Air Quality Note

Air Quality Impacts from Testing Individual Emergency Diesel Generators

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Document control

Document Title:	Air Quality Impacts from Testing Individual Emergency Diesel Generators
Prepared By:	Dr Kate Wilkins
Reviewed By:	Dr Ben Marner

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Registered Office: 3rd Floor St Augustine's Court, 1 St. Augustine's Place Bristol BS1 4UD Tel: +44(0)117 974 1086

24 Greville Street, Farringdon, London, EC1N 8SS Tel: +44(0)20 3873 4780

First Floor, Patten House, Moulders Lane, Warrington WA1 2BA Tel: +44(0)1925 937 195

Avenue du Port, 86c Box 204, 1000 Bruxelles Tel: +44(0)20 3873 4784R

1 Introduction

1.1.1 An increasing number of new developments are working towards low- and no-combustion strategies for the provision of heat and hot water. As a result, diesel generators are often installed in new developments for emergency back-up or life-safety purposes in the event of loss of electrical power. It is important that generators are operated periodically to ensure that they are well lubricated, that the fuel within the system does not degrade, and to ensure that they will operate as required when necessary. The emissions from the testing of such generators can lead to impacts on air quality at sensitive receptor locations, particularly in residential settings where exhausts can emit close to air intakes, openable windows, or accessible areas.

1.1.2 Testing routines for emergency diesel generators vary and can range, for example, from once per week for five minutes to two or three hours once per year. Based on such a low level of operation, it can often be demonstrated within an air quality assessment that testing is unlikely to lead to an exceedance of the annual or daily mean objectives or limit values[1], but further consideration may be needed for determine impacts on 1-hour mean nitrogen dioxide (NO_2) concentrations[2].

1.1.3 For developments where sensitive receptors are located well away from other significant sources of nitrogen oxides (NOx) and there is no current risk of there being any 1-hour mean NO_2 concentrations greater than 200 µg/m^3, the routine testing of a single generator will not lead to an exceedance of the 1-hour mean objective if it operates during 18 or fewer hours per year[3]. This is because the objective allows 18 hourly exceedances of the standard before it is exceeded. However, at locations close to significant sources of NOx (such as major roads), there is the potential for the cumulative impacts of testing and existing emissions to lead to an exceedance of the short-term objective at locations of relevant exposure.

1.1.4 The guidance issued by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)[4] is comprehensive in its explanation of the place of air quality in the planning regime. On combustion processes (including standby emergency generators) where there is a risk of impacts at relevant receptors, the guidance states that:

"*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. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.*

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".

1.1.5 The guidance is clear that this includes emergency diesel generators, and that the emission rate is per second and not averaged over a year. Generators whose sole purpose is maintaining power supply

[1] Annual mean concentrations of 40 µg/m^3 for NO_2 and PM_{10}, 20 µg/m^3 for $PM_{2.5}$. The short-term PM_{10} objective is 50 µg/m^3, not to be exceeded more than 35 times a year.
[2] 200 µg/m^3, not to be exceeded more than 18 times a year.
[3] Note that this means operation during 18 or fewer hours, not a cumulative operating period of 18 hours (for example, if tests only last for 15 minutes, then 18 hours of cumulative operation implies 72 hours each year during which the generator might be tested.
[4] Moorcroft and Barrowcliffe *et al.* (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2. IAQM, London

at a site during an on-site emergency that are operated for the purpose of testing/maintenance for no more than 50 hours per year are exempt from emissions limits. Thus, emissions can be considerably higher than 5 mg/sec.

1.1.6 The potential air quality impacts from generator testing are very often assessed qualitatively, based on an assumption that sporadic operation cannot feasibly have a significant effect on attainment of the objective, but there is typically a lack of evidence to support this assumption. In cases where dispersion modelling is carried out, this often focuses on the Process Contribution (PC) from the generator without considering how this might interact with existing concentrations; an hourly-mean PC of less than the 200 mg/m^3 standard added to an hourly-mean baseline concentration of less than the standard can cumulatively cause the standard, and the objective, to be exceeded.

1.1.7 The purpose of this note is to provide an evidential basis for screening out the need for detailed assessments of generator emissions. It has considered a number of simple hypothetical situations which are deliberately designed to provide a worst-case assessment. It has not been possible to consider every eventuality, in particular when multiple generators with different testing regimes affect the same receptor, and it relies on Gaussian modelling which has limitations in complex urban geometries. Nevertheless, the analysis provided is likely to be sufficient to allow robust screening of impacts in most cases.

1.1.8 The analysis has considered the potential air quality impacts on short term concentrations of NO_2 as a result of emissions from the routine testing and maintenance of a single diesel generator that operates for no more than 18 discreet hours per year, but where relevant receptors are located close to a significant source of roadside NO_2. A Monte Carlo modelling method is implemented to calculate the probability of an exceedance of the 1-hour mean NO_2 objective occurring at the receptors.

1.1.9 The following Section sets out the modelling methodology. Section 4 describes the results and Section 5 provides a summary of the assessment.

2 Monitoring Data Analysis

2.1.1 Hourly NO_2 automatic monitoring data from Urban Traffic, Kerbside and Roadside sites for 2022[5] were downloaded using the OpenAir package[6] in R from the Automatic Urban and Rural Network (AURN), Air Quality England (AQE), Scottish Air Quality Network (SAQN), Welsh Air Quality Network (WAQN) and King's College London (KCL) monitoring networks. OpenAir was then used to calculate the number of hours in 2022 in which concentrations exceeded the 1-hour mean standard (200 µg/m^3). There were very few sites with any hours exceeding the standard in 2022. These sites are shown in Table 2-1. There were no measured exceedances of the 1-hour mean NO_2 objective in 2022 at any of the monitoring sites in the networks reviewed.

Table 2-1: Number of hours measured NO_2 concentrations exceeded 200 µg/m^3 at automatic monitoring sites in 2022.

Site	Monitoring Network	Site Type	No. Hours > 200 µg/m^3
Barnet Tally Ho	AQE	Urban Traffic	1
Camden - Euston Road	AQE	Urban Traffic	2
H&F Hammersmith Town Centre	AQE	Urban Traffic	7
Halton Marzahn Way	AQE	Urban Traffic	1
Hitchin Stevenage Road	AQE	Urban Traffic	1
Kensington High Street 2	AQE	Urban Traffic	1
Manchester Bridge Street	AQE	Urban Traffic	1
Manchester Oxford Road	AQE	Urban Traffic	3
Reading Caversham Road	AQE	Urban Traffic	1
Bath A4 Roadside	AURN	Urban Traffic	1
London Marylebone Road	AURN	Urban Traffic	1
Oxford Centre Roadside	AURN	Urban Traffic	1
Lambeth - Brixton Road	KCL	Kerbside	9
Thurrock - Dock Road Tilbury	KCL	Roadside	1
Westminster - Oxford Street East	KCL	Roadside	1

2.1.2 The Lambeth – Brixton Road site measured the most exceedances of the standard (nine). This site is located at the kerbside of a busy road (with 25,721 Annual Average Daily Traffic (AADT) movements

[5] This was the most recent full year of ratified data at the time when this part of the analysis was carried out. Notwithstanding year to year variations, roadside NO_2 concentrations in most locations are falling over time, so this approach is likely to be worst-case.
[6] Carslaw D.C. & Ropkins K. (2012), openair — An R package for air quality data analysis, Environmental Modelling & Software, 27–28(0), 52–61. ISSN 1364-8152, doi:10.1016/j.envsoft.2011.09.008.

in 2022[7] and a notably large proportion of buses); it is unlikely that this site would be representative of sensitive receptor locations that would be affected by both road traffic and generator emissions, being so close to the kerb. Similarly, the H&F Hammersmith Town Centre monitor, which recorded the second highest number of exceedances of the standard (seven), is located 1.2 m from the kerb of the busy A219 gyratory. The Manchester Oxford Road monitor, which measured three exceedances, is located 1 m from the kerb of a cycle lane, and approximately 3 m from the main carriageway. While traffic flows on Oxford Road have reduced significantly in recent years due to the introduction of a bus gate (4,488 AADT in 2022[7]), it is also located approximately 43 m to the north of the busy A57(M) (94,073 AADT in 2022[7]).

[7] Department for Transport (2024), Road Traffic Statistics [online]. Available: https://roadtraffic.dft.gov.uk/

3 Modelling Methodology

3.1 Model Set-Up

3.1.1 The impacts of emissions from an emergency diesel generator have been modelled using the ADMS-6 dispersion model. The model has been run to predict the contribution of the generator emissions to 1-hour mean NO_2 concentrations.

Scenarios

3.1.2 Three different locations have been considered to take account of a range of meteorological and baseline conditions: London, Manchester and Glasgow. London and Manchester were chosen to align with the highest number of hourly exceedances of the objective value measured in their respective regions shown in Table 2-1. Glasgow was chosen as a location representative of a large conurbation in Scotland. Within the model, all sites are assumed to be urban, with moderately high surface roughness characteristics and minimum Monin-Obukhov (MO) length. It has been assumed that there is only one generator operating in the vicinity of modelled receptors.

3.1.3 Hourly sequential meteorological data in sectors of 10 degrees from Glasgow, London City Airport and Manchester for 2022 have been used in the model. Wind roses for the sites are provided in Figure 3-1. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

Model Inputs

3.1.4 Model input selections are summarised in Table 3-1, and discussed further below. Input emission parameters are presented later in Table 3-3.

Table 3-1: Summary of Model Inputs

Model Parameter	Value Used		
Terrain Effects Modelled?	No		
Variable Surface Roughness File Used?	No		
Urban Canopy Flow Used?	No		
Building Downwash Effects Modelled?	Yes		
Meteorological Monitoring Sites	Glasgow International Airport, London City Airport, Manchester Airport		
Meteorological Data Year	2022		
	Glasgow	**London**	**Manchester**
Dispersion Site Surface Roughness Length (m)	1	1	1
Dispersion Site Minimum MO Length (m)	75	75	75
Met Site Surface Roughness Length (m)	0.2	0.2	0.2
Met Site Surface Minimum MO Length (m)	30	75	30

3.1.5 The diesel generator has an assumed net fuel input of 2,500 kW_{th} which is equivalent to a fuel consumption of 252 litres per hour of diesel oil, and capable of delivering 1,250 kVA on demand. The plant has assumed NOx emissions of 5,100 mg/Nm^3 at 5% O_2 (approximately 1,900 mg/Nm^3 at 15% O_2 or 14.7 g/kWh), which is fairly standard for a non-optimised compression engine of this size, and thus a reasonable worst-case assumption.

3.1.6 The modelled generator plant is assumed to be tested 18 times per year for one hour at full load. The exhaust volume flow rate for the diesel generator has been calculated based on the complete combustion of the assumed diesel oil composition in Table 3-2.

Table 3-2: Typical diesel fuel composition.

Elemental Component	Diesel Oil
Carbon	86.5%
Hydrogen	13.2%
Oxygen	0.3%
Net Calorific Value (LHV) (MJ/kg)	42.82
Gross Calorific Value (HHV) (MJ/kg)	45.70
HHV/LHV	1.07
Liquid Density @ 15°C (kg/m3)	835

Table 3-3: Modelled emissions and release conditions.

Parameter	Value
Flue Internal Diameter (m)	0.4
Exit Velocity (m/s)	27.3
Exhaust Temperature (°C)	450
NOx Emission Concentration (g/kWh)	14.7
NOx Emission Rate (g/s)	4.1
Modelled Flue Height Above Ground (m)	10

Chemistry Module

3.1.7 The model has been run using the ADMS chemistry module, with the calculation of short-term means carried out on an hour-by-hour basis. To take account of the chemistry in the plume, background concentrations of NOx, NO_2 and ozone (O_3) have been taken from the rural background Bush Estate AURN site (for Glasgow models), Chilbolton Observatory (for London models) and Ladybower (for Manchester models) for 2022. The AURN rural background data have only been used to inform the chemistry routine, and as such, using a rural site (with relatively high O_3 concentrations) provides a worst-case assessment.

3.1.8 In order to determine the Process Contributions (PCs) from the generator for each hour, the model has been run once with an emission rate of zero and once using the emissions shown in Table 3-3. The PCs have then been calculated by taking the difference between the two scenarios. The model has assumed that 10% of the NOx emissions at the point of release is NO_2. Analysis of monitoring data from 40 diesel-fuelled compression ignition engines in the US EPA's In-Stack Ratio (ISR) database[8] indicated only one engine had a primary NO_2 value equal to or greater than 10%. As such, this is considered to be a reasonable conservative assumption.

3.2 Receptors

3.2.1 Concentrations of NO_2 have been modelled at a polar grid of receptors surrounding a generator source in the centre, at a distance of 2 m, 4 m and 10 m from the source at heights of 5 m, 10 m (at the same level as the height of the exhaust stack), 15 m and 20 m. Additional receptors at 15 m height have been modelled at 50 m, 100 m and 200 m from the source. The receptor locations in relation to the generator source are shown in Figure 3-2, at 45° intervals from north.

[8] https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database

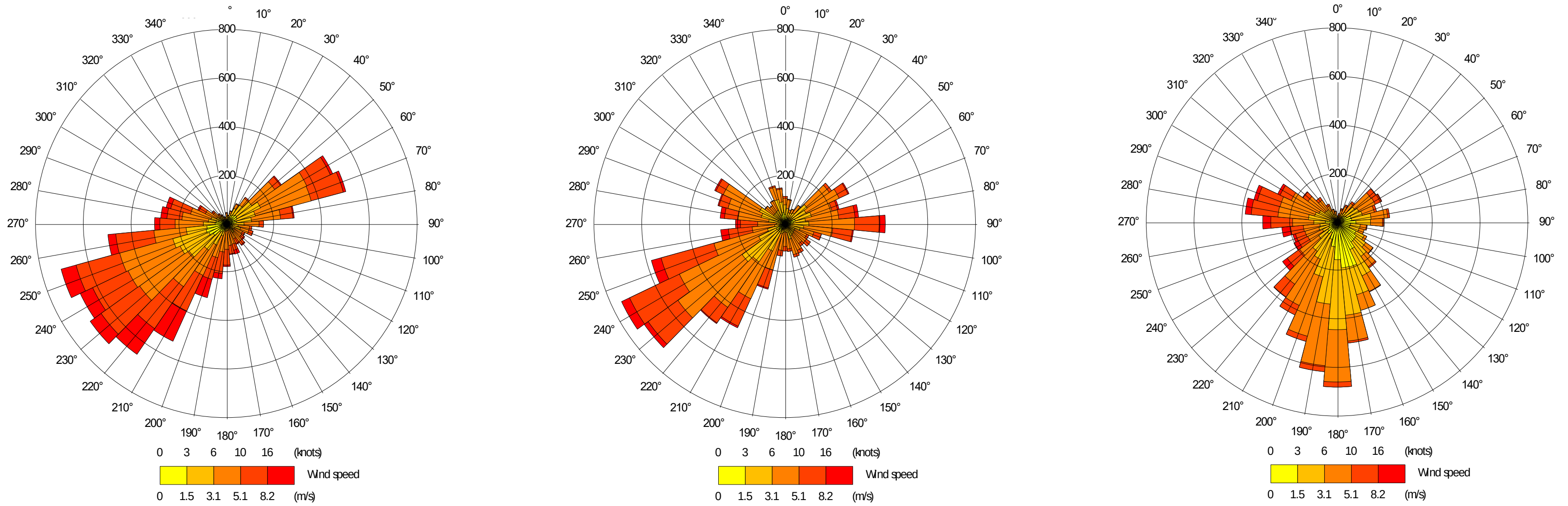

Figure 3-1: Wind roses for Glasgow (left), London City Airport (middle) and Manchester (right) for 2022.

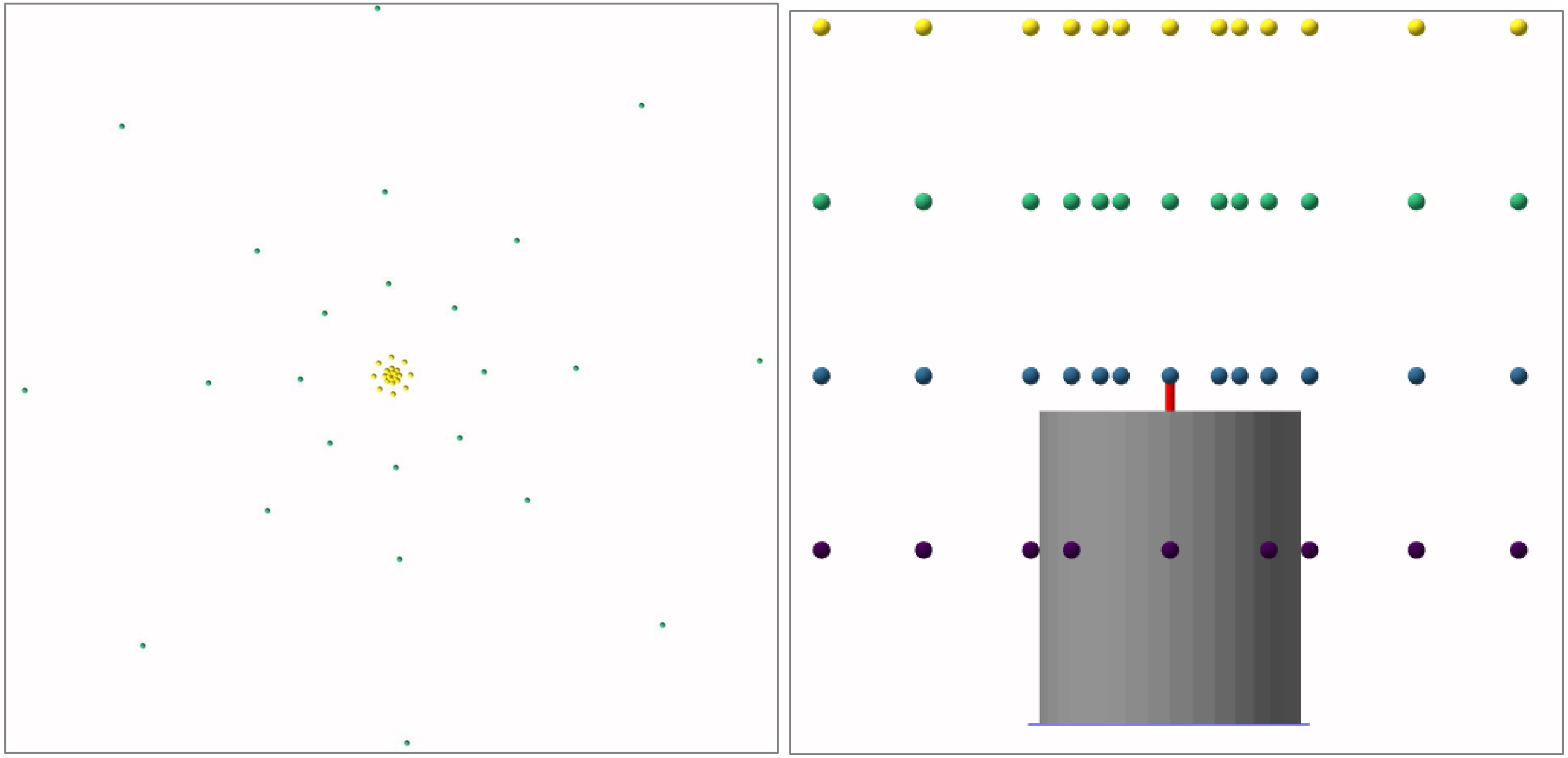

Figure 3-2: Polar receptor grid around generator stack from above (left) and close-up from the side (right). Modelled building is shown as a grey cylinder and the stack is shown as a red cylinder. Receptors of different heights are shown as coloured spheres.

3.3 Building

3.3.1 Entrainment of the plume into the wake of the buildings (the so-called building downwash effect) has been taken into account in the model by including a circular building at a height of 9 m (1 m below the top of the flue termination) and a diameter of 9 m with the flue in the centre. The locations of the flue and building are shown in Figure 3-2.

3.4 Monte Carlo Simulations

3.4.1 The likelihood of the generator tests coinciding with meteorological and baseline air quality conditions which might give rise to significant impacts at sensitive receptor locations is assessed using a Monte Carlo modelling approach. The approach involves selecting a random sample of modelled hours out of the year at every receptor. The number of hours selected is based on the number of hours that the generator is operational throughout the year (in this case, 18). The sampled NO_2 PCs are then added to the relevant hour-by-hour NO_2 concentrations measured at a nearby relevant monitoring site (i.e. the baseline) to calculate the Predicted Environmental Concentrations (PECs) for every hour of the year, where the PEC during an hour during which no generators are running is simply the baseline value. No constraints have been placed on when the generators might be tested. In practice, generators are more likely to be tested during the day, when the planetary boundary layer is typically higher. By not constraining the model to only run during daytime, the assessment will tend toward over-predicting the impacts.

3.4.2 The 99.79th percentile of the 1-hour PECs are then calculated from the annual dataset. This process is repeated *n* times (here, *n* = 20,000) to ensure that a broad range of possible operational combinations is captured in the random sampling. This process provides *n* possible 99.79th percentile 1-hour PECs from which it is possible to derive a likelihood of an exceedance of the 1-hour mean objective at each modelled receptor.

3.4.3 The measured concentrations at the Lambeth – Brixton Road automatic monitor have been chosen to represent worst-case baseline conditions in London as this monitor had the highest number of recorded exceedances of the 1-hour mean standard in 2022, as shown in Table 2-1. The measured concentrations at the Manchester Oxford Road monitor have been selected as worst-case baseline conditions representative of a city in mid- to north-England, as it measured the highest number of exceedances of the standard in 2022 in that region. There were no measured exceedances of the standard in Scotland in 2022 shown in Table 2-1. As such, measured concentrations at the Glasgow High Street monitor, which is located approximately 5.5 m from the kerb, were chosen to represent reasonable worst-case baseline conditions in a Scottish city. The locations of the automatic monitors are shown in Figure 3-3 to Figure 3-5, respectively.

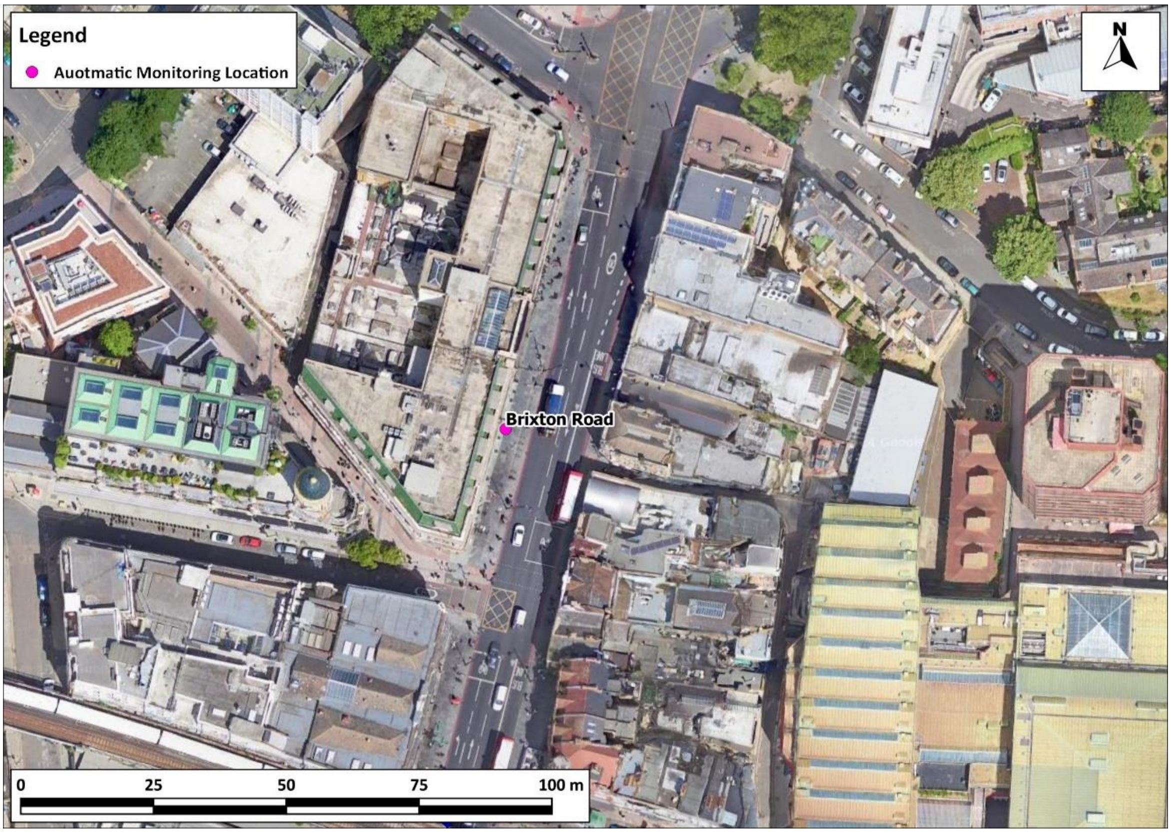

Figure 3-3: Lambeth – Brixton Road automatic monitoring location.

Imagery ©2025 Airbus, Maxar Technologies.

Figure 3-4: Manchester Oxford Road automatic monitoring location.

Imagery ©2025 Airbus, Maxar Technologies.

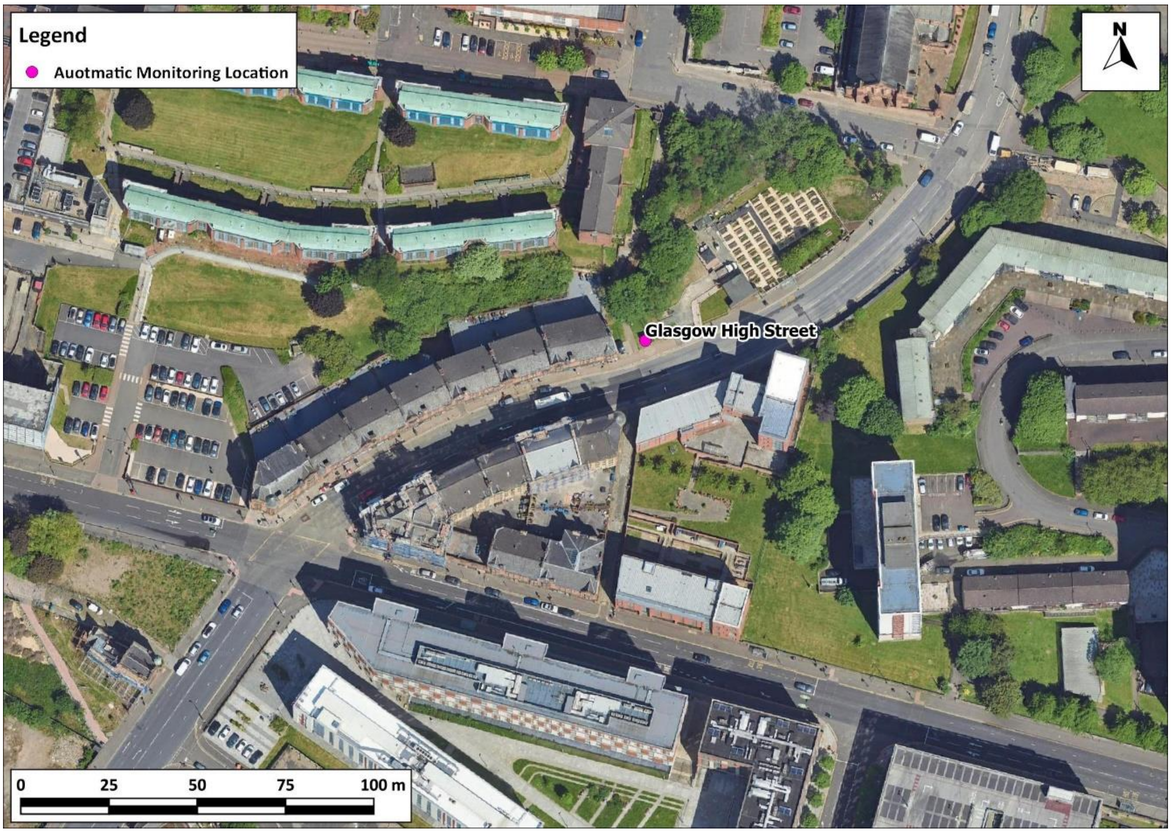

Figure 3-5: Glasgow High Street automatic monitoring location.

Imagery ©2025 Airbus, Maxar Technologies.

4 Results

4.1 Glasgow

4.1.1 The assumed baseline 99.79th percentile of 1-hour mean NO_2 concentrations at the Glasgow receptors is 85.8 µg/m^3, as measured at the Glasgow High Street automatic monitor in 2022.

4.1.2 Figure 4-1 shows a box and whisker plot of 99.79th percentile NO_2 PECs from all 20,000 simulations at each modelled receptor. This shows that the 1-hour mean objective was not exceeded in any of the simulations, at any receptor. The maximum 99.79th percentile PEC of any of the simulations is 98.3 µg/m^3, which is less than half of the 200 µg/m^3 standard.

4.1.3 Detailed results (not presented) show that there are no individual 1-hour PECs greater than 200 µg/m^3 in any of the 20,000 simulations at receptors below the generator (at 5 m height, at 4 m to 10 m from the centre of the flue), nor at 15 m height, 100 m to 200 m from the flue.

4.1.4 The maximum number of modelled exceedances of the standard across all 20,000 simulations is 15 (at receptor '45_10_15'), with a mean and mode of eight exceedances. The 99th percentile of exceedances across all simulations at this receptor is 12 (3% of simulations have between 12 and 15 exceedances. For there to be the possibility of an exceedance of the objective in these simulations, there would need to be another local emission source which contributed a sufficiently high NO_2 concentration at the receptor such that the cumulative contribution led to an exceedance of the standard in at least 7 additional hours per year.

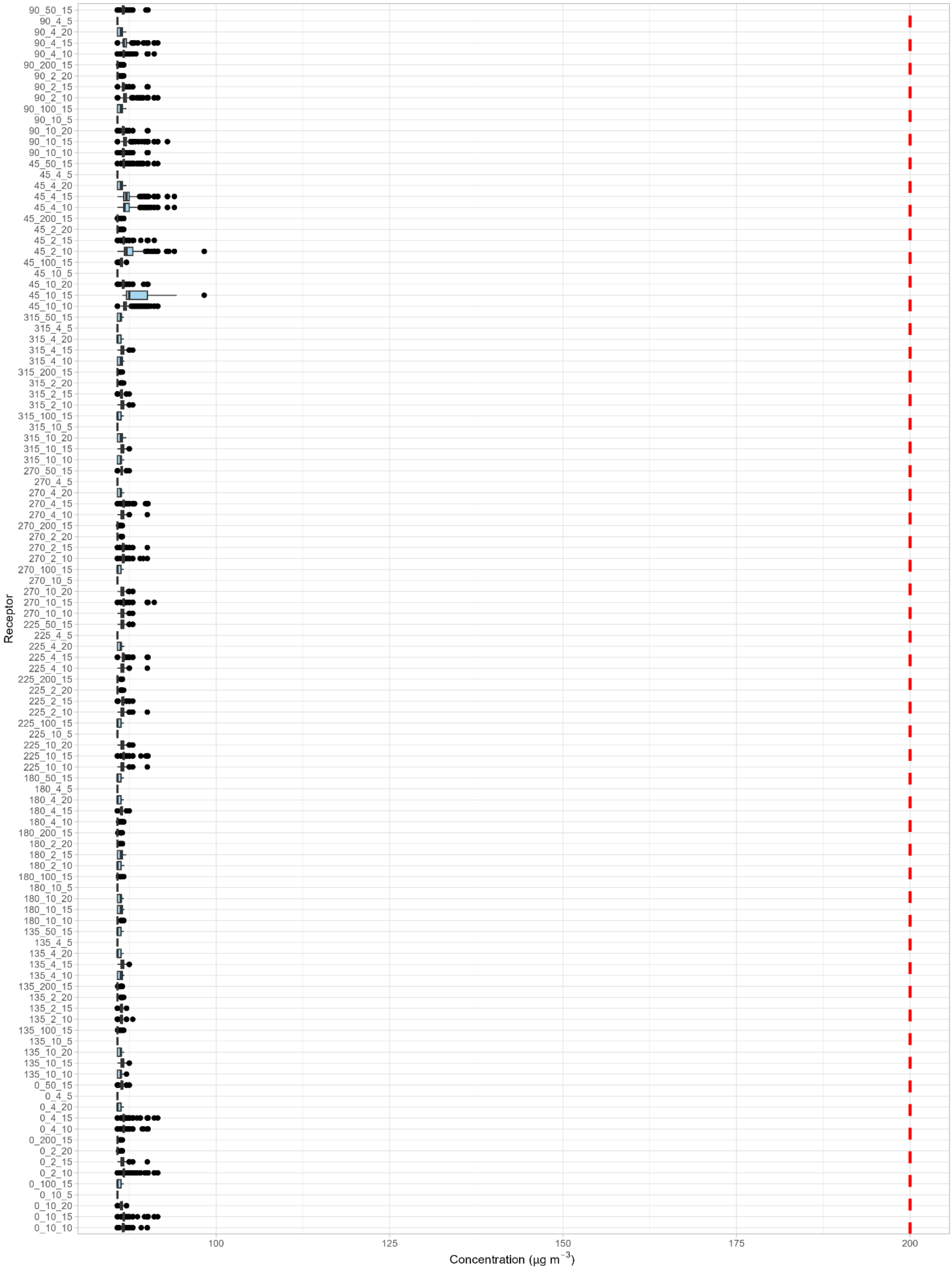

Figure 4-1: Glasgow - Box and whisker plot showing calculated 99.79th percentile of 1-hour mean NO_2 PECs across 20,000 simulations.

4.2 Manchester

4.2.1 The assumed baseline 99.79th percentile of 1-hour mean NO_2 concentrations at the Manchester receptors is 163.3 µg/m³, as measured at the Manchester Oxford Street automatic monitor in 2022.

4.2.2 The modelled 99.79th percentile NO_2 PECs for Manchester receptors are shown in Figure 4-2. This shows that there is a very a small proportion of the 20,000 simulations in which the 1-hour mean objective is exceeded, all of which are at 15 m height (5 m above the source); at receptors '0_4_15' (4 m from the source, at 0°), '0_10_15' (10 m from the source, at 0°), and '315_4_15' (4 m from the source, at 315°). These receptors are located north/northwest of the flue, which reflects the southerly prevailing wind at Manchester meteorological station shown in Figure 3-1. The percentage of simulations in which an objective exceedance is predicted at these receptors is shown in Table 4-1. This shows that the probability of an exceedance of the objective is well below 1%. Detailed results (not presented) show that the maximum number of individual 1-hour PECs greater than 200 µg/m³ is 20 at receptor 0_4_15 and 19 at the other two receptors, i.e., exceeding the objective by two hours and one hour, respectively.

Table 4-1: Percent of simulations exceeding the 1-hour mean nitrogen dioxide objective – Manchester.

Receptor	Direction (°)	Distance from Source (m)	Height (m)	% of Simulations Exceeding Objective
0_4_15	0	4	15	0.020%
0_10_15	0	10	15	0.005%
315_4_15	315	4	15	0.005%

4.2.3 Across all receptors, the highest number of exceedances of the standard at the 99th percentile of all 20,000 simulations is 16 hours. This number of exceedances occurs in 1% of simulations at receptor 45_4_15, and 3% at 0_4_15. For the objective to be exceeded in these worst 1% of cases, there would need to be another local emission source which contributed a sufficiently high NO_2 concentration at the receptor such that the cumulative contribution led to an exceedance of the standard in at least 3 additional hours per year.

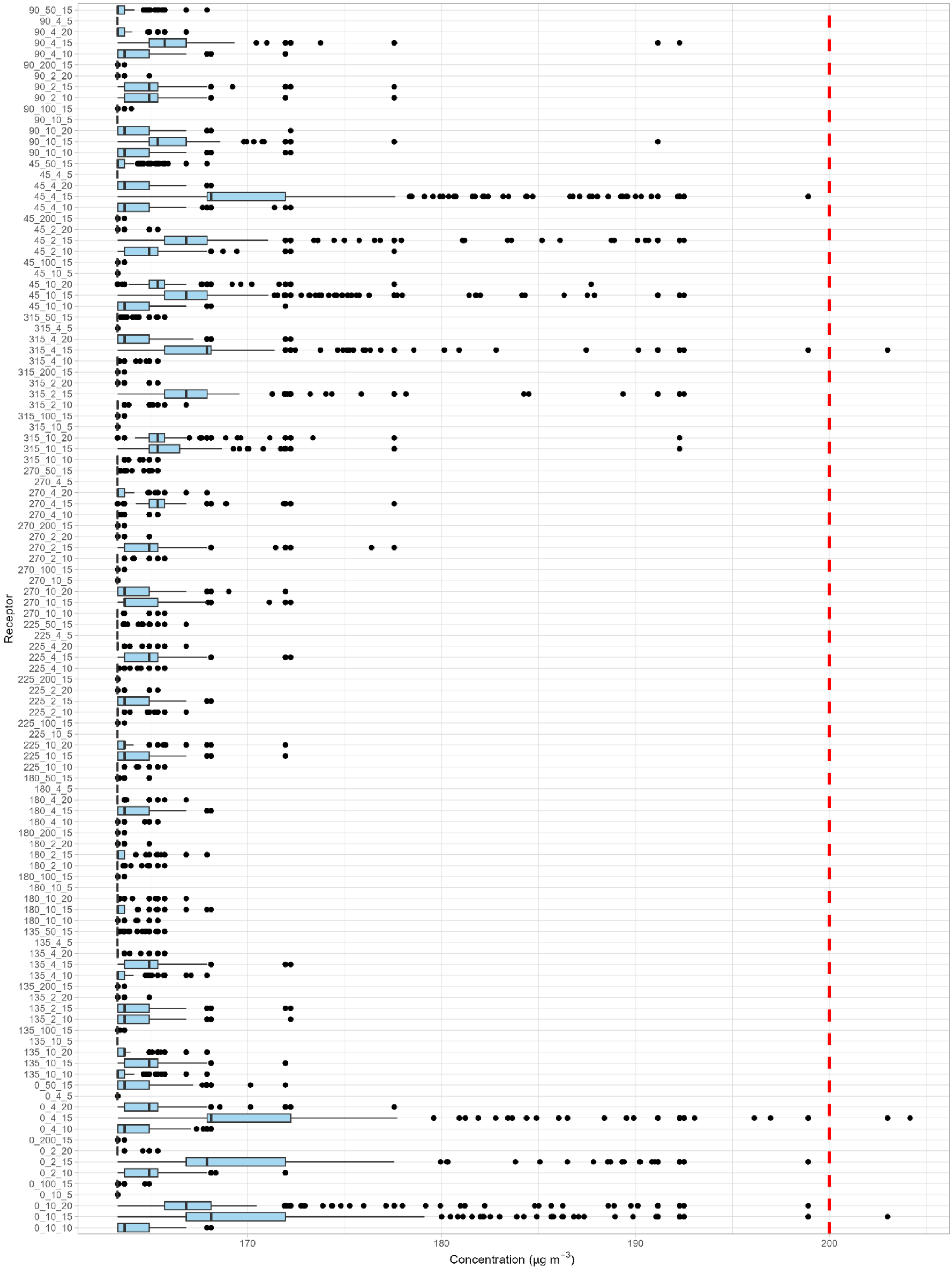

Figure 4-2: Manchester - Box and whisker plot showing calculated 99.79th percentile of 1-hour mean NO_2 PECs across 20,000 simulations.

4.3 London - Lambeth

4.3.1 The assumed baseline 99.79th percentile of 1-hour mean NO_2 concentrations at the Lambeth receptors is 185.7 µg/m^3, as measured at the Lambeth – Brixton Road automatic monitor in 2022.

4.3.2 The modelled 99.79th percentile NO_2 PECs for Lambeth receptors are shown in Figure 4-3. This shows that at 29 out of the 112 receptors, an exceedance of the objective is predicted in at least one of the 20,000 simulations. The highest number of exceedances of the standard from all 20,000 simulations is 26 hours at receptor '45_4_15' (15 m height, 4 m from the source, at 45°) (not shown), which reflects the south-westerly prevailing wind at London City Airport meteorological station shown in Figure 3-1. The percentage of simulations in which an exceedance is predicted at these 29 receptors is shown in Table 4-2.

Table 4-2: Percent of simulations exceeding the 1-hour mean nitrogen dioxide objective – London Lambeth.

Receptor	Direction (°)	Distance from Source (m)	Height (m)	% of Simulations Exceeding Objective
90_2_10	90	2	10	0.490
90_4_10	90	4	10	0.055
90_10_10	90	10	10	0.010
45_2_10	45	2	10	2.420
45_4_10	45	4	10	0.835
45_10_10	45	10	10	0.460
0_2_10	0	2	10	0.005
270_2_10	270	2	10	0.010
90_2_15	90	2	15	0.100
90_4_15	90	4	15	3.760
90_10_15	90	10	15	3.010
45_2_15	45	2	15	0.260
45_4_15	45	4	15	10.830
45_10_15	45	10	15	17.070
0_2_15	0	2	15	0.040
0_4_15	0	4	15	0.760
0_10_15	0	10	15	0.195
315_4_15	315	4	15	0.020
315_10_15	315	10	15	0.005
270_2_15	270	2	15	0.010
270_4_15	270	4	15	0.515
270_10_15	270	10	15	0.275

Receptor	Direction (°)	Distance from Source (m)	Height (m)	% of Simulations Exceeding Objective
225_2_15	225	2	15	0.015
225_4_15	225	4	15	0.165
225_10_15	225	10	15	0.045
180_2_15	180	2	15	0.005
135_4_15	135	4	15	0.055
135_10_15	135	10	15	0.035
45_10_20	45	10	20	0.035

4.3.3 The worst-case receptors in this scenario are '45_4_15' and '45_10_15', at which 11% and 17% of the simulations, respectively, exceed the objective. In total, there are two receptors at which more than 5% of simulations exceed the objective.

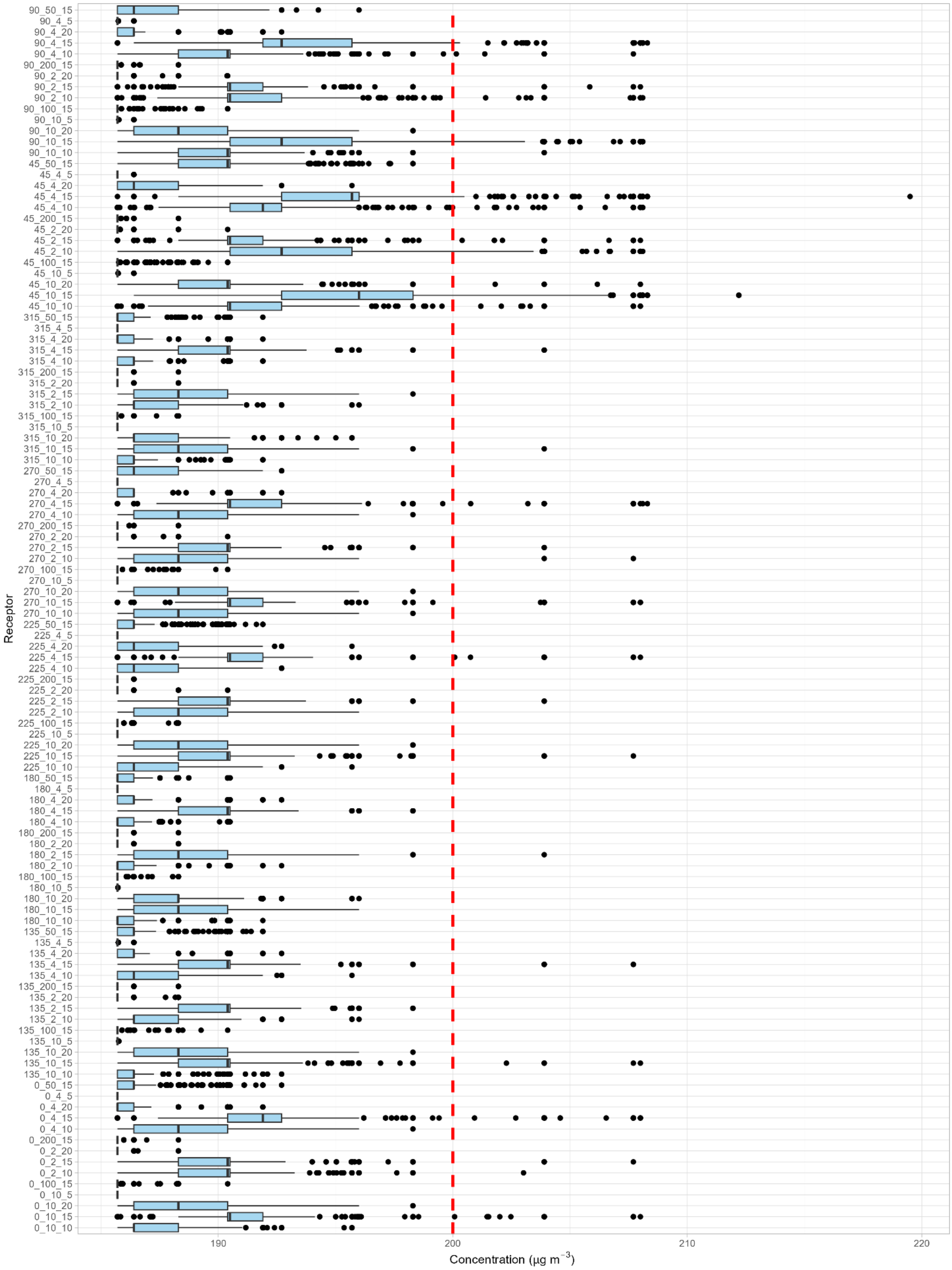

Figure 4-3: London Lambeth - Box and whisker plot showing calculated 99.79th percentile of 1-hour mean NO_2 PECs across 20,000 simulations

5 Discussion & Summary

5.1.1 The Glasgow simulations highlight that for receptors at the side of a busy road which does not itself cause any exceedances of the 200 µg/m^3 standard, there is an extremely low (effectively zero) probability of an exceedance of the objective. The simulations indicate that there would need to be another primary source of NO_2 exceeding, or approaching an exceedance of, the standard in at least seven hours per year at the worst-case receptor for there to be a probability of between 1% and 5% of an exceedance of the objective.

5.1.2 For Manchester, less than 0.1% of simulations exceed the objective at only three upwind receptors. The modelling thus shows that the risk of an exceedance of the objective is extremely low (effectively zero) at most modelled locations, and extremely low at worst-case receptors which are upwind of a generator emitting high NOx concentrations for 18 hours per year **and** are close to a major road.

5.1.3 Of the three scenarios tested, the London – Lambeth scenario has the highest probability of an exceedance of the 1-hour mean NO_2 objective. At the worst-case receptor (upwind from the generator source, at 10 m away from the source and 5 m above it), the probability of an exceedance of the standard is 17%. The probability exceeds 5% at only one other receptor. This is based on there already being nine hours in which the objective value is exceeded due to the adjacent road network. Overall, this shows that the risk of an exceedance of the objective is either zero or very low at most modelled locations, and where there is a risk of an exceedance of greater than 5%, this is limited to:

- receptors located very close to, above and downwind of, a generator; **and**
- receptors located ~1 m from the kerb of a busy road or another source which contributes around nine hours of concentrations exceeding the objective value per year; **and**
- the nearby generator emits high NOx concentrations for a minimum of 18 hours per year.

5.1.4 The Lambeth – Brixton Road automatic monitoring station consistently records some of the highest NO_2 concentrations in the UK, and as such is considered to be very conservative and not representative of many sensitive receptor locations that would be affected by both road traffic and generator emissions. Therefore, this scenario is unlikely to occur in reality.

5.1.5 In summary, the modelling has shown that there is very low risk of an exceedance of the 1-hour mean NO_2 objective at receptor locations close to an emergency diesel generator being tested for 18 hours or fewer per year, unless those receptors are also located close to a busy roadside (or other source of primary NO_2) contributing emissions leading to several (at least three) hours per year in which concentrations exceed the objective value at the receptor. This risk (with a probability greater than 5%) is limited to locations downwind of and above the generator.

5.1.6 As such, it is considered that the impacts of emissions from the testing of generators on the 1-hour mean NO_2 air quality objective can be screened out of an air quality assessment without the need for detailed modelling if:

- there is a single generator being tested for no more than 18 hours per year; **and**
- the receptor is predominantly upwind of, or below, the generator; **or**
- the receptor is predominantly downwind of the generator **and** there is no other primary source of NO_2 close by that could feasibly lead to an exceedance of the 1-hour mean standard at that location.

5.1.7 However, it should be noted that emission releases in very close proximity to sensitive receptors may still contribute very high short-term concentrations which may be problematic for other reasons. For example, they may cause an exceedance of the non-statutory Environmental Assessment Level (EAL) for nitrogen monoxide (NO) provided in Environment Agency guidance[9] and/or the Acute Exposure Guideline Levels (AEGLs) for NO_2[10] set by the US Environmental Protection Agency (EPA)[11], all of which are set at the 100th percentile. As such, generators should be situated such that these risks are minimised as far as reasonably possible.

[9] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#calculate-pec

[10] Set as maximum 10-minute, 30-minute, 60-minute, 4-hour and 8-hour means. They describe three levels based on the severity of effects of exposure.

[11] US EPA (2023), About Acute Exposure Guideline Levels (AEGLs) [online]. Available: https://www.epa.gov/aegl/about-acute-exposure-guideline-levels-aegls

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