Appendix 10.2: Air Quality Neutral Calculations

Introduction

10.2.1 This Appendix presents the calculations undertaken by Waterman Infrastructure & Environment (WIE) to demonstrate how the Development performs against relevant 'air quality neutral' benchmarks.

Description of the Development

10.2.2 The Development is located within the Outer London Activity Zone and would provide a mixed-use scheme. The total amount of floorspace proposed by the Development, relevant to the Air Quality Neutral Assessment criteria is set out below in **Table A1**.

Table A1: 'Air Quality Neutral' Emissions Benchmarks for Buildings

Land Use (Use Class)	Proposed Floorspace Areas GIA (m^2)
Residential (Use Class C3)	123,538
Office (Use Class B1)	5,532
Flexible Uses - Restaurant / bar / retail / community / leisure (Use Classes A1 / A2 / A3 / A4 / B1 / D1 / Boathouse)	5,023
Hotel (Use Class C1)	1,765
School (Use Class D1)	9,319
Cinema (Use Class D2)	1,606
Total	**146,783**

Note: Table 1 is not the Total Floor Space provided within the Development and excludes non-habitable uses such as plant and storage areas, play space, private amenity space, car park space, which are not used within the Air Quality Neutral Assessment calculations.
The AQNA assessment requires the comparison of Development against relevant benchmarks for each use class and therefore it is necessary for them to be included in Table A1.

Planning Policy

The London Plan: The Spatial Development Strategy for Greater London; Consolidated with Alterations since 2011, 2016

10.2.3 Policy 7.14 'Improving air quality' of the London Plan[1] states that development proposals should:

"…be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs);…"

1 Greater London Authority (2016): The 2015 London Plan with Minor Alterations 2016, Spatial Development Strategy for Greater London, GLA, London.

Intend to Publish London Plan: The Spatial Development Strategy for Greater London, December 2019

10.2.4 Policy SI1 'Improving Air Quality' of the Intend to Publish London Plan[2] states that development proposals should not:

"a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) create unacceptable risk of high levels of exposure to poor air quality."

10.2.5 Policy SI1 also states that "*Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development".*

The Mayor's Air Quality Strategy 'Clearing the Air', 2010

10.2.6 Similarly, the Mayor's Air Quality Strategy[3] states that:

"New developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions".

Sustainable Design and Construction - Supplementary Planning Guidance, 2014

10.2.7 The Sustainable Design and Guidance – Supplementary Planning Guidance (SPG) provides updated guidance to support the implementation of the London Plan.

10.2.8 Further to Policy 7.14 of the London Plan, Section 4.3 of the SPG focusses on air pollution and the effects from the operation of new developments within Greater London. The SPG requires all new developments to be at least 'air quality neutral'.

10.2.9 Paragraph 4.3.15 of the SPG states:

"This policy applies to all major developments in Greater London. Developers will have to calculate the NO_x and / or PM_{10} emissions from the buildings and transport elements of their developments and compare them to the benchmarks set out in Appendix 5 and 6."

10.2.10 The SPG presents emission benchmarks for buildings (associated with emissions from combustion plant introduced as part of a development to provide heating and power) and transport (associated with vehicle trips related to the operation of the development). It is considered that where a development does not exceed these benchmarks, it would be 'air quality neutral' and would not increase NO_x (oxides of nitrogen) and PM_{10} (particulate matter of 10µm diameter or less) emissions across London as a whole. A discussion on the Building Emission Benchmarks (BEBs) and the Transport Emission Benchmarks (TEBs) as set out within the SPG is presented below.

2 Greater London Authority (2019): Intend to Publish London Plan: The Spatial Development Strategy for Greater London, December 2019, GLA, London

3 Greater London Authority (GLA), 'The Mayor's Air Quality Strategy: Cleaning London's Air', London, 2002.

10.2.11 In addition to the BEBs and TEBs, the SPG provides emissions standards for any proposed combustion plant (individual / communal gas boilers, solid biomass or Combined Heat and Power (CHP) plant) to be introduced as part of a development. These emissions standards must be complied with.

Air Quality Neutral Planning Support: GLA 80371, April 2014

10.2.12 In April 2014, the GLA published the Air Quality Neutral Planning Support (AQNPS): GLA 80371[4] to provide support to the development of the Mayor's policy related to 'air quality neutral' developments. The report provides a method to enable a development to be assessed against the air quality neutral benchmarks set out in the Sustainable Design and Construction SPG.

10.2.13 The report provides a methodology required to apply the air quality neutral policy. It requires the transport and building emissions for the development to be identified and then compared to the benchmark emissions. The report notes that the building and transport emissions should be calculated separately and not combined.

Building Emissions Benchmarks (BEBs)

10.2.14 Paragraph 4.3.17 and Appendix 5 of the SPG note that Building Emission Benchmarks (BEBs) have been defined for a series of land-use classes for both NO_x and PM_{10}. The Land Use Classes are presented in **Table A2**.

Table A2: 'Air Quality Neutral' Emissions Benchmarks for Buildings

Land Use Class	NO_x (g/m^2)	PM_{10} (g/m^2)
Class A1	22.6	1.29
Class A3 - A5	75.2	4.32
Class A2 and Class B1	30.8	1.77
Class B2 – B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C2	68.5	5.97
Class C3	26.2	2.28
Class D1(a)	43.0	2.47
Class D1(b)	75.0	4.30
Class D1(c-h)	31.0	1.78
Class D2(a-d)	90.3	5.18
Class D2(e)	284	16.3

10.2.15 It is noted that whilst the BEBs have been provided for PM_{10}, these only apply for developments which would introduce heating plants likely to produce significant PM_{10} emissions. This would typically include heating plant operated by oil or solid fuel (including all biomass appliances). All other plant would not result in an increase in PM_{10}; therefore, an assessment against the PM_{10} BEBs would not be required.

4 Air Quality Consultants Environ Air Quality Neutral Planning Support: GLA 80371. April 2014

Transport Emissions Benchmarks (TEBs)

10.2.16 Paragraph 4.3.19 and Appendix 6 of the SPG sets out the TEBs defined by a series of land-use class for both NO_x and PM_{10}, presented in **Table A3**.

Table A3: 'Air Quality Neutral' Emissions Benchmarks for Transport

Land Use	London Central Activity Zone	Inner	Outer
NOx (g/dwelling/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
Residential (C3)	234	558	1553
PM10 (g/dwelling/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
Residential (C3)	40.7	100	267

Note: No Emissions Benchmark for Use Classes A2, A3, A4, D1 and D2. Use Class B1 was used for a worst-case assessment

10.2.17 Section 4.3.18 of the SPG notes that the design of a development should encourage and facilitate walking, cycling and the use of public transport, thereby minimising the generation of air pollutants.

10.2.18 As well as providing benchmarks the SPG also recommends emission standards for combustion plant to comply with, in addition to meeting the overall 'air quality neutral' benchmark.

Calculation of the Development Emissions Benchmarks

10.2.19 The Development heating and energy strategy would provide two Energy Centres to serve the eastern and western parts of Development, either side of Ship Lane. In addition, a separate heating and energy strategy would be provided for the school. The details of the Energy Centres are presented in **Table A4**.

Table A4: Calculation of the Total Building Emissions

Energy Centre	Unit	Number	Total NO_x Emissions (g/s)	Hours of Operation (hrs./annum)	Total NO_x (kg/annum)
Building 02	Boiler (2400kW)	5	0.1200	4380	1,914.1
	CHP (560kW)	2	0.0204	8760	643.3
	CHP (610kW)	1	0.0111	8760	350.0
Building 17	Boiler (2500kW)	4	0.1027	4380	1,619.4
	CHP (560kW)	2	0.0204	8760	643.3
	CHP (610kW)	1	0.0111	8760	350.0
School	Boiler (750kW)	2	0.0154	4380	242.8
	CHP (226kW)	1	0.0041	8760	129.3
Total Building NOx Emissions					**5,892.3**

Note: For gas-fired plants PM_{10} emission factors are not provided because gas-fired plants do not emit any significant level of particulates

10.2.20 The Building Emission Benchmarks (BEB) for each land use category are presented in **Table A5**. These are calculated by multiplying the floor area for each land use category with the Building Emission Benchmark presented in **Table A2**.

Table A5: Calculation of the Benchmarked NO_x Building Emissions for each Land-Use Category

Land Use	GIA	BEB (gNO_x/m^2/annum)	Benchmarked Emissions ($kgNO_x$/annum)
Residential (Use Class C3)	123,538	26.2	3236.7
Office (Use Class B1)	5,532	30.8	170.4
Flexible Uses - Restaurant / bar / retail / community / leisure (Use Classes A1 / A2 / A3 / A4 / B1 / D1 / Boathouse)*	5,023	44.3	222.5
Hotel (Use Class C1)	1,765	70.9	125.1
School (Use Class D1)	9,319	31	288.9
Cinema (Use Class D2)	1,606	90.3	145.0
Total Benchmarked Building Emissions			**4,188.6**

Note: *The average benchmark of these use-class has been taken from data presented in Table A2.

10.2.21 As shown in **Table A4**, the Total Building NOx Emission of 5,892.3kg/annum are above the benchmarks calculated in **Table A5** of 4,188.6kg/annum. The Development is therefore not considered to be 'Air Quality Neutral', with respect to building emissions.

10.2.22 Following a meeting with the GLA on 26th September 2019, it was agreed the building emissions for Development Area 1 (the detailed component of Application A to the east of Ship Lane) would be assessed in isolation. An air quality neutral assessment of the energy strategy for Development Area 2 (the outline component of the Development located to the west of Ship Lane, part of Application A) would be undertaken as part of the subsequent reserved matters applications. It is understood a planning condition would be placed on the Development as a whole to ensure it is air quality neutral.

10.2.23 The calculations to demonstrate how Development Area 1 of the Development performs against the buildings 'air quality neutral' benchmark have therefore been detailed below.

Calculation of the Development Area 1 Building Emissions Benchmarks

10.2.24 Development Area 1 of the Development would provide six ultra-low NO_X Ultragas 2300D boilers. The sixth boiler would be provided as a back-up and would only be used if there was a failure to one of the other five boilers. The details of the boilers are presented in **Table A6**.

Table A6: Calculation of the Total Building Emissions for Development Area 1

Unit	Number	Total NO_x Emissions (g/s)	Hours of Operation (hrs./annum)	Total NO_x (kg/annum)
Boiler (2300kW)	5	0.12	4,380	1,914.1
Total Building NO_x Emission				**1,914.1**

Note: For gas-fired plants PM_{10} emission factors are not provided because gas-fired plants do not emit any significant level of particulates

A sixth boiler would be provided as a back-up but would only be used if there was a failure to one of the other 5 boilers.

10.2.25 The BEB for each land use category are presented in **Table A7**. These are calculated by multiplying the floor area for each land use category with the Building Emission Benchmark presented in **Table A2**.

Table A7: Calculation of the Benchmarked NO_x Building Emissions for each Land-Use Category

Land Use	GIA (m^2)	Building Emissions Benchmark (gNO_x/m^2/annum)	Benchmarked Emissions ($kgNO_x$/annum)
Residential (Use Class C3)	63,146	26.2	1,654.4
Office (Use Class B1)	5,532	30.8	170.4
Flexible Uses - Restaurant / bar / retail / community / leisure (Use Classes A1 / A2 / A3 / A4 / B1 / D1 / Boathouse)*	5,023	44.3	222.5
Hotel (Use Class C1)	1,765	70.9	125.1
Cinema (Use Class D2)	1,606	90.3	145.0
Total Benchmarked Building Emissions			**2,317.4**

Note: * Flexible Uses - an average benchmark of A1, A2, A3, A4, B1 & D1 was used

10.2.26 As shown in **Table A6**, the Total Building NOx Emission of 1,914.1kg/annum is below the benchmark of 2,317.4kg/annum calculated in **Table A7**. The Development is therefore considered to be 'Air Quality Neutral', with respect to building emissions and no further mitigation measures are required.

Calculation of the Development Transport Emissions

10.2.27 Details of the trip generation per day for each land-use class have been provided by Stantec (the Applicant's transport consultant). The calculation of the Transport Emissions for each component of the Development is presented in **Table A8**.

Table A8: Calculation of the Benchmarked Transport Emissions for each Land-Use Category

Land Use	Trips per annum	Average Distance per trip	Distance travelled km/annum	Emission Factors (g/vehicle-km)	Transport Emission (kg/annum)	
					NO_x	PM_{10}
Residential	428,510	11.4	4,885,014	NO_x: 0.353 PM_{10}: 0.0606	1724.4	296
Office	168,995	10.8	1,825,146		644.3	110.6
Flexible Uses^	104,025	10.8	1,123,470		396.6	68.1
School	166,075	10.8	1,793,610		633.1	108.7
Cinema	59,860	10.8	646,488		228.2	39.2
Total Transport Emissions					**3,626.6**	**622.6**

Notes: Average distance travelled by car per trip for sites within Outer London Activity Zone
^Flexible Uses - No Emissions Benchmark for Use Classes A2, A3, A4, D1 and D2. Use Class B1 was used for a worst-case assessment

10.2.28 The Transport Benchmark for the Development, as shown in **Table A9**, can be calculated by multiplying the benchmark in **Table A3** by the number of properties within the Development.

Table A9: Calculation of the Benchmarked Transport Emissions for each Land-Use Category

Land Use	Units	GIA (m^2)	Transport Emission Benchmark		Benchmarked Emissions	
			gNO_x/m^2 or dwelling/ annum	gPM_{10}/m^2 or dwelling/ annum	$kgNO_x$/ annum)	$kgPM_{10}$/ annum
Residential	1,250	-	1553	267	1,941.3	333.8
Office	-	5,532	68.5	11.8	378.9	65.3
Flexible Uses*	-	5,023	158.75	27.35	797.4	137.4
School	-	9,319	68.5	11.8	638.4	110.0
Cinema	-	1,606	68.5	11.8	110.0	19.0
Total Transport Emissions					**3,866**	**665.5**

Notes: Average distance tr avelled by car per trip for sites within Outer London Activity Zone
^Flexible Uses - No Emissions Benchmark for Use Classes A2, A3, A4, D1 and D2. An average of the A1 and B1 was used for a worst-case assessment
No emissions benchmark for Use Classes D1 and D2 so the B1 was used for a worst-case assessment

10.2.29 The Total Transport NOx Emission of 3,626.6kg/annum (as shown in **Table A8**) is below the benchmark of 3,866kg/annum (as shown in **Table A9**) and the Total Transport PM_{10} Emission of 622.6kg/annum (as shown in **Table A8**) is below the benchmark of 665.5kg/annum (as shown in **Table A9**).

10.2.30 The Development is therefore considered to be 'Air Quality Neutral', with respect to transport emissions and no further mitigation measures are required.