Air Quality Assessment:
Beorma Quarter, Phases 2 & 3, Birmingham

November 2014

Experts in air quality
management & assessment

Document Control

Client	Hoare Lea	Principal Contact	Paul Judd

Job Number	J2103

Report Prepared By:	Suzanne Hodgson and Penny Wilson

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J2103/1/F1	6 November 2014	Final Report	Prof. Duncan Laxen (Managing Director)

Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
12 Airedale Road, London SW12 8SF Tel: 0208 673 4313
aqc@aqconsultants.co.uk

Registered Office: 12 St Oswalds Road, Bristol, BS6 7HT
Companies House Registration No: 2814570

10 Appendices

A1 Impact Descriptors and Assessment of Significance 30
A2 Professional Experience..33
A3 Modelling Methodology 35
A4 Gridded Outputs..40
A5 Modelled Concentrations at New Properties...43

A1 Impact Descriptors and Assessment of Significance

A1.1 There is no official guidance in the UK on how to describe the nature of air quality impacts, nor how to assess their significance. The approach developed by the Institute of Air Quality Management[3] (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. This involves three distinct stages: the application of descriptors for magnitude of change; the description of the impact at each sensitive receptor; and then the assessment of overall significance of the scheme.

Impact Descriptors

A1.2 The definition of impact magnitude is solely related to the degree of change in pollutant concentrations, expressed in microgrammes per cubic metre, but originally determined as a percentage of the air quality objective. Impact description takes account of the impact magnitude and of the absolute concentrations and how they relate to the air quality objectives or other relevant standards. The descriptors for the magnitude of change due to the scheme are set out Table A1.1, while Table A1.2 sets out the impact descriptors. These tables have been designed to assist with describing air quality impacts at each specific receptor. They apply to the pollutants relevant to this scheme and the objectives against which they are being assessed.

Table A1.1: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. days with PM_{10} concentration greater than 50 $\mu g/m^3$	Annual Mean $PM_{2.5}$
Large	Increase/decrease ≥4 $\mu g/m^3$	Increase/decrease >4 days	Increase/decrease ≥2.5 $\mu g/m^3$
Medium	Increase/decrease 2 - <4 $\mu g/m^3$	Increase/decrease 3 or 4 days	Increase/decrease 1.25 - <2.5 $\mu g/m^3$
Small	Increase/decrease 0.4 - <2 $\mu g/m^3$	Increase/decrease 1 or 2 days	Increase/decrease 0.25 - <1.25 $\mu g/m^3$
Imperceptible	Increase/decrease <0.4 $\mu g/m^3$	Increase/decrease <1 day	Increase/decrease <0.25 $\mu g/m^3$

[3] The IAQM is the professional body for air quality practitioners in the UK.

Table A1.2: Air Quality Impact Descriptors for Changes to Annual Mean Nitrogen Dioxide, PM_{10} and $PM_{2.5}$ Concentrations and Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor [a]

Absolute Concentration [b] in Relation to Objective	Change in Concentration/day [c]		
	Small	**Medium**	**Large**
Above Objective [d]	Slight	Moderate	Substantial
Just Below Objective [e]	Slight	Moderate	Moderate
Below Objective [f]	Negligible	Slight	Slight
Well Below Objective [g]	Negligible	Negligible	Slight

[a] Criteria have been adapted from the published criteria to remove overlaps at transitions.

[b] The 'Absolute Concentration' relates to the 'With-Scheme' air quality where there is an increase in concentrations and to the 'Without-Scheme' air quality where there is a decrease in concentrations.

[c] Where the Impact Magnitude is *Imperceptible*, then the Impact Description is *Negligible*.

[d] 'Above': >40 µg/m^3 annual mean NO_2 or PM_{10}, >25 µg/m^3 annual mean $PM_{2.5}$, or >35 days with PM_{10} > 50 µg/m^3.

[e] 'Just below': >36 – ≤40 µg/m^3 of annual mean NO_2 or PM_{10}, >22.5 - ≤25 µg/m^3 annual mean $PM_{2.5}$, or >32 – ≤35 days with PM_{10} >50 µg/m^3.

[f] 'Below': >30 – ≤36 µg/m^3 of annual mean NO_2 or PM_{10}, >18.75 - ≤22.5 µg/m^3 annual mean $PM_{2.5}$, or >26 – ≤32 days with PM_{10} >50 µg/m^3.

[g] 'Well below': ≤30 µg/m^3 annual mean NO_2 or PM_{10}, ≤18.75 µg/m^3 annual mean $PM_{2.5}$, or ≤26 days with PM_{10} >50 µg/m^3.

Assessment of Significance

A1.3 The IAQM guidance (Institute of Air Quality Management, 2009) is that the ***assessment of significance*** should be based on professional judgement, with the overall air quality impact of the scheme described as either, *insignificant*, *minor*, *moderate* or *major*. In drawing these conclusions, the factors set out in Table A1.3 should be taken into account. A summary of the professional experience of staff contributing to this assessment is provided in Appendix A2.

Table A1.3: Factors Taken into Account in Determining Air Quality Significance

Factors
Number of people affected by increases and/or decreases in concentrations and a judgement on the overall balance.
The number of people exposed to levels above the objective, where new exposure is being introduced.
The magnitude of the changes and the descriptions of the impacts at the receptors using the criteria set out in Table A1.1 and Table A1.2.
Whether or not an exceedence of an objective is predicted to arise in the study area where none existed before or an exceedence area is substantially increased.
Whether or not the study area exceeds an objective and this exceedence is removed or the exceedence area is reduced.
Uncertainty, including the extent to which worst-case assumptions have been made.
The extent to which an objective is exceeded, e.g. an annual mean NO_2 of 41 µg/m^3 should attract less significance than an annual mean of 51 µg/m^3.

A2 Professional Experience

Prof. Duncan Laxen, BSc (Hons) MSc PhD MIEnvSc FIAQM

Prof Laxen is the Managing Director of Air Quality Consultants, a company which he founded in 1993. He has over forty years' experience in environmental sciences and has been a member of Defra's Air Quality Expert Group and the Department of Health's Committee on the Medical Effects of Air Pollution. He has been involved in major studies of air quality, including nitrogen dioxide, lead, dust, acid rain, PM_{10}, $PM_{2.5}$ and ozone and was responsible for setting up the UK's urban air quality monitoring network. Prof Laxen has been responsible for appraisals of all local authorities' air quality Review & Assessment reports and for providing guidance and support to local authorities carrying out their local air quality management duties. He has carried out air quality assessments for power stations; road schemes; ports; airports; railways; mineral and landfill sites; and residential/commercial developments. He has also been involved in numerous investigations into industrial emissions; ambient air quality; indoor air quality; nuisance dust and transport emissions. Prof Laxen has prepared specialist reviews on air quality topics and contributed to the development of air quality management in the UK. He has been an expert witness at numerous Public Inquiries, published over 70 scientific papers and given numerous presentations at conferences. He is a Fellow of the Institute of Air Quality Management.

Penny Wilson, BSc (Hons) CSci MIEnvSc MIAQM

Ms Wilson is a Principal Consultant with AQC, with more than thirteen years' relevant experience in the field of air quality. She has been responsible for air quality assessments of a wide range of development projects, covering retail, housing, roads, ports, railways and airports. She has also prepared air quality review and assessment reports and air quality action plans for local authorities and appraised local authority assessments and air quality grant applications on behalf of the UK governments. Ms Wilson has arranged air quality and dust monitoring programmes and carried out dust and odour assessments. She has provided expert witness services for planning appeals and is a Chartered Scientist and Member of the Institute of Air Quality Management.

Suzanne Hodgson, BSc (Hons) MSc CSci MIEnvSc MIAQM

Miss Hodgson is a Senior Consultant with AQC, with over seven years' experience in the field of air quality management and assessment. She has been responsible for a wide range of air quality projects covering impact assessments for new residential, commercial and industrial developments, local air quality management, ambient air quality monitoring of various pollutants and the assessment of nuisance odours and construction dust. She has extensive modelling experience, including the modelling of road traffic, energy centre (including energy from waste) and odour sources, and is familiar with preparing stand-alone air quality reports as well as chapters for inclusion within an Environment Statement. Suzanne has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. She is a Member of the Institute of Air Quality Management.

Full CVs are available at www.aqconsultants.co.uk.

A3 Modelling Methodology

Background Concentrations

A3.1 The background concentrations across the study area have been defined using the national pollution maps published by Defra (2014a). These cover the whole country on a 1x1 km grid and are published for each year from 2011 until 2030. The maps include the influence of emissions from a range of different sources; one of which is road traffic. There are some concerns that Defra may have over-predicted the rate at which road traffic emissions of nitrogen oxides will fall in the future (Carslaw et al., 2011). The maps currently in use were verified against measurements made during 2011 at a large number of automatic monitoring stations and so there can be reasonable confidence that the maps are representative of conditions during 2011. Similarly, there is reasonable confidence that the reductions which Defra predicts from other sectors (e.g. rail) will be achieved.

A3.2 In order to calculate background nitrogen dioxide and nitrogen oxides concentrations in 2013, it is assumed that there was no reduction in the road traffic component of backgrounds between 2011[4] and 2013. This has been done using the source-specific background nitrogen oxides maps provided by Defra (2014a). For each grid square, the road traffic component has been held constant at 2011 levels, while 2013 values have been taken for the other components. Nitrogen dioxide concentrations have then been calculated using the background nitrogen dioxide calculator which Defra (2014a) publishes to accompany the maps. The result is a set of 'adjusted 2013 background' concentrations.

A3.3 As an additional step, the 'adjusted 2013 background' mapped values have been calibrated against national background measurements made as part of the AURN during 2013 (see Figure A3.1). Based on the 52 sites with more than 90% data capture for 2013, the maps under-predict the background concentrations by 5.5%, on average. This has been allowed for in production of the calibrated 'adjusted' 2013 background concentrations and 20YY background concentrations.

4 This approach assumes that there has been no reduction in emissions per vehicle, but that traffic volumes have remained constant. This is not the same as the assumption made for dispersion modelling, in which emissions per vehicle are held constant while traffic volumes are assumed to change year on year. This discrepancy is unlikely to influence the overall conclusions of the assessment.

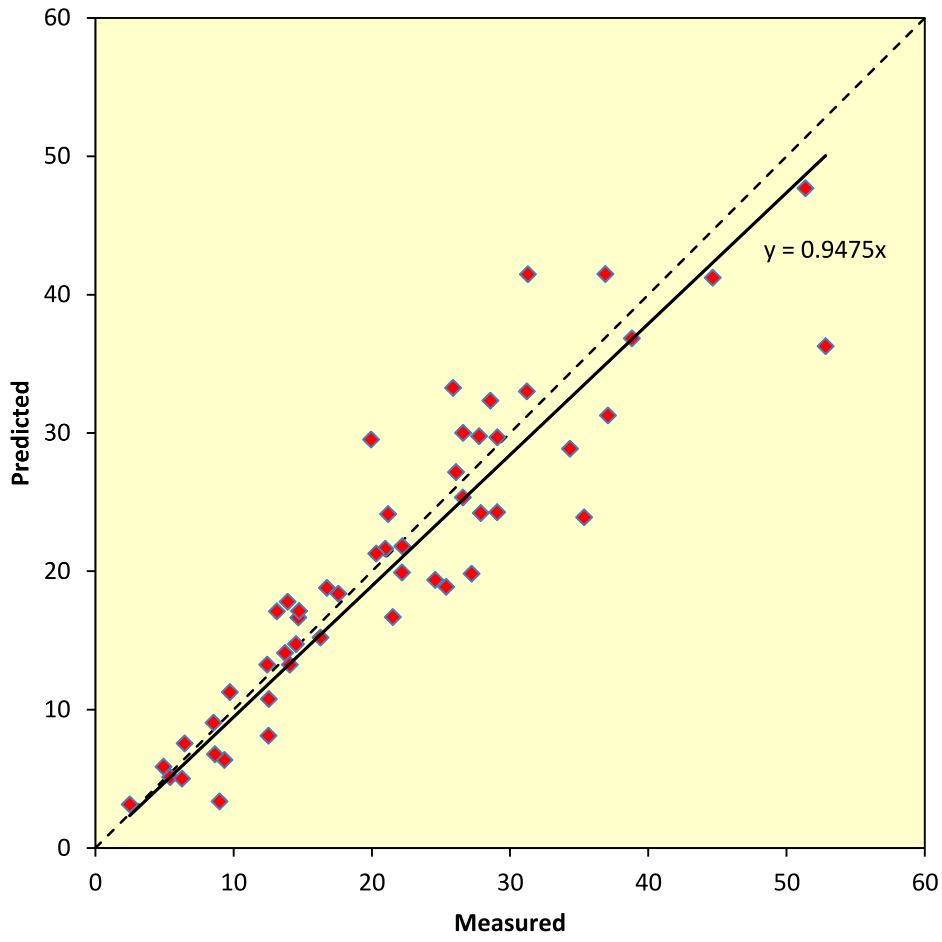

Figure A3.1: Predicted Mapped versus Measured Concentrations at AURN Background Sites in 2013

A3.4 Two separate sets of 2017 background nitrogen dioxide and nitrogen oxides concentrations have been used for the future-year assessment. The 2017 background 'without emissions reduction' has been calculated using the same approach as described for the 2013 data: the road traffic component of background nitrogen oxides has been held constant at 2011 values, while 2017 data are taken for the other components. Nitrogen dioxide has then been calculated using Defra's background nitrogen dioxide calculator. This has been adjusted by a national factor of 1.0554 for the background calibration, as described in Paragraph A3.3. The 2017 background 'with emissions reduction' assumes that Defra's revised predicted reductions occur from 2013 onward. This dataset has been derived first by calculating the ratio of the unadjusted mapped value for 2017 to the unadjusted mapped value for 2013. This ratio has then been applied to the adjusted 2013 value (as derived in Paragraph A3.2).

A3.5 For PM_{10} and $PM_{2.5}$, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used in this assessment.

Model Inputs

A3.6 The impacts of emissions from the proposed energy plant have been predicted 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 has been run to predict the contribution of the proposed CHP and boiler emissions to the annual mean concentration of nitrogen oxides and the 99.79th percentile of 1-hour mean nitrogen oxides concentrations.

A3.7 The proposed energy plant will consist of a 500 kW gas-fired CHP unit and six 1,202 kW gas boilers (one of these boilers is provided for duty only). The model input parameters and flue locations have been provided by Hoare Lea Ltd, the project's mechanical and electrical engineer. The building dimensions have been obtained from drawings provided by Broadway Maylan.

A3.8 The emissions from the CHP will be served by one flue and the emissions from the boilers from two flues (3 boilers flues emitting out of one stack). The flues will be located on top of the 29-storey building at a height of 108.8 m (2.3 m above the parapet at roof level). The location of the flue is shown in Figure A3.2.

A3.9 Entrainment of the plume into the wake of the building on which the stacks as located (the so-called building downwash effect) has been taken into account in the model. The buildings included in the model are described in Table A3.1 and shown in Figure A3.2.

Table A3.1: Modelled Building Dimensions

Building Description	Dimensions (Length x Width x Height) (m)
B1	31.8 x 14.4 x 106.5
B2	29.7 x 8.3 x 98
B3	44.1 x 28.8 x 52.8

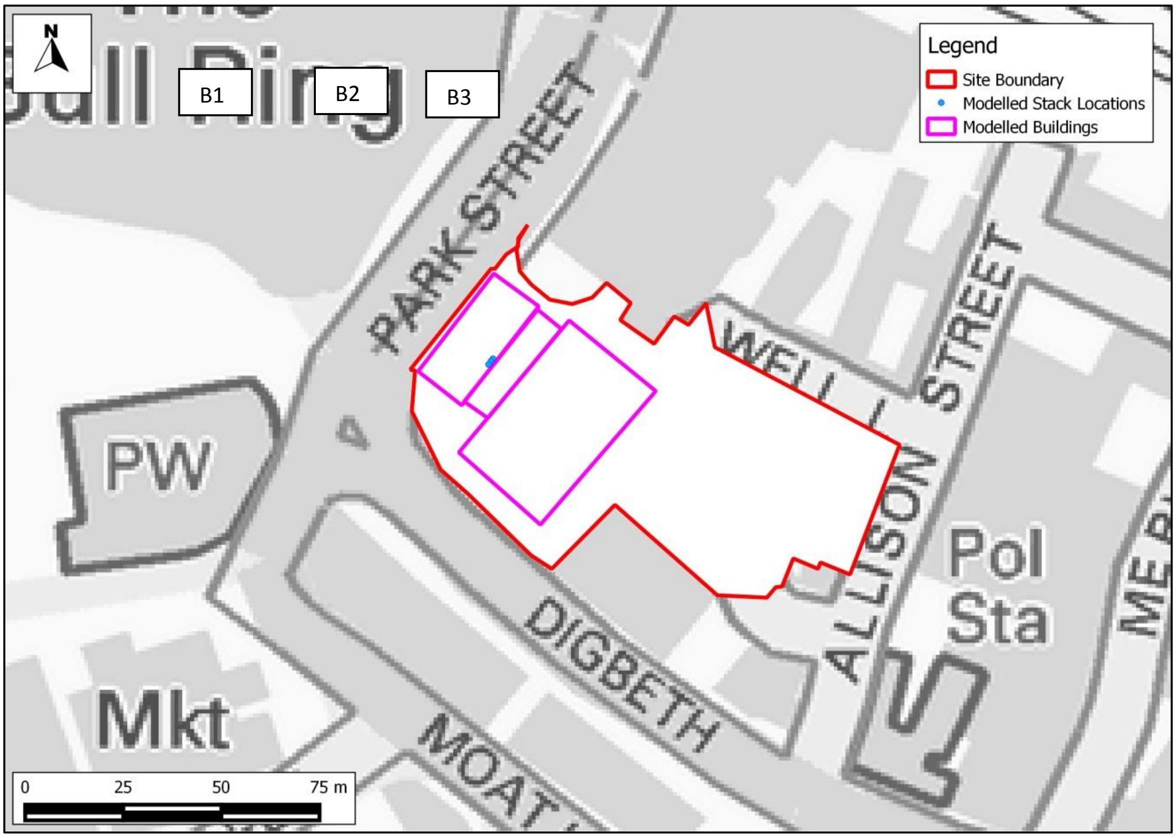

Figure A3.2: Modelled Buildings and Flue Locations

A3.10 The CHP unit is assumed to operate 18 hours per day, 7 days a week. The boiler emissions have been pro-rated (annual mean only) based on the estimated annual heat demand for the development. The parameters input to ADMS-5 are shown in Table A4.2.

Table A3.2: Model Input Parameters used in ADMS-5

Unit	CHP (500 kW)	Boiler (3 x 1,202 kW)	Boiler (2 x 1,202 kW)
Flue exit diameter (m)	0.36	0.7	0.7
Flue exit temp. (°C)	111	80	80
Volumetric Flow (m^3/s)	1.48	1.71	1.14
NOx emission rate (g/s)	0.069	0.019	0.013

A3.11 Hourly sequential meteorological data from Birmingham International Airport for 2011, 2012 and 2013 have been used in the model. The results from the worst-case meteorological year have been used.

Post-Processing

A3.12 Emissions from the proposed energy plant will be predominantly in the form of nitrogen oxides (NOx).

A3.13 ADMS-5 has been run to predict the contribution of the proposed energy plant emissions to annual mean concentrations of nitrogen oxides as well as to the 99.79^{th} percentiles of 1-hour mean nitrogen oxides. For the initial screening of the process contributions, the approach recommended by the Environment Agency (Environment Agency, 2005) has been used to predict annual mean nitrogen dioxide concentrations and 99.79^{th} percentiles of 1-hour mean nitrogen dioxide concentrations. This assumes that:

- Annual mean nitrogen dioxide concentrations = Annual mean nitrogen oxides x 0.7; and
- 99.79th percentiles of 1-hour mean nitrogen dioxide concentrations = 99.79th percentiles of 1-hour mean nitrogen oxides x 0.35.

A4 Gridded Outputs

Existing Sensitive Receptors

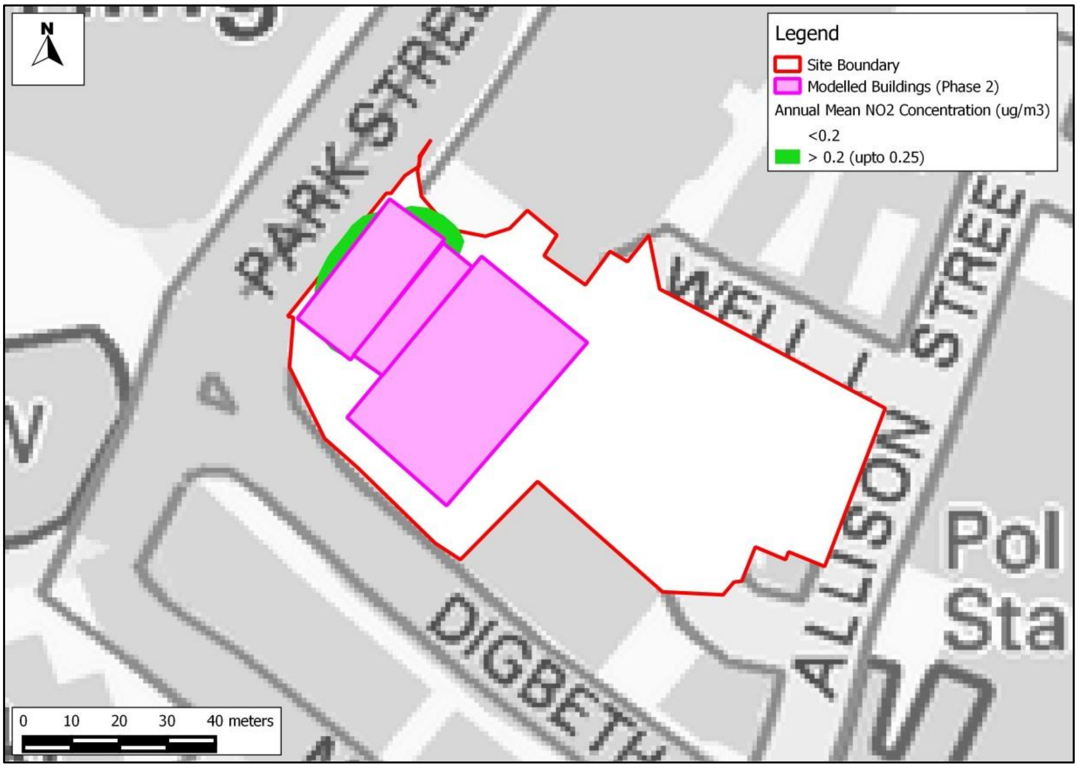

Figure A4.1: Predicted Annual Mean Nitrogen Dioxide Concentration (µg/m^3), Ground Level Process Contribution

Contains Ordnance Survey data © Crown copyright and database right 2014

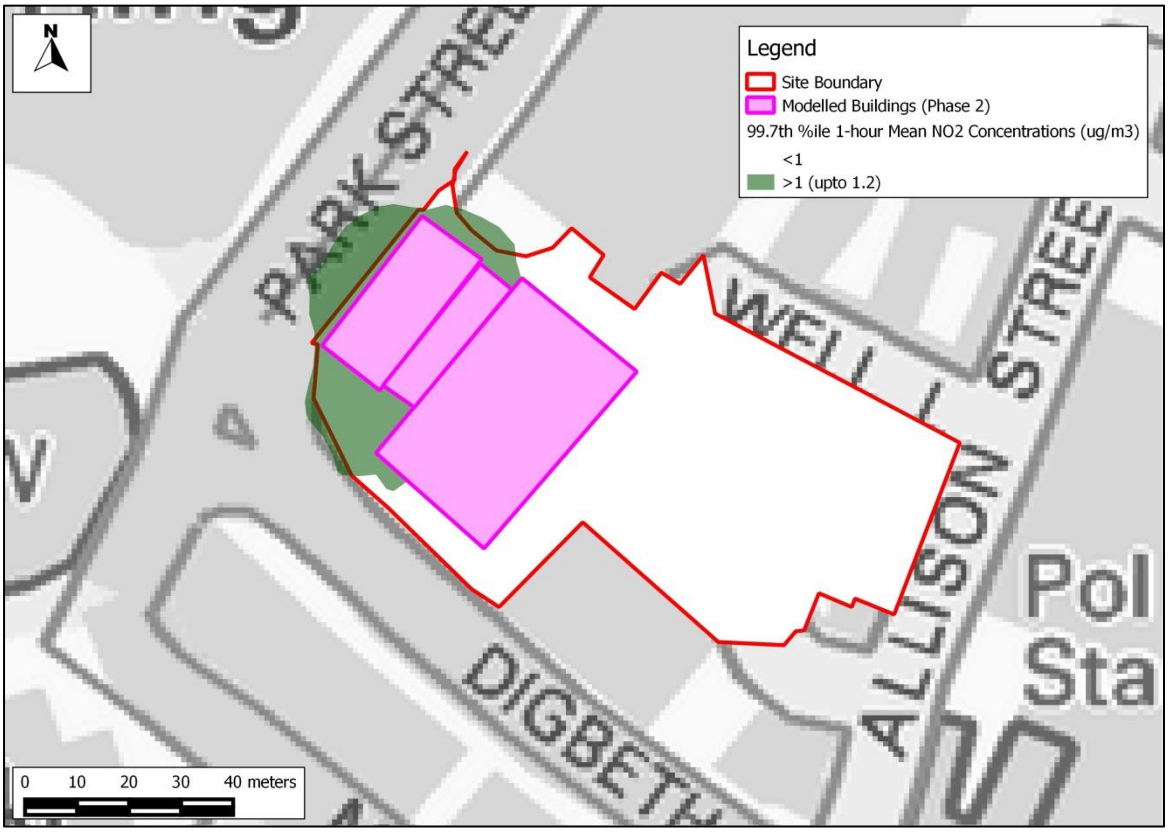

Figure A4.2: Predicted 99.79th Percentile of 1-hour Mean Nitrogen Dioxide Concentration ($\mu g/m^3$), Ground Level Process Contribution

Contains Ordnance Survey data © Crown copyright and database right 2014

New Properties

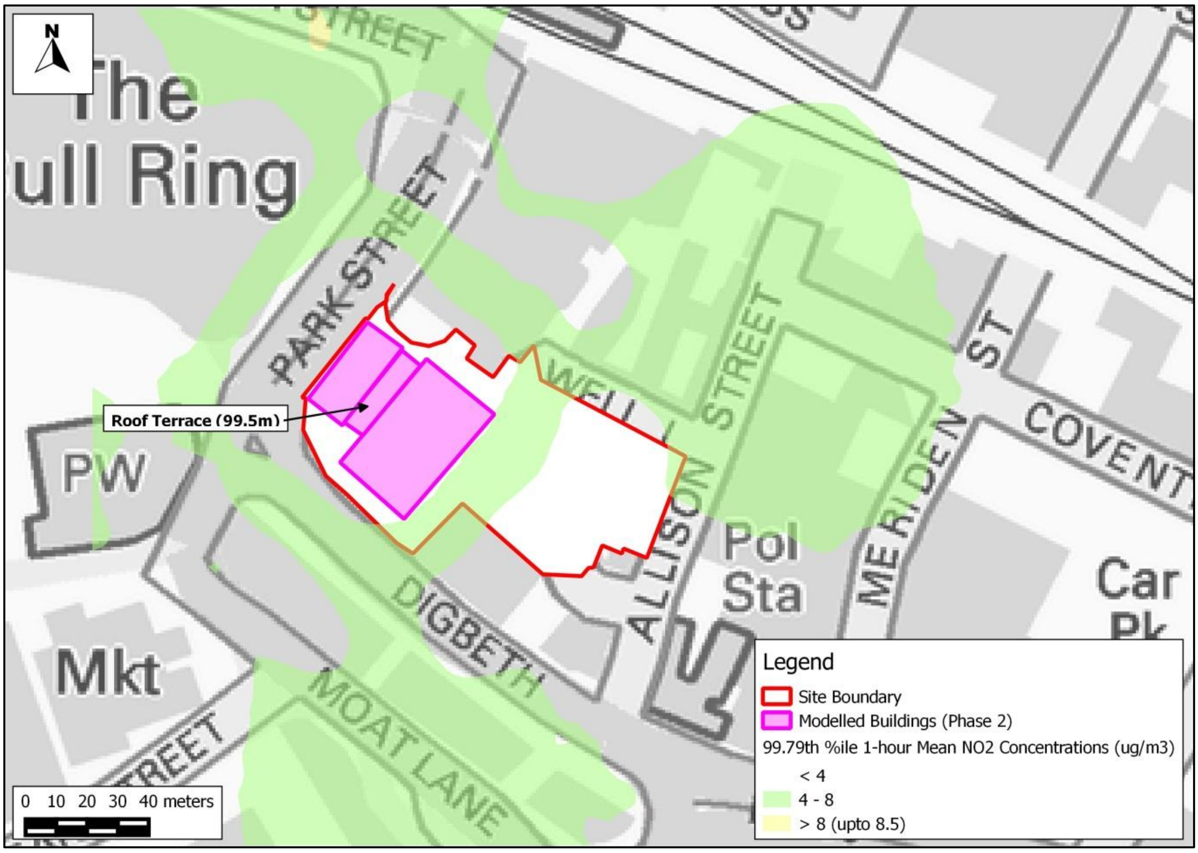

Figure A4.3: Predicted 99.79th Percentile of 1-hour Mean Nitrogen Dioxide Concentration (µg/m^3), Terrace Level Process Contribution

A5 Modelled Concentrations at New Properties

Phase 2

Table A5.1: Predicted Annual Mean Nitrogen Dioxide Concentrations (µg/m³), Process Contribution

Floor Level	Annual Mean Concentration																									
	µg/m³													% of Objective												
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13
13	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
14		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
15	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
16		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
17	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
18		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
19	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
20		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
21	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
22		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
23	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
24		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
25	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
26		0.2		0.2		0.3		0.2		0.3		0.2	0.2		0.6		0.6		0.6		0.6		0.6		0.4	0.4
27	0.2		0.3		0.2		0.2		0.3		0.1			0.4		0.6		0.6		0.4		0.7		0.3		
28		0.2		0.2		0.3							0.2		0.6		0.6		0.6							0.4
29	0.2		0.3		0.2									0.4		0.6		0.6								
Obj.	40													-												

[a] To reduce the number of modelled receptors, concentrations have been modelled at alternate floor heights

Table A5.2: Predicted 99.79th Percentile 1-hour Mean Nitrogen Dioxide Concentrations (µg/m^3), Process Contribution

Floor Level	99.79th Percentile of 1-hour Nitrogen Dioxide																									
	µg/m^3													% of Objective												
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13
13	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
14		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
15	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
16		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
17	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
18		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
19	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
20		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
21	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
22		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
23	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
24		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
25	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
26		1.1		1.1		1.1		1.1		1.1		1.1	1.1		0.6		0.6		0.6		0.6		0.6		0.5	0.6
27	1.1		1.1		1.1		1.0		1.1		1.1			0.6		0.6		0.5		0.5		0.6		0.6		
28		1.1		1.1		1.1							1.1		0.6		0.6		0.6							0.6
29	1.1		1.1		1.1									0.6		0.6		0.5								
Obj.	200													-												

[a] To reduce the number of modelled receptors, concentrations have been modelled at alternate floor heights

Phase 3

Table A5.3: Predicted Annual Mean Nitrogen Dioxide Concentrations (µg/m^3), Process Contribution

Floor Level	Annual Mean Concentration																					
	µg/m^3											% of Objective										
	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N23	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N23
G							<0.1	<0.1	<0.1	<0.1	<0.1							<0.1	<0.1	0.1	0.1	0.1
1			<0.1				<0.1	<0.1	<0.1	<0.1	<0.1			0.1				<0.1	<0.1	0.1	0.1	0.1
2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	0.1	0.1	0.1	0.1	<0.1	<0.1					0.1
3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	0.1	0.1	0.1	0.1	<0.1	<0.1					0.1
4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	0.1	0.1	0.1	0.1	<0.1	<0.1					0.1
5	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
6	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
7	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
8	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
9	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
10	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
11	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
12	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
13	<0.1	<0.1	<0.1	<0.1							<0.1	0.1	0.1	0.1	0.1							0.1
Obj.	40											-										

Table A5.4: Predicted 99.79th Percentile 1-hour Mean Nitrogen Dioxide Concentrations (µg/m³), Process Contribution

Floor Level	99.79th Percentile of 1-hour Nitrogen Dioxide																					
	µg/m³											% of Objective										
	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N23	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	N23
G							0.4	0.4	0.5	0.5	0.5							0.2	0.2	0.2	0.2	0.2
1			0.5				0.4	0.4	0.5	0.5	0.5			0.2				0.2	0.2	0.2	0.2	0.2
2	0.5	0.5	0.5	0.4	0.4	0.4					0.5	0.2	0.2	0.2	0.2	0.2	0.2					0.2
3	0.5	0.5	0.5	0.4	0.4	0.4					0.5	0.2	0.2	0.2	0.2	0.2	0.2					0.2
4	0.5	0.5	0.5	0.4	0.4	0.4					0.5	0.2	0.2	0.2	0.2	0.2	0.2					0.2
5	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
6	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
7	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
8	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
9	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
10	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
11	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
12	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
13	0.5	0.5	0.5	0.4							0.5	0.2	0.2	0.2	0.2							0.2
Obj.	200											-										