Report

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T4106 – Bishopsgate Goodsyard
Air Quality Assessment Sensitivity Test Technical Note
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1.0 Introduction

In September 2019, an Environmental Statement Addendum (ESA)[1] was submitted for the Proposed Development at Bishopsgate Goodsyard. Following review of the ESA[1], a series of clarifications were requested. Clarification AQ4 pertains to the air quality dispersion modelling assessment presented in **Chapter 12: Air Quality**[1], and states:

"The sensitivity test for future baseline concentrations assumes an ultra-low emission zone (ULEZ) compliant fleet. Clarification is required on what the potential implications are without a ULEZ compliant fleet i.e. Defra background concentrations pre-2019. This should be considered in both the LBTH only and LBTH and LBH scenarios."

Subsequently, the reviewers of the ESA were consulted to agree an approach for a sensitivity test of the air quality assessment that would suitably address clarification AQ4. This technical note outlines the agreed approach and outlines the predicted impacts associated with the sensitivity test.

[1] Temple Group Ltd (2019) The Goodsyard: Environmental Statement Addendum Volume 2 September 2019 – Chapter 12 of 21.

2.0 Sensitivity test approach

A dispersion modelling assessment was conducted using ADMS-Roads Extra v5.0.0.1 to identify air quality impacts associated with the Proposed Development, and assuming a ULEZ non-compliant fleet as agreed following consultation with the ESA reviewers. The dispersion modelling study followed the same methodology outlined in the ESA (further details on the assessment methodology can be found in **Chapter 12: Air Quality**[1] and Appendix H: Air Quality[2] of the ESA). In contrast to the previous modelling study, amendments were made to the vehicle fleet inputs in order to represent a ULEZ non-compliant environment. These amendments are described in Sections 2.1, 2.2 and 2.3. The pollutants considered in this test are NO_2, PM_{10} and $PM_{2.5}$.

Air quality impacts were predicted for the following assessment scenarios:

- 2027 'Do Minimum' construction phase;
- 2027 'Do Something' construction phase;
- 2034 'Do Minimum' fully operational phase;
- 2034 'Do Something' fully operational phase;
- 2034 'Do Minimum' fully operational phase for the London Borough of Tower Hamlets (LBTH) part of the Proposed Development; and
- 2034 'Do Something' fully operational phase for the LBTH part of the Proposed Development.

As with the original assessment, air quality impact descriptors were determined at each modelled receptor following the approach outlined in Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance[3]. The impact descriptors used in this air quality assessment relate to the national ambient air quality objectives i.e. the air quality assessment levels used are the ambient air quality objectives.

2.1 Euro emissions standards

The previous dispersion modelling study used vehicle emissions factors from Defra's emissions factors toolkit (EFT)[4] to quantify road traffic impacts on air quality as a result of the Proposed Development. The EFT assumes that vehicle fleets for years after the introduction of the ULEZ in 2019 will be compliant with the Euro emissions standards requirements of the ULEZ.

Data collected by the Greater London Authority (GLA)[5] indicate that in September 2019, 76.8% of vehicles driving in the ULEZ charging zone were compliant with the relevant Euro standards requirements, and 23.2% of vehicles did not meet these requirements. There are no ULEZ compliance proportions projected for future years. As such, in order to represent a ULEZ non-compliant fleet, the September 2019 compliance and non-compliance proportions were applied to the Euro standard proportions entered into the EFT for all assessed future year scenarios. This is

[2] Temple Group Ltd (2019) The Goodsyard: Environmental Statement Addensdum Volume 4 June 2019 – Appendix H

[3] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. V1.2. Environmental Protection UK and the Institute of Air Quality Management, London

[4] Defra. (2019) Emissions Factors Toolkit v9.0. https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.

[5] GLA. (2019) Central London Ultra Low Emission Zone - Six Month Report.

likely to overestimate road traffic emissions in future years, as it can be anticipated that compliance with the ULEZ will increase in the future as newer vehicles enter the London traffic fleet.

Additionally, it was assumed that all compliant vehicles within the vehicle fleet (that is, 76.8% of the fleet) would meet only the minimum ULEZ-compliant Euro emissions standard. These are Euro 4 for petrol cars and LGVs, and Euro 6 for diesel cars and LGVs. Euro standards proportions of non-compliant vehicles for 2018 were upscaled to fit the 23.2% non-compliance rate and applied across all assessment years. This represents a highly pessimistic scenario for the compliant portion of the vehicle fleet, as there are already vehicles within the ULEZ with Euro standards higher than the ULEZ minimum requirements, and the proportion of these vehicles in the fleet in future years is set to increase as newer vehicles enter the fleet.

In accordance with the approach agreed with the reviewers of the ESA, these amendments to fleet Euro standard proportions were applied only to light duty vehicles (LDVs) including cars, taxis and LGVs. Heavy duty vehicles (HDVs) were not subject to these amendments.

2.2 Fleet projections

Vehicle fleet proportions for LDVs on roads within the study area were provided by WSP, the transport consultants working on the project. These are displayed in **Table 2-1**. These vehicle proportions were factored to total 100% and entered into the 'Alternative Technologies' input option in Defra's EFT to calculate emissions rates for the LDV proportion of the fleet for each assessment year. All other vehicle technologies, including low emissions vehicles such as hybrid and electric cars, were excluded from the vehicle fleet. This therefore represents an LDV fleet consisting entirely of petrol and diesel vehicles. This represents a worst-case scenario, as there are already low- and zero-emissions vehicles in the LDV fleet and they are anticipated to form an increasing proportion of the vehicle fleet in future years. This is therefore likely to overestimate vehicle emissions in future years.

Table 2-1 Vehicle fleet split for 2018

Vehicle type	Percentage of LDV fleet (%)	Vehicle type	Percentage of car or LGV fleet (%)
Cars	74% - 81% depending on traffic count point	Taxis	5% on side roads 10% on major roads
		Petrol vehicles	66.5% of cars
		Diesel vehicles	33.5% of cars
LGVs	19% - 26% depending on traffic count point	Petrol LGVs	3.3%
		Diesel LGVs	96.7%

In accordance with the approach agreed with the reviewers of the ESA, these amendments to vehicle fleet proportions were applied only to LDVs including cars, taxis and LGVs. Heavy duty vehicles HDVs were not subject to these amendments.

2.3 Background pollutant concentrations

Predicted road contributions were combined with Defra pollutant background concentrations for the corresponding grid cell obtained from the UK Air Quality Archive[6] to produce a total concentration. Background concentrations for 2018 were used for all modelled scenarios in order to represent a

[6] Defra Background mapping data for local authorities – 2017 https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017

ULEZ non-compliant environment. This is likely to overestimate concentrations considerably in all assessed scenarios as, independent of the efficacy of the ULEZ charging scheme, vehicle fleet emissions are anticipated to improve in future years as newer, cleaner vehicles enter the fleet and older, more polluting vehicles are discontinued. This anticipated improvement is represented in future year background pollutant concentrations. Use of 2018 background pollutant concentrations will therefore not account for nine years and 16 years of vehicle emissions reductions in the construction and operational scenarios, respectively. It should be noted that the 2018 Defra background NO_2 concentrations are higher than locally monitored background NO_2 concentrations for 2018. Therefore, this sensitivity test used the Defra background NO_2 concentration as a highly pessimistic approach.

2.4 Updates to modelling and results processing tools

Since the completion of the original dispersion modelling study, dispersion modelling software and some air quality assessment tools have been updated. The sensitivity test presented in this study used ADMS-Roads Extra v5.0.0.1, while the original study used ADMS-Roads Extra v.4.1.1. Additionally, the present study used Defra's EFT v9.0[4] and Defra's NOx to NO_2 calculator v7.1[7]. The previous assessment made use of v8.0.1[8] of the EFT and v6.1[9] of the NO_x to NO_2 calculator, the latest versions available at the time of assessment. It is not expected that these updates will result in significantly different results to the previous assessment.

[7] Defra NO_x to NO_2 Calculator (v7.1) https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc.

[8] Defra. (2017) Emissions Factors Toolkit v8.0.1 https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.

[9] Defra NO_x to NO_2 Calculator (v6.1) https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc.

3.0 Results

3.1 Impacts of the development

3.1.1 2027 construction phase

Predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations associated with emissions from road traffic are presented in **Table 3-1**, **Table 3-2** and **Table 3-3**.

Annual mean NO_2 concentrations are predicted to exceed, and therefore not meet, the AQO at all modelled receptors for both the 2027 Do-Minimum (without development) and 2027 Do-Something (with development) scenarios. Annual mean PM_{10} and $PM_{2.5}$ concentrations are predicted to be within, and therefore meet, the respective AQOs at all modelled receptors for both the 2027 Do-Minimum (without development) and 2027 Do-Something (with development) scenarios.

The highest annual mean NO_2 concentration (64.5 µg/m^3) is predicted at receptor E14. The largest change in NO_2 concentrations (10.0 µg/m^3) is predicted at receptor E14 (**Table 3-1**).

All predicted annual mean NO_2 concentrations, except for those predicted at receptor E14, are well below 60 µg/m^3 and therefore in accordance with Defra guidance[10], the one-hour mean objective is unlikely to be exceeded (these criteria are normally applied to roadside locations).

Table 3-1 Estimated 2027 annual mean NO_2 (µg/m3) at receptors in the vicinity of the Proposed Development. (Construction phase)

Receptor Number	2027 Do-Minimum (Without Development)	2027 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	42.0	41.9	0.1	Negligible
E2	46.9	46.9	0.0	Negligible
E3	46.2	46.2	0.0	Negligible
E4	45.9	45.9	0.0	Negligible
E5	47.2	47.2	0.0	Negligible
E6	46.7	46.7	0.0	Negligible
E7	43.1	44.9	1.8	Substantial Adverse
E8	42.9	44.7	1.8	Substantial Adverse
E9	41.8	41.7	0.0	Negligible
E10	43.4	43.5	0.1	Negligible
E11	44.5	44.6	0.1	Negligible
E12	43.1	43.2	0.1	Negligible
E13	41.8	41.7	0.1	Negligible
E14	54.5	64.5	10.0	Substantial Adverse
E15	57.1	57.1	0.0	Negligible

[10] Department for Environment, Food and Rural Affairs. 2018. Local Air Quality Management: Technical Guidance LAQM.TG(16)

Receptor Number	2027 Do-Minimum (Without Development)	2027 Do-Something (With Development)	Change in concentration	Impact descriptor
E16	47.0	46.9	0.0	Negligible
E17	45.0	45.0	0.0	Negligible
E18	43.1	43.2	0.1	Negligible
E19	43.7	43.6	0.1	Negligible
E20	47.4	47.2	0.2	Moderate Beneficial
E21	47.1	47.2	0.0	Negligible
E22	53.4	53.5	0.1	Negligible

The highest annual mean PM_{10} concentration (26.5 µg/m^3) is predicted at receptor E14 located. The largest change in PM_{10} concentrations (3.1 µg/m^3) is predicted at receptor E14 (**Table 3-2**).

Table 3-2 Estimated 2027 annual mean PM_{10} (µg/m^3) at receptors in the vicinity of the Proposed Development. (Construction phase)

Receptor Number	2027 Do-Minimum (Without Development)	2027 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	20.0	20.0	0.0	Negligible
E2	21.2	21.3	0.0	Negligible
E3	21.1	21.1	0.0	Negligible
E4	21.1	21.1	0.0	Negligible
E5	21.3	21.3	0.0	Negligible
E6	21.2	21.2	0.0	Negligible
E7	20.3	20.9	0.5	Negligible
E8	20.3	20.8	0.5	Negligible
E9	19.9	19.9	0.0	Negligible
E10	20.4	20.5	0.0	Negligible
E11	20.8	20.8	0.0	Negligible
E12	20.4	20.4	0.0	Negligible
E13	19.9	19.9	0.0	Negligible
E14	23.4	26.5	3.1	Moderate Adverse
E15	24.2	24.2	0.0	Negligible
E16	21.6	21.6	0.0	Negligible
E17	21.0	21.0	0.0	Negligible
E18	20.3	20.3	0.0	Negligible
E19	20.4	20.4	0.0	Negligible
E20	21.7	21.7	0.1	Negligible
E21	21.3	21.3	0.0	Negligible
E22	23.6	23.6	0.0	Negligible

The highest annual mean $PM_{2.5}$ concentration (14.7 µg/m^3) is predicted at receptor E14. The largest change in $PM_{2.5}$ concentrations (0.8 µg/m^3) is predicted at receptor E14 (**Table 3-3**).

Table 3-3 Estimated 2027 annual mean $PM_{2.5}$ (µg/m^3) at receptors in the vicinity of the Proposed Development. (Construction phase)

Receptor Number	2027 Do-Minimum (Without Development)	2027 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	13.1	13.1	0.0	Negligible
E2	13.4	13.4	0.0	Negligible
E3	13.4	13.4	0.0	Negligible
E4	13.4	13.4	0.0	Negligible
E5	13.4	13.4	0.0	Negligible
E6	13.4	13.4	0.0	Negligible
E7	13.2	13.3	0.1	Negligible
E8	13.2	13.3	0.1	Negligible
E9	13.1	13.1	0.0	Negligible
E10	13.2	13.2	0.0	Negligible
E11	13.3	13.3	0.0	Negligible
E12	13.2	13.2	0.0	Negligible
E13	13.1	13.1	0.0	Negligible
E14	14.0	14.7	0.8	Negligible
E15	14.2	14.2	0.0	Negligible
E16	13.5	13.5	0.0	Negligible
E17	13.3	13.3	0.0	Negligible
E18	13.2	13.2	0.0	Negligible
E19	13.2	13.2	0.0	Negligible
E20	13.5	13.5	0.0	Negligible
E21	13.4	13.4	0.0	Negligible
E22	14.0	14.0	0.0	Negligible

Based on the EPUK guidance[3], the change in annual mean NO_2 concentrations associated with the construction and operation of the Proposed Development results in the air quality impact being classified as **substantial adverse** for receptors E7, E8 and E14, **moderate beneficial** for receptor E20, and **negligible** for all other receptors.

The change in annual mean PM_{10} concentrations associated with construction and operation of the Proposed Development results in the air quality impact being classified as **moderate adverse** for receptor E14 and **negligible** for all other receptors. Impacts associated with changes in $PM_{2.5}$ concentrations are classified as **negligible** for all modelled receptors.

3.1.2 2034 operational phase

Predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations associated with emissions from road traffic are presented in **Table 3-4**, **Table 3-5** and **Table 3-6**.

Annual mean NO_2 concentrations are predicted to exceed, and therefore not meet, the AQO at all modelled receptors for both the 2034 Do-Minimum (without development) and 2034 Do-Something (with development) scenarios. Annual mean PM_{10} and $PM_{2.5}$ concentrations are predicted to be within, and therefore meet, the respective AQOs at all modelled receptors for both the 2034 Do-Minimum (without development) and 2034 Do-Something (with development) scenarios.

The highest annual mean NO_2 concentration (64.5 µg/m^3) is predicted at receptor E14. The largest change in NO_2 concentrations (10.1 µg/m^3) is predicted at receptor E14 (**Table 3-4**).

All predicted annual mean NO_2 concentrations, except for those predicted at receptor E14, are well below 60 µg/m^3 and therefore in accordance with Defra guidance[10], the one-hour mean objective is unlikely to be exceeded (these criteria are normally applied to roadside locations).

Table 3-4 Estimated 2034 annual mean NO_2 (µg/m3) at receptors in the vicinity of the Proposed Development. (Operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	42.0	41.8	0.2	Moderate Beneficial
E2	46.9	46.8	0.1	Negligible
E3	46.2	46.2	0.0	Negligible
E4	45.9	45.8	0.0	Negligible
E5	47.1	47.2	0.0	Negligible
E6	46.7	46.7	0.0	Negligible
E7	43.1	45.0	1.9	Substantial Adverse
E8	42.9	44.9	1.9	Substantial Adverse
E9	41.7	41.9	0.1	Negligible
E10	43.4	44.1	0.7	Substantial Adverse
E11	44.5	44.6	0.1	Negligible
E12	43.1	43.2	0.1	Negligible
E13	41.8	41.5	0.3	Moderate Beneficial
E14	54.4	64.5	10.1	Substantial Adverse
E15	57.1	57.2	0.1	Negligible
E16	46.9	46.8	0.1	Negligible
E17	45.0	44.9	0.1	Negligible
E18	43.0	43.2	0.2	Moderate Adverse
E19	43.7	43.6	0.1	Negligible
E20	47.4	47.2	0.2	Moderate Beneficial
E21	47.1	47.2	0.1	Negligible
E22	53.4	53.3	0.1	Negligible

The highest annual mean PM_{10} concentration (26.5 µg/m^3) is predicted at receptor E14. The largest change in PM_{10} concentrations (3.1 µg/m^3) is predicted at receptor E14 (**Table 3-5**).

Table 3-5 Estimated 2034 annual mean PM_{10} (µg/m^3) at receptors in the vicinity of the Proposed Development. (Operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	20.0	19.9	0.1	Negligible
E2	21.2	21.2	0.0	Negligible
E3	21.1	21.0	0.0	Negligible
E4	21.1	21.0	0.0	Negligible
E5	21.3	21.3	0.0	Negligible
E6	21.2	21.2	0.0	Negligible
E7	20.3	20.9	0.6	Negligible
E8	20.3	20.8	0.6	Negligible
E9	19.9	20.0	0.0	Negligible
E10	20.4	20.6	0.2	Negligible
E11	20.8	20.8	0.0	Negligible
E12	20.4	20.4	0.0	Negligible
E13	19.9	19.9	0.1	Negligible
E14	23.4	26.5	3.1	Moderate Adverse
E15	24.2	24.2	0.0	Negligible
E16	21.6	21.5	0.0	Negligible
E17	21.0	20.9	0.0	Negligible
E18	20.3	20.3	0.1	Negligible
E19	20.4	20.4	0.0	Negligible
E20	21.7	21.7	0.1	Negligible
E21	21.3	21.3	0.0	Negligible
E22	23.6	23.6	0.0	Negligible

The highest annual mean $PM_{2.5}$ concentration (14.7 µg/m^3) is predicted at receptor E14. The largest change in $PM_{2.5}$ concentrations (0.8 µg/m^3) is predicted at receptor E14 (**Table 3-6**).

Table 3-6 Estimated 2034 annual mean $PM_{2.5}$ (µg/m^3) at receptors in the vicinity of the Proposed Development. (Operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	13.1	13.1	0.0	Negligible
E2	13.4	13.4	0.0	Negligible
E3	13.4	13.4	0.0	Negligible
E4	13.4	13.4	0.0	Negligible
E5	13.4	13.4	0.0	Negligible

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E6	13.4	13.4	0.0	Negligible
E7	13.2	13.3	0.1	Negligible
E8	13.2	13.3	0.1	Negligible
E9	13.1	13.1	0.0	Negligible
E10	13.2	13.3	0.0	Negligible
E11	13.3	13.3	0.0	Negligible
E12	13.2	13.2	0.0	Negligible
E13	13.1	13.1	0.0	Negligible
E14	14.0	14.7	0.8	Negligible
E15	14.2	14.2	0.0	Negligible
E16	13.5	13.5	0.0	Negligible
E17	13.3	13.3	0.0	Negligible
E18	13.2	13.2	0.0	Negligible
E19	13.2	13.2	0.0	Negligible
E20	13.5	13.5	0.0	Negligible
E21	13.4	13.4	0.0	Negligible
E22	14.0	14.0	0.0	Negligible

Based on the EPUK guidance[3], the change in annual mean NO_2 concentrations associated with the operation of the Proposed Development in 2034 results in the air quality impact being classified as **substantial adverse** at receptors E7, E8, E10 and E14, **moderate adverse** at receptor E18, **moderate beneficial** at receptors E1, E13 and E20, and **negligible** for all other receptors.

The change in annual mean PM_{10} concentrations associated with operation of the Proposed Development results in the air quality impact being classified as **moderate adverse** for receptor E18 and **negligible** for all other receptors. Impacts associated with changes in $PM_{2.5}$ concentrations are classified as **negligible** for all modelled receptors.

3.1.3 2034 LBTH only operational phase

Predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations associated with emissions from road traffic are presented in **Table 3-7**, **Table 3-8** and **Table 3-9**.

Annual mean NO_2 concentrations are predicted to exceed, and therefore not meet, the AQO at all modelled receptors for both the 2034 Do-Minimum (without development) and 2034 Do-Something (with development) scenarios. Annual mean PM_{10} and $PM_{2.5}$ concentrations are predicted to be within, and therefore meet, the respective AQOs at all modelled receptors for both the 2034 Do-Minimum (without development) and 2034 Do-Something (with development) scenarios.

The highest annual mean NO_2 concentration (57.2 µg/m^3) is predicted at receptor E14. The largest change in NO_2 concentrations (2.0 µg/m^3) is predicted at receptor E8 (**Table 3-7**).

All predicted annual mean NO_2 concentrations are well below 60 µg/m^3 and therefore in accordance with Defra guidance[10], the one-hour mean objective is unlikely to be exceeded (these criteria are normally applied to roadside locations).

Table 3-7 Estimated 2034 annual mean NO_2 (µg/m3) at receptors in the vicinity of the Proposed Development. (LBTH 2034 operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	42.0	42.0	0.0	Negligible
E2	46.9	46.9	0.0	Negligible
E3	46.2	46.3	0.1	Negligible
E4	45.9	45.9	0.0	Negligible
E5	47.1	47.2	0.0	Negligible
E6	46.7	46.7	0.0	Negligible
E7	43.1	45.1	2.0	Substantial Adverse
E8	42.9	44.9	2.0	Substantial Adverse
E9	41.7	41.9	0.2	Negligible
E10	43.4	44.1	0.7	Substantial Adverse
E11	44.5	44.7	0.2	Negligible
E12	43.1	43.2	0.1	Negligible
E13	41.8	41.8	0.0	Negligible
E14	54.4	54.5	0.0	Negligible
E15	57.1	57.2	0.1	Negligible
E16	46.9	47.0	0.0	Negligible
E17	45.0	45.0	0.0	Negligible
E18	43.0	43.3	0.2	Moderate Adverse
E19	43.7	43.7	0.0	Negligible
E20	47.4	47.5	0.1	Negligible
E21	47.1	47.2	0.0	Negligible
E22	53.4	53.4	0.0	Negligible

The highest annual mean PM_{10} concentration (24.2 µg/m^3) is predicted at receptor E15. The largest change in PM_{10} concentrations (0.6 µg/m^3) is predicted at receptor E8 (**Table 3-8**).

Table 3-8 Estimated 2034 annual mean PM_{10} (µg/m^3) at receptors in the vicinity of the Proposed Development. (LBTH 2034 operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	20.0	20.0	0.0	Negligible
E2	21.2	21.2	0.0	Negligible
E3	21.1	21.1	0.0	Negligible
E4	21.1	21.1	0.0	Negligible
E5	21.3	21.3	0.0	Negligible

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E6	21.2	21.2	0.0	Negligible
E7	20.3	20.9	0.6	Negligible
E8	20.3	20.8	0.6	Negligible
E9	19.9	20.0	0.1	Negligible
E10	20.4	20.6	0.2	Negligible
E11	20.8	20.8	0.0	Negligible
E12	20.4	20.4	0.0	Negligible
E13	19.9	19.9	0.0	Negligible
E14	23.4	23.4	0.0	Negligible
E15	24.2	24.2	0.0	Negligible
E16	21.6	21.6	0.0	Negligible
E17	21.0	21.0	0.0	Negligible
E18	20.3	20.3	0.1	Negligible
E19	20.4	20.5	0.0	Negligible
E20	21.7	21.8	0.0	Negligible
E21	21.3	21.3	0.0	Negligible
E22	23.6	23.6	0.0	Negligible

The highest annual mean $PM_{2.5}$ concentration (14.2 µg/m^3) is predicted at receptor E15. The largest change in $PM_{2.5}$ concentrations (0.1 µg/m^3) is predicted at receptor E8 (**Table 3-9**).

Table 3-9 Estimated 2034 annual mean $PM_{2.5}$ (µg/m^3) at receptors in the vicinity of the Proposed Development. (LBTH 2034 operational phase)

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E1	13.1	13.1	0.0	Negligible
E2	13.4	13.4	0.0	Negligible
E3	13.4	13.4	0.0	Negligible
E4	13.4	13.4	0.0	Negligible
E5	13.4	13.4	0.0	Negligible
E6	13.4	13.4	0.0	Negligible
E7	13.2	13.3	0.1	Negligible
E8	13.2	13.3	0.1	Negligible
E9	13.1	13.1	0.0	Negligible
E10	13.2	13.3	0.1	Negligible
E11	13.3	13.3	0.0	Negligible
E12	13.2	13.2	0.0	Negligible
E13	13.1	13.1	0.0	Negligible
E14	14.0	14.0	0.0	Negligible

Receptor Number	2034 Do-Minimum (Without Development)	2034 Do-Something (With Development)	Change in concentration	Impact descriptor
E15	14.2	14.2	0.0	Negligible
E16	13.5	13.5	0.0	Negligible
E17	13.3	13.3	0.0	Negligible
E18	13.2	13.2	0.0	Negligible
E19	13.2	13.2	0.0	Negligible
E20	13.5	13.5	0.0	Negligible
E21	13.4	13.4	0.0	Negligible
E22	14.0	14.0	0.0	Negligible

Based on the EPUK guidance[3], the change in annual mean NO_2 concentrations associated with the operation of the LBTH only aspects of the Proposed Development in 2034 results in the air quality impact being classified as **substantial adverse** at receptors E7, E8 and E10, **moderate adverse** at receptor E18, and **negligible** for all other receptors.

The change in annual mean PM_{10} and $PM_{2.5}$ concentrations associated with operation of the Proposed Development results in the air quality impact being classified as **negligible** for modelled receptors.

3.2 Impacts on future receptors introduced by the Proposed Development

An assessment was undertaken using the ADMS-Roads Extra dispersion model to assess the effect of traffic on future users of the Proposed Development.

The modelled results are provided in **Table 3-10**, **Table 3-11** and **Table 3-12** showing the predicted impacts of the emissions from the above sources during the operational stages for NO_2, PM_{10} and $PM_{2.5}$.

Annual mean NO_2 concentrations are predicted to exceed the AQO at all modelled receptors within the Proposed Development in 2027 and in both 2034 scenarios. The predicted concentrations indicate that the short-term objective will be met.

The PM_{10} and $PM_{2.5}$ concentrations are predicted to be within the ambient air quality objectives at all modelled new receptors within the Proposed Development in 2027 and in 2034. The predicted concentrations indicate that the short-term objectives will also be met.

Table 3-10 Estimated 2027 annual mean NO_2, PM_{10} and $PM_{2.5}$ (µg/m^3) at receptors within the Proposed Development. (construction phase)

Receptor Number	Annual Mean NO_2 (µg/m^3)	Annual Mean PM_{10} (µg/m^3)	Annual Mean $PM_{2.5}$ (µg/m^3)
R1_1	45.1	20.9	13.3
R1_2	44.7	20.8	13.3
R1_3	41.9	20.0	13.1
R1_4	41.5	19.9	13.1
R1_5	41.2	19.8	13.1
R2_1	44.7	20.7	13.3

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R2_2	44.6	20.7	13.3
R2_3	41.9	20.0	13.1
R2_4	41.4	19.8	13.1
R2_5	41.2	19.8	13.1
R3_1	44.3	20.6	13.3
R3_2	44.1	20.6	13.3
R3_3	43.6	20.4	13.2
R3_4	42.9	20.2	13.2
R3_5	42.3	20.1	13.1
R4_1	41.5	19.9	13.1
R4_2	41.4	19.8	13.1
R4_3	41.3	19.8	13.1
R4_4	41.2	19.8	13.1
R4_5	41.1	19.8	13.1
R5_1	41.3	19.8	13.1
R5_2	41.2	19.8	13.1
R5_3	41.2	19.8	13.1
R5_4	41.1	19.8	13.1
R5_5	41.1	19.7	13.0
R6_1	44.5	20.7	13.3
R6_2	43.8	20.5	13.2
R6_3	43.4	20.4	13.2
R7_1	44.5	20.7	13.3
R7_2	43.7	20.5	13.2
R7_3	43.3	20.4	13.2
R8_1	41.7	19.9	13.1
R8_2	41.6	19.9	13.1
R8_3	41.4	19.8	13.1
R8_4	41.3	19.8	13.1
R8_5	41.1	19.8	13.1
R9_1	41.3	19.8	13.1
R9_2	41.2	19.8	13.1
R9_3	41.2	19.8	13.1
R9_4	41.1	19.8	13.1
R9_5	41.0	19.7	13.0
R10_1	41.0	19.7	13.0
R10_2	41.0	19.7	13.0
R10_3	41.0	19.7	13.0
R10_4	40.9	19.7	13.0
R10_5	40.9	19.7	13.0
R11_1	41.0	19.7	13.0

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R11_2	40.9	19.7	13.0
R11_3	40.9	19.7	13.0
R11_4	40.8	19.7	13.0
R11_5	40.8	19.7	13.0
R12_6	41.0	19.7	13.0
R12_7	40.9	19.7	13.0
R12_8	40.8	19.7	13.0
R12_9	40.8	19.7	13.0
R12_10	40.7	19.6	13.0

Table 3-11 Estimated 2034 annual mean NO_2, PM_{10} and $PM_{2.5}$ ($\mu g/m^3$) at receptors within the Proposed Development. (operational phase)

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R1_1	41.6	19.9	14.0
R1_2	41.3	19.8	13.1
R1_3	41.2	19.8	13.1
R1_4	41.1	19.8	13.1
R1_5	41.0	19.7	13.1
R2_1	46.7	21.3	13.0
R2_2	46.0	21.1	13.4
R2_3	45.5	20.9	13.4
R2_4	45.2	20.8	13.3
R2_5	44.9	20.8	13.3
R3_1	44.0	20.6	13.3
R3_2	43.5	20.4	13.2
R3_3	43.2	20.3	13.2
R3_4	42.6	20.2	13.2
R3_5	42.2	20.0	13.2
R4_1	41.2	19.8	13.1
R4_2	41.1	19.8	13.1
R4_3	41.1	19.7	13.1
R4_4	41.0	19.7	13.0
R4_5	40.9	19.7	13.0
R5_1	41.1	19.8	13.0
R5_2	41.1	19.7	13.1
R5_3	41.0	19.7	13.0
R5_4	41.0	19.7	13.0
R5_5	40.9	19.7	13.0
R6_1	44.6	20.8	13.0
R6_2	43.8	20.5	13.3
R6_3	43.4	20.4	13.2

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R7_1	44.6	20.7	13.2
R7_2	43.8	20.5	13.3
R7_3	43.4	20.4	13.2
R8_1	41.3	19.8	13.2
R8_2	41.2	19.8	13.1
R8_3	41.1	19.8	13.1
R8_4	41.1	19.7	13.1
R8_5	41.0	19.7	13.0
R9_1	41.1	19.7	13.0
R9_2	41.0	19.7	13.1
R9_3	41.0	19.7	13.0
R9_4	41.0	19.7	13.0
R9_5	40.9	19.7	13.0
R10_1	40.9	19.7	13.0
R10_2	40.9	19.7	13.0
R10_3	40.9	19.7	13.0
R10_4	40.9	19.7	13.0
R10_5	40.8	19.7	13.0
R11_1	40.9	19.7	13.0
R11_2	40.9	19.7	13.0
R11_3	40.8	19.7	13.0
R11_4	40.8	19.7	13.0
R11_5	40.8	19.7	13.0
R12_6	41.0	19.7	13.0
R12_7	40.9	19.7	13.0
R12_8	40.8	19.7	13.0
R12_9	40.8	19.7	13.0
R12_10	40.7	19.6	13.0

Table 3-12 Estimated 2034 annual mean NO_2, PM_{10} and $PM_{2.5}$ ($\mu g/m^3$) at receptors within the Proposed Development. (LBTH only operational phase)

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R1_1	45.2	20.9	13.3
R1_2	44.8	20.8	13.3
R1_3	42.0	20.0	13.1
R1_4	41.5	19.9	13.1
R1_5	41.3	19.8	13.1
R2_1	47.1	21.4	13.5
R2_2	46.5	21.2	13.4
R2_3	45.9	21.0	13.4
R2_4	45.5	20.9	13.3

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R2_5	45.1	20.8	13.3
R3_1	44.3	20.6	13.3
R3_2	43.8	20.5	13.2
R3_3	43.4	20.4	13.2
R3_4	42.8	20.2	13.2
R3_5	42.3	20.1	13.1
R4_1	41.4	19.8	13.1
R4_2	41.3	19.8	13.1
R4_3	41.2	19.8	13.1
R4_4	41.2	19.8	13.1
R4_5	41.1	19.8	13.1
R5_1	41.3	19.8	13.1
R5_2	41.2	19.8	13.1
R5_3	41.2	19.8	13.1
R5_4	41.1	19.8	13.1
R5_5	41.0	19.7	13.0
R6_1	44.7	20.8	13.3
R6_2	43.9	20.6	13.2
R6_3	43.5	20.4	13.2
R7_1	44.6	20.8	13.3
R7_2	43.8	20.5	13.2
R7_3	43.4	20.4	13.2
R8_1	41.7	19.9	13.1
R8_2	41.6	19.9	13.1
R8_3	41.5	19.9	13.1
R8_4	41.3	19.8	13.1
R8_5	41.2	19.8	13.1
R9_1	41.3	19.8	13.1
R9_2	41.2	19.8	13.1
R9_3	41.2	19.8	13.1
R9_4	41.1	19.8	13.1
R9_5	41.0	19.7	13.0
R10_1	41.0	19.7	13.0
R10_2	41.0	19.7	13.0
R10_3	41.0	19.7	13.0
R10_4	40.9	19.7	13.0
R10_5	40.9	19.7	13.0
R11_1	40.9	19.7	13.0
R11_2	40.9	19.7	13.0
R11_3	40.9	19.7	13.0
R11_4	40.9	19.7	13.0

Receptor Number	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)
R11_5	40.8	19.7	13.0
R12_6	41.1	19.8	13.1
R12_7	41.0	19.7	13.0
R12_8	40.9	19.7	13.0
R12_9	40.8	19.7	13.0
R12_10	40.7	19.6	13.0

4.0 Evaluation of results and conclusion

4.1 Impacts of the development

The previous dispersion modelling study identified substantial adverse impacts with regard to NO_2 at receptor E14 due to the formation of a new street canyon once the Proposed Development is constructed and operational. In addition to this, the present study indicates that substantial adverse impacts for NO_2 are expected at receptors E7 and E8 during the construction scenario and both operational scenarios. Additionally, under the operational scenarios substantial adverse impacts are expected at receptor E10, and moderate adverse impacts are expected at receptor E18.

As outlined in **Section 2.0**, the sensitivity test was based upon a series of highly pessimistic assumptions regarding future Euro standard proportions and vehicle fleet splits on roads within the study area. These included the pessimistic assumptions that:

- compliance rates within the ULEZ would not improve beyond levels observed in 2019;
- that only compliance with the minimum ULEZ-compliant Euro standards would be achieved;
- that the future fleet of LDVs would consist **entirely of petrol and diesel vehicles**, excluding low- and zero-emissions vehicles; and
- background pollutant concentrations would not change from those predicted by the Defra background maps for 2018. Furthermore, these predicted concentrations are higher than monitored background concentrations within the vicinity of the Proposed Development.

These assumptions represent no improvement on current vehicle emissions and, in some respects, represent increased fleet emissions from the existing scenario, representing compounded levels of pessimism within the predicted fleet emissions.

Given the highly pessimistic approach used within this sensitivity test it can be expected that the predicted impacts associated with the test are likely to represent an unrealistic worst-case scenario. It is anticipated that vehicle fleet emissions will reduce and therefore improve in future years as newer, less polluting petrol and diesel vehicles enter the vehicle fleet, and as uptake of low- and zero-emissions vehicles increases.

Consequently, it is likely that impacts on existing receptors as a result of construction and operation of the Proposed Development will be closer to those described in the ESA.

4.2 Impacts on future receptors

This sensitivity test predicts that new receptors introduced by the Proposed Development are likely to be exposed to concentrations of NO_2 that breach the ambient air quality objective for annual mean NO_2 concentration. Future receptors are expected to be exposed to concentrations of PM_{10} and $PM_{2.5}$ that are within the respective air quality objectives.

The assessment adopted 2018 Defra background pollutant concentrations to calculate total pollutant concentrations. Background NO_2 concentrations for 2018 exceed the NO_2 objective. In addition, the Defra predicted concentrations are higher than monitored background concentrations within the vicinity of the Proposed Development. This represents a highly pessimistic approach, as it is anticipated that background concentrations will decrease in future years as cleaner vehicles occupy a larger portion of the vehicle fleet. It is therefore judged that the predicted concentrations

of NO_2, PM_{10} and $PM_{2.5}$ reported in the original assessment are more representative of the air quality that future receptors will be exposed to.

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