are presented for two scenarios so as to include a sensitivity test. In cases where impacts have been modelled at more than one height, the worst-case results (i.e. the results showing the greatest change in concentration) have been presented.

Table 8.13 Predicted Impacts on Annual Mean NO_2 Concentrations in 2021 for the Proposed Development Scenario (µg/m^3) [a]

Receptor	Future Baseline	Future Baseline+ Proposed Development	% Change[b]	Impact Descriptor
E1	18.4	18.8	1	Negligible
E2	17.3	17.6	1	Negligible
E3	25.3	26.0	2	Negligible
E4	22.0	22.5	1	Negligible
E5	24.9	25.6	2	Negligible
E6	15.2	15.3	0	Negligible
E7	14.8	15.0	0	Negligible
E8	14.6	14.9	1	Negligible
E9	28.6	29.4	2	Negligible
E10	19.9	20.3	1	Negligible
E11	25.4	26.1	2	Negligible
E12	23.2	23.7	1	Negligible
E13	23.8	24.2	1	Negligible
E14	28.8	29.3	1	Negligible
E15	22.0	22.1	0	Negligible
E16	25.8	26.2	1	Negligible
E17	29.2	29.8	1	Negligible
E18	26.6	27.1	1	Negligible
E19	23.5	24.0	1	Negligible
E20	32.0	33.2	3	Minor Adverse
E21	22.4	23.2	2	Negligible
E22	25.3	26.6	3	Negligible
E23	37.0	38.2	3	Moderate Adverse
E24	26.0	26.9	2	Negligible
E25	33.4	33.9	1	Negligible
E26	36.8	37.1	1	Negligible
E27	22.7	22.8	0	Negligible
E28	28.9	29.0	0	Negligible
E29	32.4	32.6	0	Negligible
E30	21.3	21.7	1	Negligible
E31	21.5	22.0	1	Negligible
E32	19.6	20.0	1	Negligible
E33	17.9	18.1	1	Negligible
E34	19.2	19.5	1	Negligible
E35	17.9	18.2	1	Negligible
E36	17.5	17.8	1	Negligible
E37	18.8	19.0	1	Negligible
E38	17.5	17.6	0	Negligible
E39	18.7	18.9	1	Negligible
E40	15.0	15.2	0	Negligible

Receptor	Future Baseline	Future Baseline+ Proposed Development	% Change[b]	Impact Descriptor
E41	14.7	14.9	0	Negligible
E42	28.0	28.6	2	Negligible
E43	26.6	27.0	1	Negligible
E44	22.7	22.9	0	Negligible
E45	22.8	22.8	0	Negligible
E46	21.2	21.2	0	Negligible
E47	23.1	23.1	0	Negligible
E48	32.6	32.7	0	Negligible
E49	16.6	16.7	0	Negligible
E50	22.3	22.3	0	Negligible
E51	18.1	18.1	0	Negligible
E52	22.3	22.3	0	Negligible
E53	23.8	23.8	0	Negligible
E54	33.0	33.2	0	Negligible
E55	38.9	39.2	1	Minor Adverse
E56	35.4	35.8	1	Negligible
E57	29.5	30.0	1	Negligible
E58	35.3	35.9	2	Minor Adverse
E59	32.0	32.5	1	Negligible
E60	20.6	20.8	1	Negligible
E61	26.4	26.4	0	Negligible
E62	17.8	17.9	0	Negligible
E63	16.9	17.0	0	Negligible
E64	27.0	27.3	1	Negligible
E65	24.4	24.6	0	Negligible
E66	30.8	31.0	0	Negligible
E67	33.2	33.4	1	Negligible
E68	31.9	32.0	0	Negligible
E69	32.3	32.5	0	Negligible
E70	30.7	30.9	0	Negligible
E71	29.2	29.3	0	Negligible
E71	32.1	32.3	0	Negligible
E73	26.9	27.0	0	Negligible
E74	32.2	32.3	0	Negligible
E75	32.6	32.7	0	Negligible
E76	23.8	23.9	0	Negligible
E77	24.9	25.0	0	Negligible
E78	25.8	25.9	0	Negligible
Objective	40		-	-

[a] Exceedances of the objective are shown in bold.
[b] % changes are relative to the objective and have been rounded to the nearest whole number.

Table 8.14 Predicted Impacts on Annual Mean NO_2 Concentrations in 2021 for the Proposed Development Scenario (Sensitivity Test) (µg/m^3) [a,b]

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[c]	Impact Descriptor
E1	17.6	18.0	1	Negligible
E2	16.2	16.6	1	Negligible
E3	25.1	25.9	2	Negligible
E4	21.5	22.1	1	Negligible
E5	24.7	25.4	2	Negligible
E6	14.0	14.1	0	Negligible
E7	13.5	13.7	0	Negligible
E8	13.3	13.6	1	Negligible
E9	28.7	29.6	2	Negligible
E10	19.2	19.6	1	Negligible
E11	25.2	25.9	2	Negligible
E12	22.7	23.3	2	Negligible
E13	23.4	23.9	1	Negligible
E14	29.0	29.6	1	Negligible
E15	21.4	21.6	0	Negligible
E16	26.0	26.5	1	Negligible
E17	29.7	30.3	1	Negligible
E18	26.9	27.4	1	Negligible
E19	23.1	23.7	1	Negligible
E20	32.5	33.8	3	Minor Adverse
E21	22.0	22.8	2	Negligible
E22	25.1	26.6	4	Negligible
E23	38.1	39.4	3	Moderate Adverse
E24	26.0	26.9	2	Negligible
E25	34.1	34.7	1	Negligible
E26	37.8	38.1	1	Minor Adverse
E27	22.5	22.6	0	Negligible
E28	29.3	29.5	0	Negligible
E29	33.2	33.3	0	Negligible
E30	20.7	21.2	1	Negligible
E31	20.9	21.5	1	Negligible
E32	18.9	19.3	1	Negligible
E33	17.0	17.2	1	Negligible
E34	18.4	18.7	1	Negligible
E35	16.9	17.2	1	Negligible
E36	16.5	16.8	1	Negligible
E37	17.9	18.1	1	Negligible
E38	16.4	16.6	0	Negligible
E39	17.8	18.0	1	Negligible
E40	13.7	13.9	0	Negligible

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[c]	Impact Descriptor
E41	13.4	13.6	0	Negligible
E42	28.1	28.8	2	Negligible
E43	26.6	27.0	1	Negligible
E44	22.3	22.4	0	Negligible
E45	22.5	22.6	0	Negligible
E46	20.8	20.8	0	Negligible
E47	22.9	22.9	0	Negligible
E48	33.5	33.6	0	Negligible
E49	16.1	16.1	0	Negligible
E50	22.3	22.3	0	Negligible
E51	17.8	17.8	0	Negligible
E52	22.3	22.3	0	Negligible
E53	24.0	24.0	0	Negligible
E54	34.2	34.4	0	Negligible
E55	**40.7**	**40.9**	1	Minor Adverse
E56	36.8	37.3	1	Negligible
E57	30.3	30.9	1	Negligible
E58	36.7	37.4	2	Minor Adverse
E59	33.1	33.6	1	Negligible
E60	20.4	20.6	1	Negligible
E61	27.0	27.0	0	Negligible
E62	17.4	17.5	0	Negligible
E63	16.5	16.5	0	Negligible
E64	27.1	27.4	1	Negligible
E65	24.2	24.4	0	Negligible
E66	31.2	31.4	0	Negligible
E67	33.8	34.0	1	Negligible
E68	32.8	33.0	0	Negligible
E69	33.3	33.5	0	Negligible
E70	31.6	31.8	0	Negligible
E71	29.9	30.0	0	Negligible
E71	33.1	33.3	0	Negligible
E73	27.4	27.5	0	Negligible
E74	33.2	33.3	0	Negligible
E75	33.6	33.8	0	Negligible
E76	24.0	24.1	0	Negligible
E77	25.3	25.4	0	Negligible
E78	26.2	26.3	0	Negligible
Objective	40		-	-

[a] Exceedances of the objective are shown in bold.
[b] Assuming higher emissions from modern diesel vehicles as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.
[c] % changes are relative to the objective and have been rounded to the nearest whole number.

Table 8.15 Predicted Impacts on Annual Mean PM_{10} Concentrations in 2021 for the Proposed Development Scenario (µg/m^3)

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[a]	Impact Descriptor
E1	15.3	15.3	0	Negligible
E2	15.0	15.1	0	Negligible
E3	16.9	17.0	0	Negligible
E4	16.2	16.3	0	Negligible
E5	16.8	17.0	1	Negligible
E6	14.6	14.6	0	Negligible
E7	14.5	14.5	0	Negligible
E8	14.5	14.5	0	Negligible
E9	14.5	14.5	0	Negligible
E10	17.7	17.9	1	Negligible
E11	17.1	17.2	0	Negligible
E12	16.6	16.7	0	Negligible
E13	16.2	16.3	0	Negligible
E14	17.1	17.2	0	Negligible
E15	15.9	15.9	0	Negligible
E16	17.0	17.1	0	Negligible
E17	17.8	18.0	0	Negligible
E18	17.3	17.4	0	Negligible
E19	16.4	16.5	0	Negligible
E20	18.2	18.4	1	Negligible
E21	16.1	16.3	1	Negligible
E22	16.6	16.9	1	Negligible
E23	18.7	19.0	1	Negligible
E24	16.6	16.8	1	Negligible
E25	18.0	18.1	0	Negligible
E26	19.4	19.5	0	Negligible
E27	16.2	16.2	0	Negligible
E28	17.6	17.7	0	Negligible
E29	18.6	18.6	0	Negligible
E30	15.8	15.9	0	Negligible
E31	15.9	15.9	0	Negligible
E32	15.6	15.6	0	Negligible
E33	15.2	15.2	0	Negligible
E34	15.5	15.5	0	Negligible
E35	15.2	15.2	0	Negligible
E36	15.1	15.1	0	Negligible
E37	15.4	15.4	0	Negligible
E38	15.1	15.1	0	Negligible
E39	15.4	15.4	0	Negligible
E40	14.6	14.6	0	Negligible

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[a]	Impact Descriptor
E41	14.5	14.5	0	Negligible
E42	17.0	17.2	0	Negligible
E43	16.9	17.0	0	Negligible
E44	16.4	16.4	0	Negligible
E45	16.4	16.4	0	Negligible
E46	15.9	16.0	0	Negligible
E47	16.5	16.5	0	Negligible
E48	18.7	18.7	0	Negligible
E49	14.6	14.6	0	Negligible
E50	16.0	16.0	0	Negligible
E51	14.7	14.7	0	Negligible
E52	15.9	15.9	0	Negligible
E53	16.3	16.3	0	Negligible
E54	17.4	17.4	0	Negligible
E55	18.6	18.6	0	Negligible
E56	17.9	18.0	0	Negligible
E57	16.5	16.6	0	Negligible
E58	17.7	17.8	0	Negligible
E59	17.0	17.1	0	Negligible
E60	15.3	15.4	0	Negligible
E61	16.2	16.2	0	Negligible
E62	14.6	14.6	0	Negligible
E63	14.5	14.5	0	Negligible
E64	16.9	17.0	0	Negligible
E65	16.7	16.7	0	Negligible
E66	18.3	18.3	0	Negligible
E67	18.8	18.9	0	Negligible
E68	18.3	18.3	0	Negligible
E69	18.4	18.4	0	Negligible
E70	18.0	18.0	0	Negligible
E71	17.6	17.6	0	Negligible
E72	18.3	18.4	0	Negligible
E73	16.9	16.9	0	Negligible
E74	18.2	18.2	0	Negligible
E75	18.3	18.4	0	Negligible
E76	16.1	16.1	0	Negligible
E77	16.3	16.3	0	Negligible
E78	16.5	16.5	0	Negligible
Objective	32[b]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16[3]. A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance[5].

Table 8.16 Predicted Impacts on Annual Mean $PM_{2.5}$ Concentrations in 2021 for the Proposed Development Scenario (µg/m^3)

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[a]	Impact Descriptor
E1	10.7	10.7	0	Negligible
E2	10.5	10.6	0	Negligible
E3	11.6	11.7	0	Negligible
E4	11.2	11.3	0	Negligible
E5	11.5	11.6	0	Negligible
E6	10.3	10.3	0	Negligible
E7	10.2	10.3	0	Negligible
E8	10.2	10.2	0	Negligible
E9	12.0	12.2	0	Negligible
E10	10.9	11.0	0	Negligible
E11	11.6	11.7	0	Negligible
E12	11.4	11.4	0	Negligible
E13	11.2	11.2	0	Negligible
E14	11.7	11.8	0	Negligible
E15	11.0	11.0	0	Negligible
E16	11.4	11.4	0	Negligible
E17	11.8	11.9	0	Negligible
E18	11.5	11.6	0	Negligible
E19	11.3	11.4	0	Negligible
E20	12.3	12.5	1	Negligible
E21	11.2	11.3	0	Negligible
E22	11.4	11.6	1	Negligible
E23	12.7	12.8	1	Negligible
E24	11.5	11.6	0	Negligible
E25	12.3	12.3	0	Negligible
E26	13.1	13.1	0	Negligible
E27	11.2	11.2	0	Negligible
E28	12.0	12.1	0	Negligible
E29	12.6	12.6	0	Negligible
E30	11.0	11.0	0	Negligible
E31	11.0	11.1	0	Negligible
E32	10.8	10.9	0	Negligible
E33	10.6	10.7	0	Negligible
E34	10.8	10.8	0	Negligible
E35	10.6	10.6	0	Negligible
E36	10.6	10.6	0	Negligible
E37	10.7	10.8	0	Negligible
E38	10.6	10.6	0	Negligible
E39	10.7	10.7	0	Negligible
E40	10.3	10.3	0	Negligible

Receptor	Future Baseline	Future Baseline + Proposed Development	% Change[a]	Impact Descriptor
E41	10.2	10.2	0	Negligible
E42	11.7	11.8	0	Negligible
E43	11.6	11.6	0	Negligible
E44	11.3	11.3	0	Negligible
E45	11.3	11.3	0	Negligible
E46	11.1	11.1	0	Negligible
E47	11.4	11.4	0	Negligible
E48	12.4	12.4	0	Negligible
E49	10.1	10.1	0	Negligible
E50	10.9	10.9	0	Negligible
E51	10.2	10.2	0	Negligible
E52	10.8	10.8	0	Negligible
E53	11.0	11.0	0	Negligible
E54	11.7	11.8	0	Negligible
E55	12.4	12.5	0	Negligible
E56	12.0	12.1	0	Negligible
E57	11.1	11.2	0	Negligible
E58	11.8	11.9	0	Negligible
E59	11.5	11.5	0	Negligible
E60	10.5	10.5	0	Negligible
E61	11.1	11.1	0	Negligible
E62	10.1	10.1	0	Negligible
E63	10.0	10.0	0	Negligible
E64	11.6	11.7	0	Negligible
E65	11.5	11.5	0	Negligible
E66	12.4	12.4	0	Negligible
E67	12.7	12.7	0	Negligible
E68	12.4	12.4	0	Negligible
E69	12.5	12.5	0	Negligible
E70	12.3	12.3	0	Negligible
E71	12.0	12.0	0	Negligible
E72	12.4	12.5	0	Negligible
E73	11.6	11.6	0	Negligible
E74	12.4	12.4	0	Negligible
E75	12.4	12.5	0	Negligible
E76	11.2	11.2	0	Negligible
E77	11.3	11.3	0	Negligible
E78	11.4	11.4	0	Negligible
Objective	25[b]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

NO_2

8.98 The 'official' scenario annual mean NO_2 concentrations are below the objective at all receptors, both with and without the Proposed Development. Furthermore, the annual mean NO_2 concentrations are below 60 µg/m^3 at all of the receptor locations both with and without the Proposed Development; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded. The 'official' scenario percentage changes in concentrations, relative to the air quality objective (when rounded), are predicted to be 3% at three receptors, 2% at eight receptors, 1% at 31 receptors and 0% at 36 receptors; using the matrix in Table A1.1, these impacts are described as being *moderate adverse* at one receptor (representing two residences), *minor adverse* at three receptors (representing 19 residences) and *negligible* elsewhere within the study area.

8.99 In the 'sensitivity test' scenario, annual mean NO_2 concentrations are above the objective at one receptor (E55), both with and without the Proposed Development (although as discussed in paragraph 8.74, concentrations at this receptor are likely to be over-predicted), and below the objective both with and without the development at all other receptors. The annual mean NO_2 concentrations are below 60 µg/m^3 at all of the receptor locations both with and without the Proposed Development; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded. The 'sensitivity test' scenario percentage changes in concentrations, relative to the air quality objective (when rounded), are predicted to be 4% at one receptor, 3% at two receptors, 2% at nine receptors, 1% at 30 receptors and 0% at 36 receptors; using the matrix in Table A1.1, these impacts are described as being *moderate adverse* at one receptor (representing two residences), *minor adverse* at four receptors (representing 25 residences) and *negligible* elsewhere within the study area.

PM_{10} and $PM_{2.5}$

8.100 The annual mean PM_{10} concentrations are well below the annual mean objectives at all receptors, with or without the Proposed Development. Furthermore, as the annual mean PM_{10} concentrations are below 32 µg/m^3, it is unlikely that the 24-hour mean PM_{10} objective will be exceeded at any of the receptors. The percentage changes in PM_{10} concentrations, relative to the air quality objective (when rounded), are predicted to be 1% at five receptors and 0% at 73 receptors; using the matrix in Table 8.2, these impacts are described as being *negligible* at all receptors.

8.101 The annual mean $PM_{2.5}$ concentrations are well below the annual mean objectives at all receptors, with or without the Proposed Development. The percentage changes in $PM_{2.5}$ concentrations, relative to the air quality objective (when rounded), are predicted to be 1% at three receptors and 0% at 75 receptors; using the matrix in Table 8.2, these impacts are described as being *negligible* at all receptors.

Combined Impacts of Proposed Development-Generated Road Traffic and Energy Plant Emissions at Existing Sensitive Receptors – Proposed Development in Combination with the Egley Road Scheme

8.102 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2021 for existing receptors are set out in Table 8.17 to Table 8.20 for both the future baseline and for the Proposed Development in combination with the Egley Road scheme. Predictions take account of emissions from the adjacent road network and, for the Proposed Development in combination with the Egley Road scheme, emissions from the proposed boiler plant within the Proposed Development and the CHP and boiler plant for the Egley Road scheme. These tables also describe the impacts at each receptor using the impact descriptors given in Table 8.2. For NO_2, results are presented for two scenarios so as to include a sensitivity test. In cases where impacts have been modelled at more than one height, the worst-case results (i.e. the results showing the greatest change in concentration) have been presented.

Table 8.17 Predicted Impacts on Annual Mean NO_2 Concentrations in 2021 for the Proposed Development in Combination with the Egley Road Scheme Scenario (µg/m^3)

Receptor	Future Baseline	Future Baseline + Proposed Development & Egley Road Scheme	% Change[a]	Impact Descriptor
E1	18.4	18.9	1	Negligible
E2	17.3	17.7	1	Negligible
E3	25.3	26.0	2	Negligible
E4	22.0	22.6	1	Negligible
E5	24.9	25.6	2	Negligible
E6	15.2	15.4	1	Negligible
E7	14.9	15.1	1	Negligible
E8	14.6	15.0	1	Negligible
E9	28.6	29.4	2	Negligible
E10	19.9	20.4	1	Negligible
E11	25.4	26.2	2	Negligible
E12	23.2	23.7	1	Negligible
E13	23.8	24.3	1	Negligible
E14	28.8	29.6	2	Negligible
E15	22.0	22.3	1	Negligible
E16	25.8	26.5	2	Negligible
E17	29.2	30.1	2	Negligible
E18	26.6	27.3	2	Negligible
E19	23.5	24.0	1	Negligible
E20	32.0	33.2	3	Minor Adverse
E21	22.4	23.3	2	Negligible
E22	25.3	26.8	4	Negligible
E23	37.0	38.9	5	Moderate Adverse
E24	26.0	27.3	3	Negligible
E25	33.4	34.5	3	Minor Adverse
E26	36.8	37.7	2	Minor Adverse
E27	22.7	23.1	1	Negligible
E28	28.9	29.4	1	Negligible
E29	32.4	33.1	2	Minor Adverse
E30	21.3	21.8	1	Negligible
E31	21.5	22.0	1	Negligible
E32	19.6	20.1	1	Negligible
E33	17.9	18.2	1	Negligible
E34	19.2	19.5	1	Negligible
E35	17.9	18.2	1	Negligible
E36	17.5	17.8	1	Negligible
E37	16.6	16.9	1	Negligible
E38	17.5	17.7	1	Negligible
E39	18.7	18.9	1	Negligible
E40	15.1	15.3	0	Negligible
E41	14.8	15.0	0	Negligible
E42	28.0	29.2	3	Negligible
E43	26.6	27.6	2	Negligible
E44	22.7	23.4	2	Negligible
E45	22.8	23.4	2	Negligible
E46	21.2	21.7	1	Negligible
E47	23.1	23.8	2	Negligible
E48	32.6	33.9	3	Minor Adverse
E49	16.6	17.0	1	Negligible
E50	22.3	23.1	2	Negligible
E51	18.1	18.7	1	Negligible
E52	22.3	22.9	2	Negligible
E53	23.8	24.4	2	Negligible
E54	33.0	33.8	2	Minor Adverse
E55	38.9	39.9	2	Moderate Adverse
E56	35.4	36.5	3	Minor Adverse
E57	29.5	30.5	3	Minor Adverse
E58	35.3	36.6	3	Minor Adverse
E59	32.0	33.1	3	Minor Adverse
E60	20.6	21.0	1	Negligible
E61	26.4	26.8	1	Negligible
E62	17.8	18.1	1	Negligible
E63	16.9	17.2	1	Negligible
E64	27.0	27.8	2	Negligible
E65	24.4	25.0	1	Negligible
E66	30.8	31.6	2	Minor Adverse
E67	33.2	33.9	2	Minor Adverse
E68	31.9	32.4	1	Negligible
E69	32.3	32.9	1	Negligible
E70	30.7	31.3	1	Negligible
E71	29.2	29.6	1	Negligible
E72	32.1	32.7	1	Negligible
E73	26.9	27.2	1	Negligible
E74	32.2	32.6	1	Negligible
E75	32.6	33.0	1	Negligible
E76	23.8	24.0	1	Negligible
E77	24.9	25.2	1	Negligible
E78	25.8	26.1	1	Negligible
Objective	40		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

Table 8.18 Predicted Impacts on Annual Mean NO_2 Concentrations in 2021 for the Proposed Development in Combination with the Egley Road Scheme Scenario (Sensitivity Test) (µg/m³) [a,b]

Receptor	Future Baseline	Future Baseline + Proposed Development & Egley Road Scheme	% Change[c]	Impact Descriptor
E1	17.6	17.9	1	Negligible
E2	16.2	16.5	1	Negligible
E3	25.1	25.8	2	Negligible
E4	21.5	22.1	1	Negligible
E5	24.7	25.4	2	Negligible
E6	14.0	14.1	0	Negligible
E7	13.6	13.7	0	Negligible
E8	13.3	13.4	0	Negligible
E9	28.7	29.6	2	Negligible
E10	19.2	19.6	1	Negligible
E11	25.2	26.0	2	Negligible
E12	22.7	23.3	2	Negligible
E13	23.4	24.0	1	Negligible
E14	29.0	29.8	2	Negligible
E15	21.4	21.8	1	Negligible
E16	26.0	26.8	2	Negligible
E17	29.7	30.7	2	Minor Adverse
E18	26.9	27.7	2	Negligible
E19	23.1	23.7	1	Negligible
E20	32.5	33.8	3	Minor Adverse
E21	22.0	22.9	2	Negligible
E22	25.1	26.8	4	Negligible
E23	38.1	**40.1**	5	Moderate Adverse
E24	26.0	27.4	4	Negligible
E25	34.1	35.3	3	Minor Adverse
E26	37.8	38.7	2	Moderate Adverse
E27	22.5	22.9	1	Negligible
E28	29.3	29.9	1	Negligible
E29	33.2	33.8	2	Minor Adverse
E30	20.7	21.1	1	Negligible
E31	20.9	21.3	1	Negligible
E32	18.9	19.2	1	Negligible
E33	17.0	17.2	1	Negligible
E34	18.4	18.7	1	Negligible
E35	16.9	17.1	1	Negligible
E36	16.5	16.7	0	Negligible
E37	17.9	18.1	1	Negligible
E38	16.4	16.6	0	Negligible
E39	17.8	18.0	1	Negligible
E40	13.8	13.9	0	Negligible
E41	13.5	13.6	0	Negligible
E42	28.1	29.4	3	Negligible
E43	26.6	27.7	3	Negligible
E44	22.3	23.0	2	Negligible
E45	22.5	23.2	2	Negligible
E46	20.8	21.4	2	Negligible
E47	22.9	23.6	2	Negligible
E48	33.5	34.9	3	Minor Adverse
E49	16.1	16.5	1	Negligible
E50	22.3	23.1	2	Negligible
E51	17.8	18.2	1	Negligible
E52	22.3	22.8	1	Negligible
E53	24.0	24.5	1	Negligible
E54	34.2	35.0	2	Minor Adverse
E55	**40.7**	**41.6**	2	Moderate Adverse
E56	36.8	37.9	3	Moderate Adverse
E57	30.3	31.4	3	Minor Adverse
E58	36.7	38.1	3	Moderate Adverse
E59	33.1	34.3	3	Minor Adverse
E60	20.4	20.8	1	Negligible
E61	27.0	27.3	1	Negligible
E62	17.4	17.7	1	Negligible
E63	16.5	16.6	0	Negligible
E64	27.1	27.9	2	Negligible
E65	24.2	24.8	2	Negligible
E66	31.2	32.0	2	Minor Adverse
E67	33.8	34.5	2	Minor Adverse
E68	32.8	33.4	1	Negligible
E69	33.3	33.9	2	Minor Adverse
E70	31.6	32.2	1	Negligible
E71	29.9	30.4	1	Negligible
E72	33.1	33.7	1	Negligible
E73	27.4	27.7	1	Negligible
E74	33.2	33.7	1	Negligible
E75	33.6	34.2	1	Negligible
E76	24.0	24.3	1	Negligible
E77	25.3	25.6	1	Negligible
E78	26.2	26.5	1	Negligible
Objective	40		-	-

[a] Exceedances of the objective are shown in bold.
[b] Assuming higher emissions from modern diesel vehicles as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.
[c] % changes are relative to the objective and have been rounded to the nearest whole number.

Table 8.19 Predicted Impacts on Annual Mean PM_{10} Concentrations in 2021 for the Proposed Development in Combination with the Egley Road Scheme Scenario (µg/m^3)

Receptor	Future Baseline	Future Baseline + Proposed Development & Egley Road Scheme	% Change[a]	Impact Descriptor
E1	15.3	15.3	0	Negligible
E2	15.0	15.1	0	Negligible
E3	16.9	17.0	0	Negligible
E4	16.2	16.3	0	Negligible
E5	16.8	17.0	1	Negligible
E6	14.6	14.6	0	Negligible
E7	14.5	14.5	0	Negligible
E8	14.5	14.5	0	Negligible
E9	17.7	17.9	1	Negligible
E10	15.7	15.8	0	Negligible
E11	17.1	17.2	1	Negligible
E12	16.6	16.7	0	Negligible
E13	16.2	16.3	0	Negligible
E14	17.1	17.2	0	Negligible
E15	15.9	15.9	0	Negligible
E16	17.0	17.2	1	Negligible
E17	17.8	18.0	1	Negligible
E18	17.3	17.5	1	Negligible
E19	16.4	16.5	0	Negligible
E20	18.2	18.4	1	Negligible
E21	16.1	16.3	1	Negligible
E22	16.6	16.9	1	Negligible
E23	18.7	19.1	1	Negligible
E24	16.6	16.9	1	Negligible
E25	18.0	18.3	1	Negligible
E26	19.4	19.6	1	Negligible
E27	16.2	16.3	0	Negligible
E28	17.6	17.8	0	Negligible
E29	18.6	18.8	0	Negligible
E30	15.8	15.9	0	Negligible
E31	15.9	16.0	0	Negligible
E32	15.6	15.6	0	Negligible
E33	15.2	15.2	0	Negligible
E34	15.5	15.5	0	Negligible
E35	15.2	15.2	0	Negligible
E36	15.1	15.1	0	Negligible
E37	15.0	15.0	0	Negligible
E38	15.1	15.1	0	Negligible
E39	15.4	15.4	0	Negligible
E40	14.6	14.6	0	Negligible
E41	14.5	14.5	0	Negligible
E42	17.0	17.3	1	Negligible
E43	16.9	17.1	1	Negligible
E44	16.4	16.5	0	Negligible
E45	16.4	16.5	0	Negligible
E46	15.9	16.1	0	Negligible
E47	16.5	16.6	1	Negligible
E48	18.7	19.1	1	Negligible
E49	14.6	14.6	0	Negligible
E50	16.0	16.1	1	Negligible
E51	14.7	14.8	0	Negligible
E52	15.9	16.0	0	Negligible
E53	16.3	16.4	0	Negligible
E54	17.4	17.5	0	Negligible
E55	18.6	18.8	1	Negligible
E56	17.9	18.1	1	Negligible
E57	16.5	16.7	1	Negligible
E58	17.7	17.9	1	Negligible
E59	17.0	17.2	1	Negligible
E60	15.3	15.4	0	Negligible
E61	16.2	16.3	0	Negligible
E62	14.6	14.7	0	Negligible
E63	14.5	14.5	0	Negligible
E64	16.9	17.1	1	Negligible
E65	16.7	16.8	0	Negligible
E66	18.3	18.5	1	Negligible
E67	18.8	19.0	1	Negligible
E68	18.3	18.4	0	Negligible
E69	18.4	18.5	0	Negligible
E70	18.0	18.1	0	Negligible
E71	17.6	17.7	0	Negligible
E72	18.3	18.5	0	Negligible
E73	16.9	16.9	0	Negligible
E74	18.2	18.3	0	Negligible
E75	18.3	18.4	0	Negligible
E76	16.1	16.1	0	Negligible
E77	16.3	16.4	0	Negligible
E78	16.5	16.6	0	Negligible
Objective	32[b]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16[3]. A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance[5].

Table 8.20 Predicted Impacts on Annual Mean $PM_{2.5}$ Concentrations in 2021 for the Proposed Development in Combination with the Egley Road Scheme Scenario (µg/m^3)

Receptor	Future Baseline	Future Baseline + Proposed Development & Egley Road Scheme	% Change[a]	Impact Descriptor
E1	10.7	10.7	0	Negligible
E2	10.5	10.6	0	Negligible
E3	11.6	11.7	0	Negligible
E4	11.2	11.3	0	Negligible
E5	11.5	11.6	0	Negligible
E6	10.3	10.3	0	Negligible
E7	10.2	10.3	0	Negligible
E8	10.2	10.2	0	Negligible
E9	12.0	12.2	0	Negligible
E10	10.9	11.0	0	Negligible
E11	11.6	11.7	0	Negligible
E12	11.4	11.5	0	Negligible
E13	11.2	11.2	0	Negligible
E14	11.7	11.8	0	Negligible
E15	11.0	11.0	0	Negligible
E16	11.4	11.5	0	Negligible
E17	11.8	11.9	0	Negligible
E18	11.5	11.6	0	Negligible
E19	11.3	11.4	0	Negligible
E20	12.3	12.5	1	Negligible
E21	11.2	11.3	0	Negligible
E22	11.4	11.6	1	Negligible
E23	12.7	12.9	1	Negligible
E24	11.5	11.6	1	Negligible
E25	12.3	12.4	1	Negligible
E26	13.1	13.2	0	Negligible
E27	11.2	11.3	0	Negligible
E28	12.0	12.1	0	Negligible
E29	12.6	12.7	0	Negligible
E30	11.0	11.0	0	Negligible
E31	11.0	11.1	0	Negligible
E32	10.8	10.9	0	Negligible
E33	10.6	10.7	0	Negligible
E34	10.8	10.8	0	Negligible
E35	10.6	10.6	0	Negligible
E36	10.6	10.6	0	Negligible
E37	10.7	10.8	0	Negligible
E38	10.6	10.6	0	Negligible
E39	10.7	10.8	0	Negligible
E40	10.3	10.3	0	Negligible
E41	10.2	10.2	0	Negligible
E42	11.7	11.8	1	Negligible
E43	11.6	11.7	0	Negligible
E44	11.3	11.4	0	Negligible
E45	11.3	11.4	0	Negligible
E46	11.1	11.1	0	Negligible
E47	11.4	11.5	0	Negligible
E48	12.4	12.6	1	Negligible
E49	10.1	10.1	0	Negligible
E50	10.9	11.0	0	Negligible
E51	10.2	10.2	0	Negligible
E52	10.8	10.9	0	Negligible
E53	11.0	11.1	0	Negligible
E54	11.7	11.8	0	Negligible
E55	12.4	12.5	0	Negligible
E56	12.0	12.2	1	Negligible
E57	11.1	11.3	0	Negligible
E58	11.8	12.0	1	Negligible
E59	11.5	11.6	1	Negligible
E60	10.5	10.5	0	Negligible
E61	11.1	11.1	0	Negligible
E62	10.1	10.2	0	Negligible
E63	10.0	10.1	0	Negligible
E64	11.6	11.7	0	Negligible
E65	11.5	11.5	0	Negligible
E66	12.4	12.5	0	Negligible
E67	12.7	12.8	0	Negligible
E68	12.4	12.5	0	Negligible
E69	12.5	12.6	0	Negligible
E70	12.3	12.3	0	Negligible
E71	12.0	12.1	0	Negligible
E72	12.4	12.5	0	Negligible
E73	11.6	11.7	0	Negligible
E74	12.4	12.4	0	Negligible
E75	12.4	12.5	0	Negligible
E76	11.2	11.2	0	Negligible
E77	11.3	11.3	0	Negligible
E78	11.4	11.5	0	Negligible
Objective	25[b]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.
[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

NO_2

8.103 The 'official' predictions for the Proposed Development in combination with the Egley Road scheme scenario show slightly greater impacts compared to the Proposed Development scenario. The annual mean NO_2 concentrations remain below the objective at all receptors, both with and without the Proposed and Egley Road developments. Furthermore, the annual mean NO_2 concentrations are below 60 µg/m^3 at all of the receptor locations. It is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded. The Proposed Development in combination with the Egley Road scheme will cause two *moderate adverse* impacts (representing three residences), and twelve *minor adverse* impacts (representing 63 residences). Impacts are *negligible* at all other receptor locations.

8.104 The 'sensitivity test' scenario shows that an exceedance of the annual mean objective could occur at receptor E55, although this is the case both with and without the Proposed Development and Egley Road scheme in operation. At receptor E23, operation of the Proposed Development and Egley Road scheme could lead to a marginal exceedance of the objective (i.e. 40.1 µg/m^3). It is, however, important to note that baseline concentrations at these receptors are likely to be over-predicted (see paragraph 8.74). Annual mean NO_2 concentrations remain below the objective at all other receptor locations. In addition, the annual mean NO_2 concentrations are below 60 µg/m^3 at all of the receptor locations. It is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded anywhere in the study area. The sensitivity test shows that there could be a total of five *moderate adverse* impacts (representing 13 residences), and 11 *minor adverse* impacts (representing 69 residences). Impacts will be *negligible* elsewhere in the study area.

PM_{10} and $PM_{2.5}$

8.105 The concentrations of PM_{10} and $PM_{2.5}$ are not materially different in the Proposed Development in combination with the Egley Road scheme , and are well below the objectives at all receptors. In addition, all impacts remaining *negligible.*

Impacts of Existing and Proposed Sources on the Proposed Development - Proposed Development in Isolation

8.106 Predicted air quality conditions for future residents and users of the Proposed Development, taking account of emissions from the adjacent road network (including both existing road traffic and traffic generated by the Proposed Development itself) and the proposed back-up boiler plant within the Proposed Development, are set out in Table 8.21 and Table 8.22 for Receptors D1 to D27. In cases where impacts have been modelled at more than one height, the worst-case (i.e. highest) predicted concentration is presented.

8.107 All of the values are well below the objectives. Air quality for future residents and users of the Proposed Development will thus be acceptable.

Table 8.21 Predicted Concentrations of NO_2 in 2021 for Receptors within the Proposed Development (Future Baseline + Proposed Development Scenario)

Receptor	Annual Mean NO_2 (µg/m^3)		99.79th percentile of 1-hour mean NO_2 (µg/m^3)[c]
	'Official' predictions [a]	Sensitivity Test [b]	
D1	20.0	19.3	39.5
D2	22.8	22.4	46.2
D3	23.4	23.1	47.5
D4	27.1	27.1	54.9
D5	21.5	20.9	43.6
D6	17.5	16.4	35.4
D7	17.1	16.1	34.8
D8	19.6	18.8	39.8
D9	18.6	17.7	37.9
D10	16.1	14.9	32.7
D11	16.7	15.5	35.8
D12	15.8	14.6	32.2
D13	16.0	14.8	32.5
D14	16.7	15.6	34.1
D15	15.7	14.5	32.1
D16	15.3	14.1	31.2
D17	15.1	13.8	30.8
D18	15.1	13.8	30.6
D19	15.1	13.9	31.0
D20	15.1	13.8	30.9
D21	15.0	13.7	30.3
D22	18.4	17.0	30.5
D23	14.9	13.6	37.8
D24	15.0	13.7	30.8
D25	15.1	13.9	30.9
D26	15.7	14.4	32.0
D27	16.3	15.1	33.2
Objective	40		200

[a] In line with Defra's forecasts.

[b] Assuming higher emissions from modern diesel vehicles as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

[c] Calculated by adding the 99.79th percentile of 1-hour mean NO_2 process contributions from the energy plant to two times the predicted baseline annual mean concentration at each receptor (including the contribution of road traffic emissions), which is common practice. The annual mean concentration predicted using the official predictions has been used, which is worst-case.

Table 8.22 Predicted Concentrations of PM_{10} and $PM_{2.5}$ in 2021 for Receptors within the Proposed Development (Future Baseline + Proposed Development)

Receptor	Annual Mean PM_{10} (µg/m^3)	Annual Mean $PM_{2.5}$ (µg/m^3)
D1	15.5	10.8
D2	16.1	11.2
D3	16.2	11.2
D4	17.0	11.6
D5	15.8	11.0
D6	15.0	10.5
D7	14.9	10.5
D8	15.5	10.8
D9	15.3	10.7
D10	14.7	10.4
D11	14.8	10.4
D12	14.7	10.3
D13	14.7	10.3
D14	14.9	10.4
D15	14.7	10.3
D16	14.6	10.3
D17	14.5	10.2
D18	14.5	10.2
D19	14.5	10.2
D20	14.5	10.2
D21	14.5	10.2
D22	14.4	10.2
D23	14.5	10.2
D24	14.5	10.2
D25	14.5	10.2
D26	14.6	10.3
D27	14.8	10.4
Objective	32[a]	25[b]

[a] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16[3]. A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance[5].

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Impacts of Existing and Proposed Sources on the Proposed Development – Proposed Development In Combination with the Egley Road Scheme

8.108 Predicted air quality conditions for future residents and users of the Proposed Development, taking account of emissions from the adjacent road network (including both existing road traffic and traffic generated by the Proposed Development and the Egley Road scheme), the proposed back-up boiler plant within the Proposed Development and the proposed CHP and boiler plant within the Egley Road scheme, are set out in Table 8.23 and Table 8.24 for Receptors D1 to D27. In cases where impacts have been modelled at more than one height, the worst-case (i.e. highest) predicted concentration is presented.

8.109 All of the values are well below the objectives. Air quality for future residents and users of the Proposed Development will thus be acceptable.

Table 8.23 Predicted Concentrations of NO_2 in 2021 for Receptors within the Proposed Development (Proposed Development in Combination with the Egley Road Scheme Scenario)

Receptor	Annual Mean NO_2 (µg/m^3)		99.79th percentile of 1-hour mean NO_2 (µg/m^3)[c]
	'Official' predictions [a]	Sensitivity Test [b]	
D1	20.1	19.0	39.7
D2	16.4	14.9	46.4
D3	23.5	22.8	47.7
D4	27.1	27.0	55.2
D5	21.6	20.7	43.8
D6	17.5	16.1	35.7
D7	17.2	15.8	35
D8	19.7	18.6	40
D9	18.6	17.5	38.1
D10	16.2	14.6	32.9
D11	16.7	15.2	36
D12	15.9	14.3	32.4
D13	16.0	14.5	32.7
D14	16.8	15.4	34.3
D15	15.8	14.3	32.4
D16	15.4	13.9	31.5
D17	15.1	13.6	31.1
D18	15.1	13.5	30.8
D19	15.2	13.6	31.2
D20	15.1	13.6	31.1
D21	15.1	13.4	30.6
D22	15.0	13.4	30.7
D23	15.0	13.3	38.1
D24	15.0	13.5	31
D25	15.2	13.7	31.1
D26	15.7	14.2	32.3
D27	16.3	14.9	33.5
Objective	40		200

[a] In line with Defra's forecasts.

[b] Assuming higher emissions from modern diesel vehicles as described in ***ES Volume 3, Appendix: Air Quality (Annex 3)***.

[c] Calculated by adding the 99.79th percentile of 1-hour mean NO_2 process contributions from the energy plant to two times the predicted baseline annual mean concentration at each receptor (including the contribution of road traffic emissions), which is common practice. The annual mean concentration predicted using the official predictions has been used, which is worst-case.

Table 8.24 Predicted Concentrations of PM_{10} and $PM_{2.5}$ in 2021 for Receptors within the Proposed Development (Proposed Development in Combination with the Egley Road Scheme Scenario)

Receptor	Annual Mean PM_{10} (µg/m³)	Annual Mean $PM_{2.5}$ (µg/m³)
D1	15.5	10.8
D2	14.8	10.4
D3	16.2	11.2
D4	17.0	11.7
D5	15.9	11.0
D6	15.0	10.5
D7	14.9	10.5
D8	15.5	10.8
D9	15.3	10.7
D10	14.7	10.4
D11	14.8	10.4
D12	14.7	10.3
D13	14.7	10.3
D14	14.9	10.4
D15	14.7	10.3
D16	14.6	10.3
D17	14.5	10.2
D18	14.5	10.2
D19	14.5	10.3
D20	14.5	10.2
D21	14.5	10.2
D22	14.5	10.2
D23	14.5	10.2
D24	14.5	10.2
D25	14.5	10.3
D26	14.6	10.3
D27	14.8	10.4
Objective	32[a]	25[b]

[a] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16[3]. A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance[5].

[b] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Emissions from the Proposed Emergency Diesel Generators

8.110 It has been confirmed that the Proposed Development will be equipped with five emergency diesel generators to be situated on the roofs of each Block. The testing regime for the proposed diesel generators is currently not known, but would typically consist of up to an hour per month, thus twelve hours a year. Although emissions from the proposed generators were not included in the model, consideration has been given as to what impacts they may have on pollutant concentrations at proposed and existing sensitive receptors.

8.111 Diesel generators exhaust gas contain NOx and fine particulate matter (PM_{10}/$PM_{2.5}$), thus these are the pollutants of concern with regards to such emissions. Their exhaust gases contain higher concentrations of NOx compared to gas-fired CHPs or boilers, and measurable levels of PM too, thus they have the potential to impact concentrations of such pollutants when in operation. However, as they will only be in operation up to 12 hours per year, their contribution to annual mean pollutant concentrations will be negligible. Given that pollutant concentrations are predicted to be well below the objective at the site, the very small contribution from emergency diesel generators would not be capable of leading to any exceedance of the objectives, thus long-term impacts can be screened out.

8.112 Their impacts on 1-hour mean NO_2 and 24-hour mean PM_{10} concentrations, however, require further consideration.

8.113 The 1-hour mean nitrogen dioxide concentration objective is 200 µg/m³, not to be exceeded more than 18 times (hours) in the year (see Table 8.1). WBC monitoring data (refer to Table 8.5) indicate that annual mean NO_2 concentrations are well below 60 µg/m³ in the study area, which suggests that the 1-hour mean NO_2 objective is currently not exceeded. Although there is no available automatic monitoring data to confirm this, it is reasonable to assume that currently, 1-hour mean nitrogen dioxide concentrations never or rarely exceed 200 µg/m³ at and near the site of Proposed Development. This would only improve in the future, due to the projected improvements in air quality. Provided that the five generators are tested within the same hour, their emissions would only be capable of leading to a maximum of twelve 1-hour mean NO_2 concentrations above 200 µg/m³ at any receptor location (this is very unlikely, but is the theoretical worst-case scenario). Considering existing conditions in the study area (i.e. none or a small number of 1-hour mean NO_2 concentrations above 200 µg/m³), it is highly unlikely that 12 new values above 200 µg/m³ would lead to a total of more than 18 values above 200 µg/m³ in a year at any receptor.

8.114 The 24-hour mean PM_{10} objective corresponds to 50 µg/m³ as a 24-hour mean concentration not to be exceeded more than 35 times a year. As the generators will only be tested for an hour in any one day, the PM_{10} emissions will not contribute enough to cause the 24-hour mean concentrations to exceed 50 µg/m³, therefore there is no risk of significant impacts in relation to the 24-hour mean PM_{10} objective.

8.115 Overall, emissions from the proposed emergency diesel generators will have a negligible impact on annual mean pollutant concentrations, and would not be capable of leading to exceedances of the 1-hour mean NO_2 and 24-hour mean PM_{10} objectives anywhere in the study area, provided that testing is carried out simultaneously every month (within the same hour).

Significance of Operational Air Quality effects

8.116 The professional judgements outlined in this Section are made in accordance with the methodology set out in ***ES Volume 3, Appendix: Air Quality (Annex 3)***, and also take into account the results of the 'sensitivity test' scenario for NO_2.

Proposed Development in Isolation

8.117 The assessment has considered the impacts that emissions associated with Proposed Development-generated traffic and plant emissions would have on air quality at existing receptors, as well as the impacts of existing and proposed sources onto air quality that future residents and occupants of the Proposed Development will be exposed to.

8.118 As explained in paragraph 8.22, the assessment is based on a worst-case assumption such that all Proposed Development-generated traffic and energy plant emissions has been considered to occur in 2021, which is the earliest year of first occupation. In reality, the Proposed Development will be fully completed and occupied in 2025. Air quality is projected to improve with time, with background pollutant concentrations and vehicle emissions factors expected to reduce between 2021 and 2025. The predicted concentrations and impacts presented in this Chapter are thus conservative.

8.119 Despite this worst-case approach, the assessment has shown that air quality conditions at the site in the opening year will be acceptable, with pollutant concentrations predicted to be well below the national air quality objectives throughout the site.

8.120 In addition, operation of the Proposed Development has been shown to lead to negligible impacts on concentrations of PM_{10} and $PM_{2.5}$ at all selected existing receptor locations. Impacts on annual mean NO_2 concentrations are, however, predicted to be moderate adverse at one receptor (representing two residences), minor adverse at three to four receptors (representing 19 to 29 residences) and negligible elsewhere within the study area. As discussed above, the assessment has adopted a worst-case approach by assuming full operation of the Proposed Development in 2021, which has led to conservative results. In reality, in 2021, only Block 1 will be completed and operational, with 107 car parking spaces in use out of the 855 spaces to be provided as part of the Proposed Development. As such, based on the assumption that the increase in road traffic will be proportionate to the number of car parking spaces in use, it is expected that only 12.5% of the Proposed Development-generated road traffic will appear on the roads in 2021. In

addition, only one out of the five back-up gas-fired boilers will be in operation. On this basis, it is unlikely that the moderate adverse impact predicted at receptor E23 (and representative of two residences only) as a result of the completed Proposed Development will occur in reality. Therefore, it is expected that impacts will range from negligible to minor adverse at all receptors.

8.121 Overall, based on the above, the operational air quality effects associated with the Proposed Development are considered to be 'non-significant'.

Proposed Development in Combination with the Egley Road Scheme

8.122 This assessment has also considered the air quality impacts associated with the Proposed Development in combination with the Egley Road scheme. The road traffic and plant emissions associated with operation of the Egley Road scheme were added to the Proposed Development operational emissions, and the combined impacts at existing and introduced receptor locations were considered.

8.123 The assessment has shown that future air quality conditions at the Proposed Development site remain acceptable, with pollutant concentrations predicted to be well below the objectives.

8.124 The impacts on annual mean PM_{10} and $PM_{2.5}$ concentrations remain negligible at all selected existing receptors, and concentrations are well below the objectives at all receptors.

8.125 The impacts on annual mean NO_2 concentration remain negligible or minor adverse at most receptor locations, but are predicted to be moderate adverse at two to five receptor locations, representative of between three and 13 residential properties (based on both the official predictions and results from the sensitivity test).

8.126 As explained in paragraphs 8.22 and 8.23, this assessment has adopted a worst-case approach in assuming that road traffic and plant emissions associated with full operation of the Proposed Development and Egley Road scheme will be generated in 2021. However, these are conservative results as, in 2021, only Block 1 of the Proposed Development and only the David Lloyd Leisure Centre of the Egley Road scheme will be completed and operational. This corresponds to 107 car parking spaces out of 855 provided by the Proposed Development and 280 car parking spaces out of 370 provided by the Egley Road scheme will be in use, leading to approximately only 31.6% of the total potential increases in road traffic being likely to occur in 2021 (based on the assumption that traffic generation is proportionate to the number of car parking spaces in use). In addition, as explained in paragraph 8.120, only one out of the five gas-fired boilers within the Proposed Development will be operational in 2021.

8.127 Based on a review of the modelled road traffic contributions to concentrations at receptors, and the expected increase in traffic in 2021, it can be concluded that although a moderate adverse impact may remain at receptors E23, E26, E55, E56 and E58, the predicted moderate adverse impacts are unlikely to occur. Overall, it can be expected that impacts will range from negligible to minor adverse at all but one receptor location (E23), where a moderate adverse impact could occur. However, it is anticipated that in future years, as the Proposed Development grows to full capacity (by 2025), expected improvements in baseline air quality conditions[15], due to more stringent emission standards for vehicles and the uptake of clean-technology vehicles (such as electric or hybrid), will reduce the potential for this moderate adverse impact from occurring.

8.128 The official predictions show that annual mean NO_2 remain below the objective at all receptors. The sensitivity test shows that concentrations with the Proposed Development and Egley Road scheme in operation could be above the objective at receptor E23 and receptor E55, although such results are based on worst-case assumptions and are in reality unlikely to occur.

8.129 Overall, based on the above, the operational air quality effects associated with the Proposed Development in combination with the Egley Road scheme are considered to be 'non-significant'.

MITIGATION AND RESIDUAL EFFECTS

Mitigation Included by Design

8.130 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required. The Proposed Development incorporates the following good design and best practice measures:

- Setting back of the residential properties from the kerb of nearby main roads by at least 5 m;
- Installation of low NOx boilers only, with emission rates below 40 mg/kWh;
- Use of Air Source heat Pumps (ASHP) to provide heat and hot water to the Proposed Development;
- Running of the boiler flues to 1.5 m above roof level to promote dispersion; and
- Use of exhaust flues for the boilers and emergency generators that discharge vertically upwards, unimpeded by any fixture on top of the stack (e.g. rain cowls).

Additional Mitigation

Demolition and Construction

8.131 Measures to mitigate dust emissions will be required during the demolition and construction works of the Proposed Development in order to minimise effects upon nearby sensitive receptors.

8.132 The site has been identified as a Medium to High Risk site for dust soiling and as a Low to High Risk site for human health impacts, as set out in Table 8.12. The IAQM guidance[10] describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on what monitoring should be undertaken during the construction phase. This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in ***ES Volume 3, Appendix: Air Quality (Annex 6)***.

8.133 The mitigation measures shall be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan (CEMP), and may require monitoring.

8.134 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There will not be any excessive use of water.

Completed Development

8.135 The assessment has demonstrated that air quality within the Proposed Development will be acceptable for the proposed new residents and users. As such, there is no requirement for mitigation.

8.136 The assessment has demonstrated that the Proposed Development, both in isolation and in combination with the Egley Road scheme, will have 'non-significant' effects on existing sensitive properties in the local area, and no mitigation is required.

8.137 It should, however, be ensured that the proposed plant installed within the Proposed Development meet the specifications set out in ***ES Volume 3, Appendix: Air Quality (Annexes 3 and 5)***. If the installed plant do not conform to these specifications, additional assessment may be required.

8.138 Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law). WBC has also produced an Air Quality Action Plan[16] in response to AQMA Order 2 which will also be helping to deliver improved air quality within the study area.

Summary

8.139 Table 8.25 provides a summary of the identified mitigation and measures committed to, and Table 8.26 provides a tabulated summary of the outcomes of the air quality impact assessment of the Proposed Development.

Table 8.25 Summary of Proposed Mitigation and Enhancement Measures

Potential Effects Identified	Proposed Mitigation / Enhancement Measures
Demolition and Construction	
Demolition and Construction works (dust)	Mitigation Measures listed in ***ES Volume 3, Appendix: Air Quality (Annex 6)***
Demolition and Construction traffic	No mitigation measures required
Completed Development	

[15] Refer to paragraphs A7.7 and A7.8 in ***ES Volume 3, Appendix: Air Quality (Annex 7)*** for further details.

[16] Woking Borough Council (2015) Anchor Hill AQMA – Air Quality Action Plan

Potential Effects Identified	Proposed Mitigation / Enhancement Measures
Road traffic emissions	No mitigation measures required
Plant emissions	No mitigation measures required

RESIDUAL EFFECTS

8.140 The residual effects resulting from the Proposed Development are summarised in Table 8.26.

Table 8.26 Summary of Residual Effects

Receptor	Receptor Sensitivity	Residual Effect (Nature and Scale)	Effect Significance	Geo	D I	P T	R IR	St Mt Lt
Demolition and Construction								
Dust								
Existing Human Health Receptors	High	Adverse*	Not significant	L / B	D	T	R	Mt
Demolition and Construction Traffic								
Existing Human Health Receptors	High	Negligible	Not significant	L / B	D	T	IR	Mt
Completed Development								
Operational Traffic and Energy Plant Emissions								
Introduced Human Health Receptors	High	n/a**	Not significant	L / B	D	P	IR	Lt
Existing Human Health Receptors (Proposed Development only)	High	Negligible to Adverse***	Not significant*****	L / B	D	P	IR	Lt
Existing Human Health Receptors (Proposed Development and Egley Road Scheme combined)	High	Negligible to Adverse****	Not significant*****	L / B	D	P	IR	Lt

Notes:

Residual Effect

- Scale = Negligible / Minor / Moderate / Major
- Nature = Beneficial or Adverse

Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N)

D = Direct / I = Indirect

P = Permanent / T = Temporary

R = Reversible / IR= Irreversible

St = Short Term / Mt = Medium Term / Lt = Long Term

N/A = not applicable / not assessed

* The scale of impacts at individual receptor locations was not determined for demolition and construction. A qualitative assessment was undertaken, and it is considered that with the application of recommended mitigation measures, residual effects will be 'not significant'.

** There are no impacts at proposed receptors, as they are not currently present on site. Future air quality conditions that residents of the Proposed Development will be exposed to have, however, been predicted.

*** The impacts at individual receptors are likely to be negligible to minor adverse and the overall effects are not significant.

**** The impacts at individual receptors are likely to be negligible to minor adverse, with a moderate adverse impact at a single receptor location.

*****The overall significance of effects has been based on the impacts descriptors at individual receptors, the number of properties affected, and professional judgment.

LIKELY SIGNIFICANT EFFECTS

8.141 The construction of the Proposed Development is not predicted to result in any significant effects in relation to air quality, either from dust associated with the site works and trackout or from emissions from demolition and construction traffic generated by the Proposed Development.

8.142 The assessment demonstrated that existing and proposed emissions, without mitigation, will not cause exceedances of the relevant objectives at any of the identified worst-case sensitive locations within the Proposed Development, and that air quality conditions for new residents and users of the development will, therefore, be acceptable.

8.143 The assessment also demonstrated that the Proposed Development, in isolation, will not cause any exceedances of the NO_2, PM_{10} or $PM_{2.5}$ at existing sensitive properties, and that the overall effect on air quality at existing receptors will be not-significant.

8.144 The assessment has demonstrated that the Proposed Development in combination with the Egley Road scheme, without mitigation, will not cause any exceedances of the PM_{10} or $PM_{2.5}$ at objectives at existing sensitive properties, and PM_{10} and $PM_{2.5}$ impacts throughout the study area will be *negligible*. However, it could cause a new exceedance of the annual mean NO_2 objective at one existing property (for the 'sensitivity test' scenario only) and may result in *moderate adverse* NO_2 impacts at some existing properties. However, the assessment has adopted a conservative approach, and it has been judged that, with the exception of one receptor location representative of two residences only, such impacts are unlikely to occur.

8.145 Overall, the Proposed Development, both in isolation and in combination with the Egley Road scheme, will have a non-significant effect on air quality.

CLIMATE CHANGE

8.146 Air Quality is predicted to improve in the future, owing to lower emissions from road vehicles and heating and cooling plant as progressively lower emission technologies become available. The assessment, therefore, focuses on the near-term (year of opening), but the outlook for the longer term is one of improvement, both in terms of local and regional air quality, but also in terms of emissions associated with the Proposed Development and Egley Road scheme themselves. Climate change is a long-term effect, and significant changes in climate are not expected by 2021 (the year that the Proposed Development is anticipated to open). Climate change will, therefore, not affect air quality model predictions set out in this chapter. In the longer term (2050 – 2080) changes in climate might affect the need for heating and cooling and, therefore, have an influence on the energy plant emissions associated with the Proposed Development and Egley Road scheme, but significant effects are not expected as a result.