Air Quality Assessment	
Cholmley Gardens, Camden	
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1 Introduction

1.1.1 Air Quality Assessments Ltd (AQA) has been commissioned to undertake an air quality assessment for proposed gas boilers at Cholmley Gardens, Camden. Three high efficiency combination gas boilers will be installed, to replace four ageing gas heating boilers and one hot water boiler. Emissions from the gas boilers will be discharged through a new flue lining, to be installed within an existing chimney stack.

1.1.2 This report describes the existing air quality conditions in proximity to the site, and assesses the likely impact that the gas boiler plant will have on local air quality. The main air pollutant of concern related to gas boiler emissions is nitrogen dioxide (NO_2).

1.1.3 The assessment has been prepared taking into account all relevant local and national guidance and regulations.

1.1.4 The references and a glossary of common air quality terminology used in this assessment are shown in **Section 10** and **Section 11** respectively.

2 Air Quality Legislation and Policy

2.1. EU Limit Values

2.1.1 The European Union's Directive on ambient air quality and cleaner air for Europe (European Parliament, Council of the European Union, 2008) set legally binding limit values for NO_2. The Air Quality Standards Regulations 2010 (The Stationary Office, 2010) implement the EU Directive limit values in English legislation. Achievement of the limit values is a national obligation rather than a local one.

2.1.2 The limit values are the same as the objective values (see **Table 1**); however, the compliance dates differ, and the limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway). The NO_2 limit value applied from 2010.

2.2. The Air Quality Strategy

2.2.1 Part IV of The Environment Act 1995 required the UK Government to prepare an Air Quality Strategy. The Air Quality Strategy (Defra, 2007), provides an overview and outline of ambient air quality policy in the UK and the devolved administrations. The strategy sets out air quality standards and objectives intended to protect human health and the environment.

2.2.2 Standards are the concentrations of pollutants in the atmosphere, below which there is a minimum risk of health effects or ecosystem damage; they are set with regard to scientific and medical evidence. Objectives are the policy targets set by the Government, taking account of economic efficiency, practicability, technical feasibility and timescale, where the standards are expected to be achieved by a certain date.

2.2.3 The Air Quality Strategy also describes the system of Local Air Quality Management (LAQM), introduced in Part IV of the Environment Act 1995, which requires every local authority to carry out regular review and assessments of air quality in its area. Where an objective has not been, or is unlikely to be achieved, the local authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which sets out appropriate measures to be introduced in pursuit of the objectives.

2.2.4 The objectives for NO_2, as prescribed by the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 (The Stationary Office, 2000; The Stationary Office, 2002), are shown in **Table 1**. The objectives for NO_2 were to have been achieved by 2005, and continue to apply in all future years thereafter.

Table 1: The Objectives for NO_2

Pollutant	Concentration Measured As	Objective
NO_2	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3

2.2.5 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Examples of where the objectives should apply are provided in the London Local Air Quality Management Technical Guidance (Mayor of London, 2016). The annual mean NO_2 objectives should apply at the building façades of residential properties, schools, hospitals, care homes etc.; they should not apply at the building façades of places of work, hotels, gardens or kerbside sites. The 1-hour mean NO_2 objective should apply at all locations where the annual mean objectives apply, as well as at gardens of residential properties and hotels and kerbside sites where the public have regular access, e.g. the pavements of busy shopping streets.

2.3. Planning Policy

National Policies

2.3.1 The National Planning Policy Framework (NPPF) (DCLG, 2012) sets out planning policy for England and acts as guidance for local planning authorities in drawing up plans and as a material consideration in determining applications. It places a general presumption in favour of sustainable development, stressing that the planning system should perform an environmental role to minimise pollution.

2.3.2 The NPPF states that:

"The planning system should contribute to conserving and enhancing the environment and reducing pollution by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."

2.3.3 The NPPF goes on to say that:

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account."

2.3.4 With specific reference to air quality, the NPPF states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

2.3.5 The NPPF is supported by Planning Practice Guidance (PPG) (DCLG, 2014). The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the

potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit."

2.3.6 The PPG goes on to state that:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."

2.3.7 The PPG also sets out the information that may be required in an air quality assessment, stating that:

"Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality."

2.3.8 It also provides guidance on options for mitigating air quality impacts, and makes clear that:

"Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact."

Regional Policies

2.3.9 The London Plan (GLA, 2016) sets out the spatial development strategy for London and presents a London-wide policy framework, including Policy 7.14 Improving Air Quality, which states that development proposals should:

"a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);

b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition';

c) be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));

d) ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches; and

e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."

2.3.10 The Mayor's Air Quality Strategy (GLA, 2010) explains the actions that the Mayor will take to improve air quality in London, with the aim of achieving compliance with the EU limit values as soon as possible. The Strategy includes a number of measures to improve air quality, including those that encourage the use of sustainable transport modes, promote the use of cleaner vehicles, improve traffic management and use the planning process to improve air quality.

Local Policies

2.3.11 Camden Council's Local Development Framework (LDF) includes Camden Development Policies 2010-2025 (Camden Council, 2010), which sets out the detailed planning policies that the Council will use when determining applications for planning permission. Policy DP32 Air Quality and Camden's Clear Zone states:

"The Council will require air quality assessments where development could potentially cause significant harm to air quality. Mitigation measures will be expected in developments that are located in areas of poor air quality."

Air Quality Action Plan

2.3.12 Camden Council has developed a Clean Air Action Plan for the AQMA (Camden Council, 2016). The Action Plan sets out measures that the council intends to implement in order to help meet the objectives. Overall, the measures aim to continue monitoring air quality in Camden, reduce emissions from transport, buildings and new development, raise awareness of air quality and promote lobbying and partnership working.

3 Methodology

3.1. Existing Conditions

3.1.1 Information on existing air quality within the study area has been collated from the following sources:

- The results of monitoring and the LAQM review and assessment reports undertaken by Camden Council;
- Maps of roadside concentrations published by Defra, which have been used to identify current exceedences of the annual mean NO_2 EU limit value (Defra, 2017a)[1]; and
- Background pollutant concentration maps published by Defra (Defra, 2017b).

3.2. Boiler Plant Impacts

Modelling Methodology

3.2.1 Concentrations have been predicted using the ADMS 5 dispersion model. ADMS 5 is an extensively validated new generation Gaussian plume air dispersion model, and is used by regulators, government departments, consultancies and industry.

3.2.2 The model has been run to predict the contribution of boiler plant emissions to annual mean nitrogen oxides and the 99.79th percentile of 1-hour mean nitrogen oxides concentrations. The approach recommended by the Environment Agency has been used to adjust the model output of NOx to nitrogen dioxide as follows (Environment Agency and Defra, 2016):

- annual mean nitrogen dioxide concentration = annual mean nitrogen oxides; and
- 99.79th percentile of 1-hour mean nitrogen dioxide concentrations = 99.79th percentile of 1-hour mean nitrogen oxides x 0.5.

Model Input Parameters

3.2.3 Details of the flue height and location and plans of the building housing the boiler plant have been provided by MA Consulting Engineers Ltd. Operating parameters of the boiler plant have been taken from the data sheet for the plant (Remeha, 2016). The flue location is shown in **Figure 1**. It has been assumed that the new boilers and new controls will make the entire heating and domestic hot water system around 25% more efficient; therefore, the emissions have been calculated based on 75% of the gas consumption at Cholmley Gardens in 2016. Monthly factors have been applied to the emissions based on the monthly gas consumption in 2016.

3.2.4 The boiler plant will be located in a ground floor, single storey building, with the new boiler flue routed across to a chimney, with the flue routed up to above roof level within the existing brick chimney stack. The Cholmley Gardens buildings and the chimney stack may have an effect on the dispersion of exhaust gasses from the flue (the building downwash effect); therefore, the buildings and the chimney stack have

[1] There are no exceedences of the PM_{10} limit values.

been included in the model. The buildings included in the model are shown in **Figure 1**.

3.2.5 Emissions from the existing heating and hot water system have also been modelled. The existing system is comprised of four 400kW output gas boilers for heating and a 462kW output gas boiler for hot water. The existing system is old and non-condensing, and the boilers are fired using pressure jet burners. The burners used on the four heating boilers emit 110mgNOx/kW. Assuming that 80% of the 2016 gas consumption was used for heating, the emissions due to heating are 0.01986 gNOx/s. The NOx emission rate from the burners used on the hot water boiler are not known; therefore, they have been assumed to be the same as those from the heating boilers. Assuming 20% of the 2016 gas consumption was used for hot water, the hot water emissions are 0.004965 gNOx/s.

3.2.6 The existing heating system vents through the same chimney stack as the proposed system; however, the hot water system vents at a low level above the flat roof of the plant room within the Cholmley Gardens courtyard (see **Figure 1**). The exhaust gas mass flow rate and flue gas temperature of the existing system are unknown; therefore, these have been assumed to be the same as those of the proposed system.

3.2.7 The differences between predicted concentrations due to the new boiler plant and the old boiler plant have been used to determine the impact.

Table 2: Model Input Parameters used in ADMS 5

Parameter		Value
Make and model		Remeha 610 Eco Pro 860
Fuel		Natural Gas
Output (kW_{th})		790
Exhaust gas temperature (°C)		80
Exhaust gas mass flow rate (kg/s) [a]		0.75
Flue height above ground (m)		16.5
Flue height above roof (m)		2.5
Flue diameter (m)		0.45
2016 gas consumption (kWh/yr)		3,558,903
Anticipated gas consumption (kWh/yr)		2,669,177
NOx emissions	mg/kWh	32
	mg/yr	85,413,672
	g/s	0.002708

a Data for two boilers with exhaust to a single flue (the third boiler is for backup only, and no more than two boilers will operate at any one time).

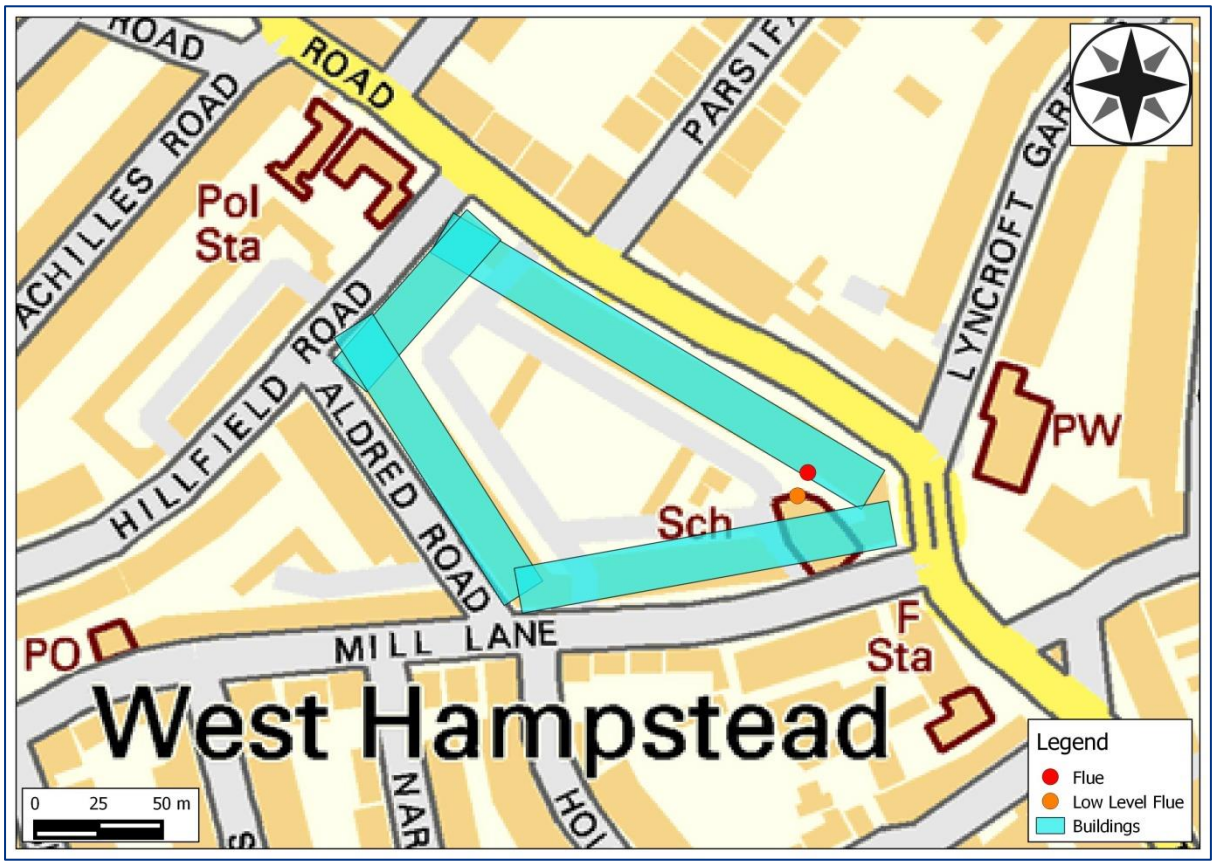

Figure 1: Boiler Flue and Building Locations
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Meteorological Data

3.2.1 The model has been run using one year of meteorological data (2015) from Heathrow Airport. A wind rose is shown in **Figure 2**.

3.2.2 Other model inputs relating to meteorology are shown in **Table 3**. The ADMS 5 default values were used for surface albedo and the Priestly-Taylor parameter.

3.2.3 The surrounding area is relatively flat; therefore the effects of complex terrain were not included in the model.

Table 3: Model Meteorological Input Parameters used in ADMS 5 [a]

Parameter		Value
Monin-Obukhov Length (m)	Dispersion Site	100
	Met Measurement Site	30
Surface Roughness (m)	Dispersion Site	1.5
	Met Measurement Site	0.3

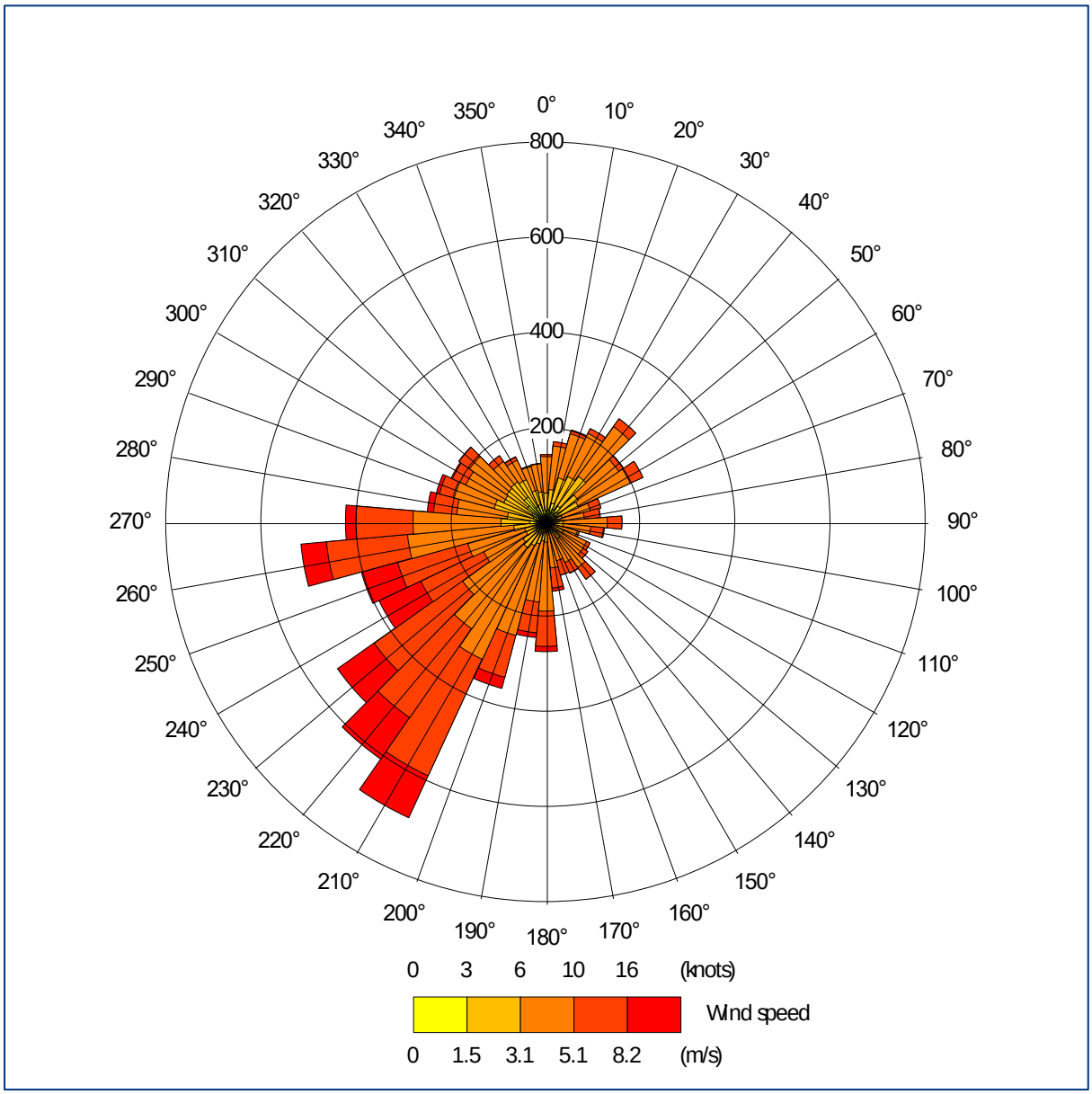

Figure 2: Wind Rose for Heathrow Airport

Sensitive Locations

3.2.4 Concentrations have been predicted across a 400m by 400m grid with a 4m resolution (see **Table 4**).

Table 4: Grid Settings used in ADMS5 [a]

Grid	Start	Finish	Number of Points
x	525132	525532	100
y	185088	185488	100
z	1.5	13	4

a Kriging has been used to interpolate a final grid spacing of 1 m.

3.3. Assessment Criteria and Significance

3.3.1 Environment Agency and Defra online guidance (Environment Agency and Defra, 2016), explains that regardless of the baseline environmental conditions, a process can be considered as insignificant if:

- the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
- the short-term (24-hour mean or less) process contribution is <10% of the short-term environmental standard.

3.3.2 The EPUK/IAQM planning guidance adopts the Environment Agency's short-term screening criterion; however, for long-term concentrations, only changes of less than 0.5% of the annual mean objectives are considered as negligible regardless of baseline conditions (EPUK and IAQM, 2017). For the purposes of this assessment, the screening criteria in **Table 5** have been used to determine whether there is the potential for significant impacts to occur. Where predicted concentrations are below the screening criteria, the potential for significant impacts has been discounted and no further assessment undertaken. Where predicted concentrations are above the screening criteria, the impacts have been considered in more detail, as described below.

Table 5: Screening Criteria

Pollutant	Averaging Period	Screening Criteria (µg/m^3)
NO_2	Annual Mean	0.2
	1-hour Mean	20

3.3.3 It should be recognised that these criteria determine when an impact can be screened out as insignificant. They do not imply that impacts will necessarily be significant above these criteria, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology, such as a detailed dispersion modelling study (as has been carried out for this assessment in any event), and taking into account background concentrations.

Health Criteria and Significance

3.3.4 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach suggested by Environmental Protection UK (EPUK) and the IAQM in guidance on Land-Use Planning & Development Control: Planning for Air Quality (EPUK and IAQM, 2017) has been used for this assessment. The air quality impacts have been described by determining the percentage change in concentrations relative to an air quality assessment level (AQAL) and comparing this with the total long-term average concentration, as set out in **Table 6**. For this assessment the AQAL for NO_2 is based on the annual mean objective (as shown in **Table 1)**.

Table 6: Impact Descriptors for Individual Receptors

Long-term Average Concentration at Receptor in Assessment Year [b]	% Change in Concentration Relative to AQAL [a]			
	1	2-5	6-10	>10
≤ 75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
≥ 110% of AQAL	Moderate	Substantial	Substantial	Substantial

a The % change rounded to a whole number. Changes of 0%, i.e. less than 0.5%, are described as negligible. The AQAL for NO_2 is 40 µg/m^3. The impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

b The without scheme concentration where there is a decrease in predicted concentrations, and the with scheme concentration where there is an increase in predicted concentrations.

3.3.1 With regard to impacts on short-term concentrations, the approach outlined in the EPUK/IAQM guidance has been used, where a short-term process contribution of 11-20% of the relevant standard is considered to be of small magnitude, 21-50% of medium magnitude and above 51% of large magnitude, with the severity of the impact described as slight, moderate or substantial respectively. A short-term process contribution of less than 20% is considered to be insignificant.

3.3.2 The air quality impact, i.e. the change in concentrations as a result of the proposed development, may have an effect on human health, dependent on the severity of the impact and other factors.

3.3.3 The IAQM guidance advises that the overall effect of the air quality impacts should be judged as either significant or not significant taking account of:

- The descriptions of the predicted impacts;
- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts;
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- The potential for cumulative impacts, i.e. several slight impacts taken together could have a significant effect, or a moderate or substantial effect confined to a small area and not obviously a cause of harm to human health could be described as not significant; and
- The consequences of the impacts, i.e. will the impacts have an effect on human health that can be considered significant? The impacts from an individual development would usually not be large enough to result in a measurable change in health outcomes regarded as significant by healthcare professionals, and therefore the impact on local air quality is used as a proxy for assessing effects on health.

3.3.4 The judgement of significance should be made by a competent, suitably qualified professional, and the professional experience of the consultant preparing the report is set out in **Appendix A1**.

4 Baseline Conditions

4.1. Industrial Sources

4.1.1 The search of the UK Pollutant Release and Transfer Register, and Environment Agency's 'What's in your backyard?' websites did not identify any significant industrial or waste management sources that are likely to affect air quality at the application site.

4.2. EU Limit Values

4.2.1 There are no AURN monitoring sites located within the study area and none of the roads adjacent to Cholmley Gardens are included in modelling undertaken by Defra.

4.3. LAQM Review and Assessment

4.3.1 Camden Council has declared the entire borough an AQMA for exceedences of the annual mean NO_2 objective and the 24-hour mean PM_{10} objective.

4.4. Local Air Quality Monitoring

4.4.1 Camden Council currently operates four automatic monitoring sites within its area; however, none of these sites are within the study area. The council also operates a number of diffusion tube monitoring sites. One of these sites, located on Mill Lane, adjacent to Emmanuel Primary School, close to the boiler flue location. Another, located on Frognal Lane, measures urban background concentrations, approximately 900m to the east of the application site. Data from these diffusion tube monitoring sites are shown in **Table 7**, and the locations are shown in Error! Not a valid bookmark self-reference..

4.4.2 Roadside annual mean NO_2 concentrations at the Emmanuel Primary site high, ranging from 41.5 to 57.9 µg/m^3 between 2011 and 2014. Urban background annual mean NO_2 concentrations ranged from 28.6 to 32.09 µg/m^3 between 2010 and 2014.

Table 7: Measured Annual Mean NO_2 Concentrations (2010 to 2014) [a]

Site ID	Location	Site Type	Annual Mean (µg/m^3)				
			2010	2011	2012	2013	2014
CA7	Frognal Way	Urban Bkgd	29	31.5	28.9	32.0	28.6
CA25	Emmanuel Primary	Roadside	-	**41.5**	**46.0**	**57.9**	**48.4**
Objective			**40**				

a Exceedences are shown in bold. Data taken from the 2015 Updating and Screening Assessment (Camden Council, 2015).

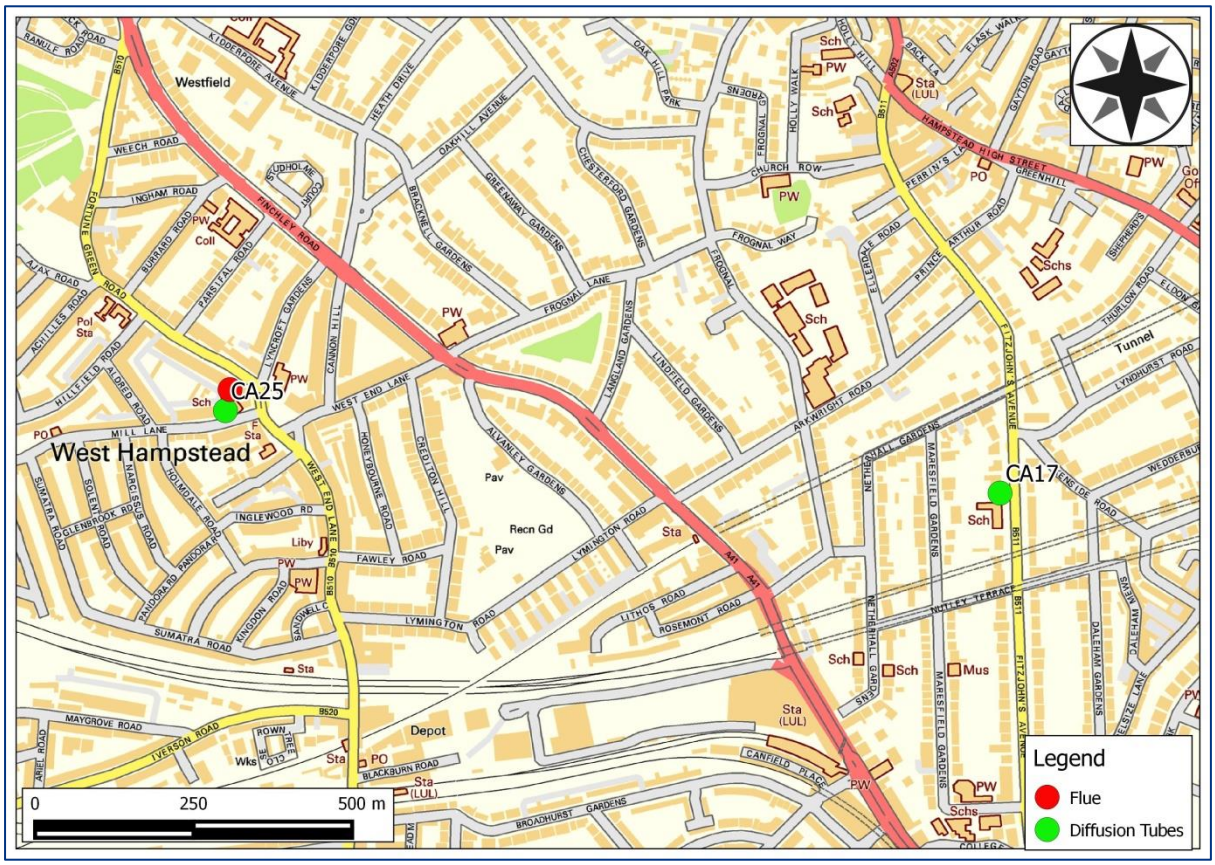

Figure 3: Air Quality Monitoring Sites
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4.5. Background Concentrations

4.5.1 Estimated background concentrations at the application site are shown in **Table 8**. The background concentrations have been derived from data in the national maps published by Defra. The background concentrations are well below the objective.

Table 8: Estimated Annual Mean Background Concentrations 2017 (µg/m^3)

Year	NOx	NO_2
2017	44.5	28.1
Objective	-	**40**

5 Impact Assessment

5.1. Screening

5.1.1 The maximum predicted process contributions to annual mean NO_2 concentrations and 99.79th percentiles of 1-hour mean NO_2 concentrations across the modelled grid are shown in **Table 9**.

Table 9: Maximum Predicted Process Contributions Across the Modelled Grid

Pollutant	Maximum Predicted Process Contribution (µg/m^3)	Screening Criteria
NO_2 annual mean	**0.3**	0.2
NO_2 99.79th %ile 1-hour	0.7	20

a Exceedences of the screening criteria are shown in bold.

5.1.2 The predicted maximum process contribution to the annual mean NO_2 concentration is above the screening criterion and further assessment that considers background concentrations is required. The predicted maximum process contribution to 99.79th percentiles of 1-hour mean concentrations is below the screening criterion; therefore, the impact is considered insignificant, and will not be considered further.

5.2. Detailed Assessment

5.2.1 The isopleths in **Figure 4** show 0.2 µg/m^3 annual mean process contribution concentrations, i.e. 0.5% of the AQAL for NO_2. Predicted process contribution concentrations between 0.2 µg/m^{3}and 0.6 µg/m^3 correspond with a 1% change in concentration relative to the AQAL, rounded to a whole number, when emissions from the existing system are not considered.

5.2.2 The predicted process contribution does not take into account the emissions from the existing heating and hot water system. The predicted impacts, i.e. predicted concentrations due to the new system minus the predicted concentrations due to the old system, are shown in **Figure 5**. Annual mean NO_2 concentrations are predicted to decrease by more than 4.2 µg/m^3 at the façade of receptors close to the flue, i.e. more than 10% relative to the AQAL.

5.2.3 Assuming a baseline annual mean NO_2 concentration of 48.4 µg/m^3, as measured outside Emmanuel Primary School in 2014 (see **Table 7**), and with reference to the impact descriptors in **Table 6**, the impacts would be described as substantial beneficial.

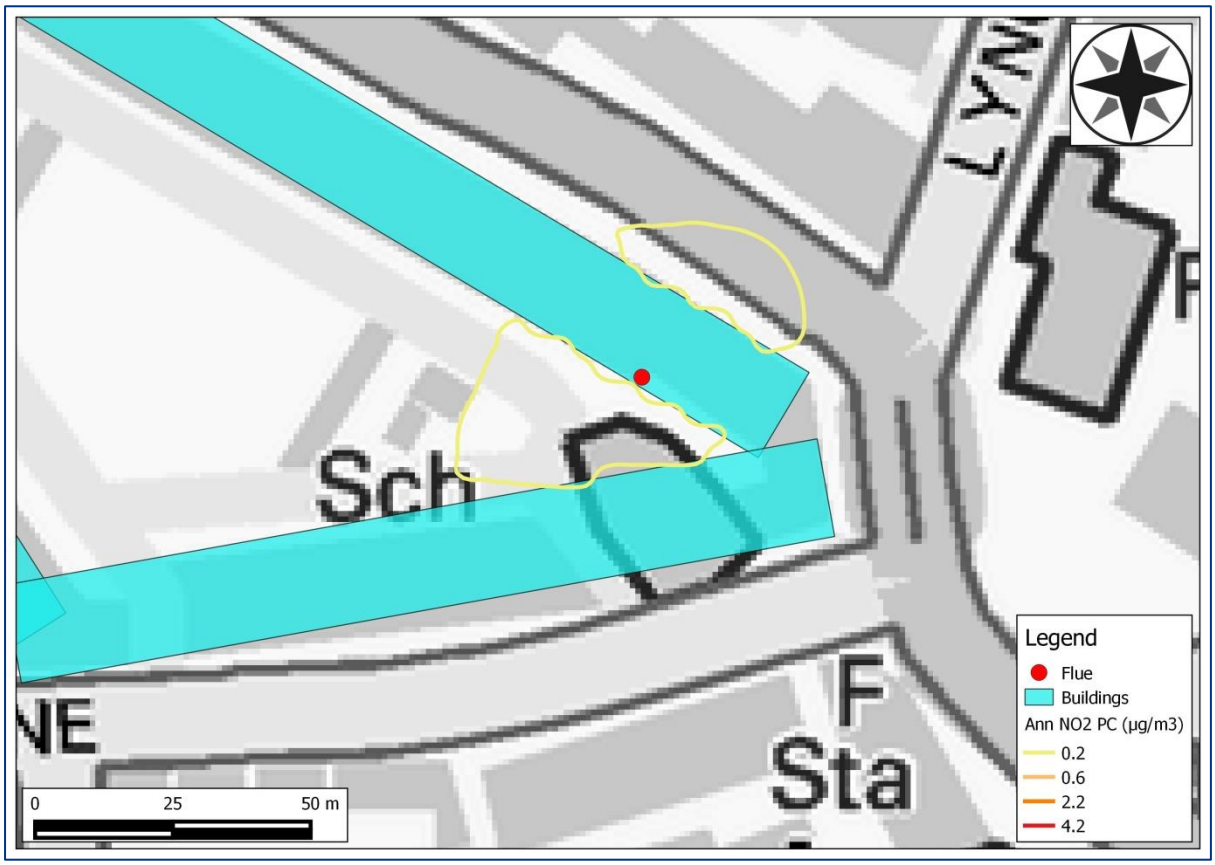

Figure 4: Annual Mean NO_2 Process Contributions
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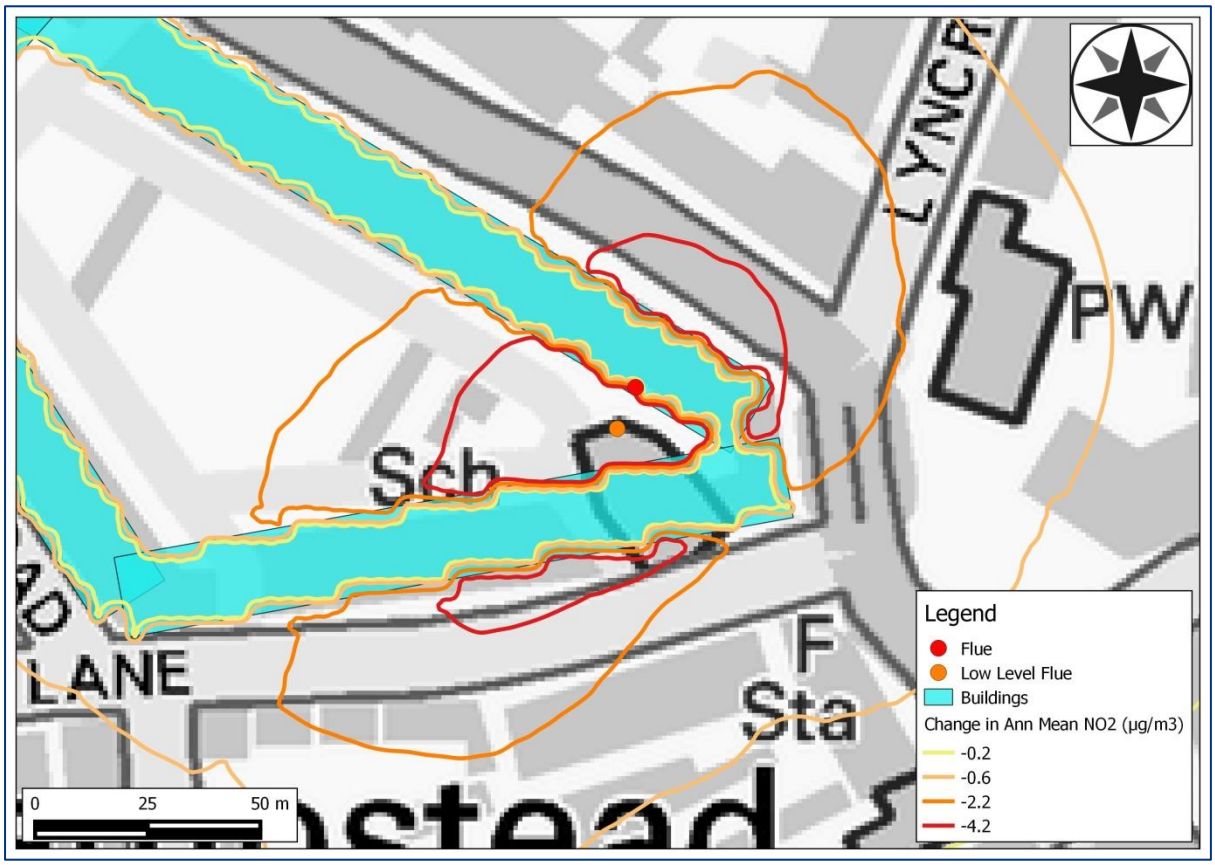

Figure 5: Annual Mean NO_2 Predicted Impact
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6 Mitigation

6.1.1 The assessment has demonstrated that the scheme will lead to an improvement in local air quality and no further mitigation is necessary.

7 Residual Impacts

7.1.1 The residual impacts will be the same as those identified in **Section 5**.

8 Conclusions

8.1.1 The impacts due to emissions from the new boiler plant have been shown to be substantial beneficial. Therefore, it is judged that the new boilers will lead to a significant improvement in local air quality.

8.1.2 The proposed development is consistent with:

- The NPPF;
- The London Plan, and
- Policy DP32 of Camden's Development Policies.

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10 Glossary

ADMS5	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
EPUK	Environmental Protection UK
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
µg/m^3	Microgrammes per cubic metre
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

11 Appendices

A1 Professional Experience

Bob Thomas, BSc (Hons) PgDip MSc MIEnvSc MIAQM CSci

Bob Thomas is a Director at AQA, with over nine years' experience in the field of air quality management and assessment. He has carried out air quality assessments for a wide range of developments, including residential, commercial, industrial, minerals and waste developments. He has been responsible for air quality projects that include ambient air quality monitoring of nitrogen dioxide, dust and PM_{10}, the assessment of nuisance odours and dust, and the preparation of Review and Assessment reports for local authorities. He has extensive dispersion modelling experience for road traffic, energy centre and industrial sources, and has completed many stand-alone reports and chapters for inclusion within an Environmental Statement. Bob has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers, architects and process operators, and has provided expert witness services at public inquiry. He is a Chartered Scientist, a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

A full CV for Bob Thomas is available at http://aqassessments.co.uk/about