Air Quality Technical Memo: GB One Data Centre, Ajax Avenue, Slough, SL1 4BG
Application Reference: EPR/CP3042QG/A001

Overview

Air Quality Consultants (AQC) Ltd was commissioned to undertake an air quality assessment for planning for the development of a data centre at GB1 on Ajax Avenue in Slough. The proposals include the installation of 21 no. 4.5 MVA diesel generators across three buildings.

The air quality assessment for planning has subsequently been used as part of the permit application for the facility. The following comment has been received by the Environment Agency (EA) in response to the assessment:

"On a side note, for the Air Quality Assessment, we have requested a 72hrs operation scenario, which I appreciate is way more than your 24hr scenario, however, we use this as our worst case standard for data centres, so you will need to provide this along with your considered worst case of 24hrs."

For the short-term impact assessment, the air quality assessment for planning assumed continuous operation of the generators throughout the year and considered the 100th percentile of 1-hour and 24-hour mean NO_2 concentrations (i.e. the maximum concentration from any 1-hour and 24-hour period in the year) based on all of the generators operating concurrently. Consequently, due to the modelling approach and assumptions, absolute concentrations arising from the requested 72-hour scenario will not change and are independent of the number of 24-hour operational periods considered.

However, operating the generators for 72 hours will increase the probability of hourly mean concentrations of NO_2 exceeding the Air Quality Objective (AQO) concentration more than 18 times (the maximum number of exceedances in a calendar year allowed by the objective).

This technical memo presents the exceedance probabilities for short-term hourly mean NO_2 for the generators operating concurrently based on the requested 72-hour operational scenario, as well as those associated with the 24-hour scenario originally considered as part of the application.

Approach

The approach described in Section 4 and Appendix A2 of the air quality assessment for planning has broadly been followed. Exceedance probabilities have been calculated at a number of discrete receptors, representing high sensitivity receptors, such as schools and residential properties. The locations of these receptors are shown below.

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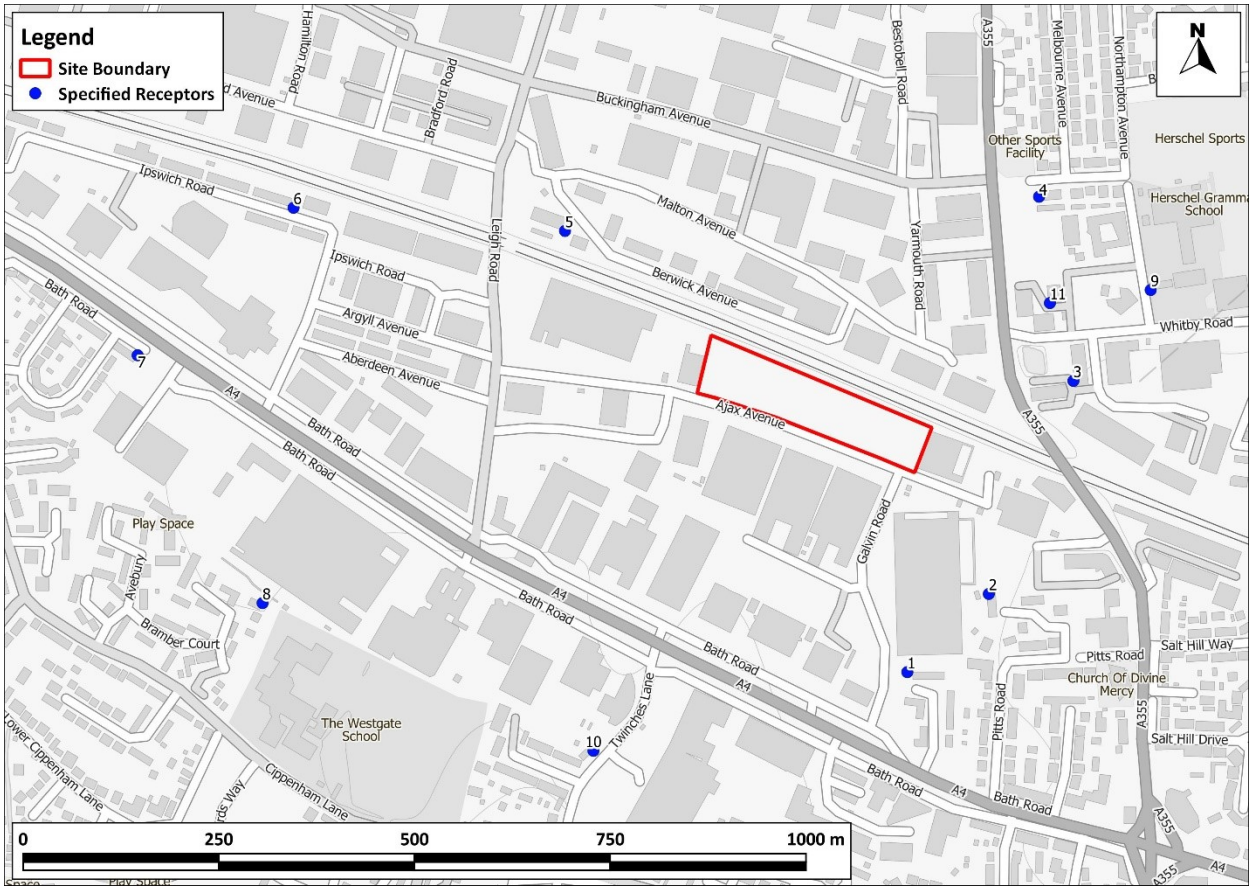

For each building scenario considered (with and without buildings), the model has been run assuming continuous operation of all generators to output hourly mean Process Contributions (PCs) for three separate meteorological years (2018, 2019 and 2020 at the Cippenham S Wks meteorological site). For every hourly output at each receptor, Predicted Environmental Concentrations (PECs) have been calculated, based on the annual mean concentration in 2019 measured at the SLO50 kerbside monitoring site (42.8 µg/m^3)[1], and the number of hours where the PEC exceeds 200 µg/m^3 calculated.

For each meteorological year and building scenario, the hypergeometric distribution probability function has then been used, based on 24-hours or 72-hours operation, to calculate the probability of an exceedance at each assessed receptor based on the actual hours of operation.

[1] In accordance with the Environment Agency's Air emissions risk assessment guidance, this concentration has been multiplied by a factor of two before being added to the PC.

In line with EA guidance[2], since the generators would operate for more than one hour at a time during the assumed 24-hour or 72-hour loss of off-site power event, the probability derived from the hypergeometric distribution has been multiplied by 2.5 to account for the fact that generator operating hours during a loss of off-site power scenario are not completely random or independent.

Results

The highest probability of exceeding the hourly mean AQO concentration more than 18 times determined from any assessed building configuration or meteorological year at each receptor is provided below.

Receptor	Probability of Exceeding the Hourly Mean AQO Concentration >18 Times Based on 24-hour Emergency Operation (%)	Probability of Exceeding the Hourly Mean AQO Concentration >18 Times Based on 72-hour Emergency Operation (%)
R1	0	0
R2	0	<0.01
R3	0	0.01
R4	<0.01	3.77
R5	0	<0.01
R6	0	0
R7	0	0
R8	0	<0.01
R9	<0.01	0.12
R10	0	<0.01
R11	<0.01	5.46

Summary

The probability of exceeding the hourly mean NO_2 AQO concentration more than 18 times for both scenarios is less than 5% at most specific receptor locations; there is, therefore, considered to be a negligible risk of an exceedance of the short-term objective as a result of an emergency loss of off-site power situation lasting either 24-hours or 72-hours.

At Receptor R11, the probability of exceeding the hourly mean NO_2 AQO concentration marginally exceeds 5% during the 72-hour scenario, equivalent to a possible exceedance once every 18 years.

[2] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment