Bourne Estate, Camden, London

BOURNE ESTATE: AIR QUALITY ASSESSMENT

- Final
- 21 November 2012

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Executive Summary

It is proposed that various buildings within the Bourne Estate, Camden, London, are to be demolished. These buildings include Mawson House, existing tenants and resident's hall, caretaker's facilities and the substation. These buildings will be replaced with the development of two new residential blocks as well as environmental improvements to the public realm.

The potential for impacts on local air quality from development-related traffic, and an assessment of site suitability for the introduction of potentially sensitive use, was undertaken using the Design Manual for Roads and Bridges (DMRB) screening assessment tool. Detailed dispersion modelling of emissions from the proposed energy plant was also carried out using the ADMS version 4.2 dispersion modelling software, which was informed by a D1 stack height assessment.

The results of potential road-traffic impacts in the vicinity of the development indicated that the maximum contribution to existing levels of pollution as a percentage of the air quality objective value was 0.025%, which is considered as an insignificant impact. Due to existing elevated background concentrations of nitrogen dioxide present at the development location, the annual mean air quality objective was exceeded.

The predicted impacts of emissions from the proposed energy plant at the development indicated that the short-term air quality objective for nitrogen dioxide would be complied with at all assessed locations. The results indicated that the annual mean air quality objective would be exceeded at all assessed locations as a result of elevated existing background concentrations. The maximum contribution to existing levels from the proposed energy plant was 7% of the air quality objective. A number of measures to be considered by the Mechanical and Electrical Engineering consultants for the development to consider have been put forward, to improve the efficiency of the proposed plant, which should result in a reduced impact on local air quality.

A qualitative assessment of the impact of dust generated through construction, demolition and earthworks activities was carried out for the application site. Although it is probable that dust will be generated during these phases of the development, it will only last for a defined period and is not likely to cause any residual impacts. The use of prescribed mitigation measures should be sufficient to keep generated dust levels to a minimum.

A review of industrial processes near to the development was undertaken. One Part A1 process was identified within 2 kilometres of the development site. A number of Part B processes were also identified within the area. It is unlikely that significant impacts on air quality at the Bourne Estate will be experienced due to the distance between the processes and the development site enabling sufficient dispersion of emissions.

This assessment indicates that, based on the current outline design of the energy plant, further modifications and improvement to the environmental performance of the energy plant may be required to reduce the potential impact on local air quality to an acceptable level.

Contents

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1. Introduction

It is proposed that various buildings within the Bourne Estate, Camden, London, are to be demolished. These buildings include Mawson House, existing tenants and resident's hall, caretaker's facilities and the substation. These buildings will be replaced with the development of two new residential blocks as well as environmental improvements to the public realm.

The application site is bounded by residential properties as part of the Bourne Estate to the north with Portpool Lane beyond, residential and commercial properties on Leather Lane to the east, residential and commercial properties on Baldwin Gardens to the south and the commercial properties which front onto Gray's Inn Road to the west.

It is proposed that the development will include up to 75 residential units, associated cycle storage and environmental improvements.

The site is located in the north-western sector of the block formed by Gray's Inn Road, Clerkenwell Road, Farringdon Road and High Holborn, in the London Borough of Camden. The site is located in a predominantly residential and commercial area.

The Design Manual for Roads and Bridges (DMRB)[1] states that it is only necessary to consider sections of road within 200 metres of a receptor site for the purposes of an air quality assessment. Government guidance[2] also states that roads with less than 10,000 vehicles per day are unlikely to have a significant impact on local air quality and do not require further assessment. Information obtained from the transport consultant for the development scheme indicated that there are currently two roads within 200 metres of the proposed residential properties at the Bourne Estate that carry more than 10,000 vehicle movements per day; Gray's Inn Road (A5200), and Clerkenwell Road (A401). However, further air quality guidance published by Environmental Protection UK (EPUK)[3] recommends that an assessment of air quality impacts should be undertaken for:

> *"Proposals that will give rise to a significant change in either traffic volumes, typically a change in annual average daily traffic (AADT) or peak flows of greater than ±5% or ±10%, depending on local circumstances (a change of ±5% will be appropriate for traffic flows within an AQMA)...on a road with more than 10,000 AADT (5,000 if 'narrow and congested')".*

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[1] **Design Manual for Roads and Bridges.** Department for Transport, February 2009

[2] **Department of Environment, Food and Rural Affairs,** Part IV of the Environment Act 1995 Local Air Quality Management: Technical Guidance Note, LAQM.TG (09), January 2009

[3] **Environmental Protection UK,** Development Control: Planning for Air Quality (2010) update, April 2010

The site is located within an Air Quality Management Area (AQMA). No roads were predicted to experience a change in peak flows or AADT of ±10% within 200 m of the proposed development. Emissions of pollutants from all other roads in the vicinity of the site and roads further than 200 metres from the proposed development were taken into account by the use of appropriate background air quality data.

An assessment has been carried out in order to identify if the site is suitable for residential use from an air quality perspective. The proposed development includes the provision of a number of parking spaces, which will give rise to an increase in the volume of traffic on local roads. This increase could have a potential impact on local air quality; therefore, the assessment was also carried out to predict the magnitude of the impact on local air quality at sensitive locations close to the development site and assessed roads. An assessment of the impacts on local air quality of the proposed combined heat and power (CHP) plant was also undertaken.

A qualitative assessment of the potential impacts of dust generated during the demolition and construction phases of the development on existing sensitive locations was also carried out.

2. Air Quality Context

The Bourne Estate is located within the jurisdiction of the London Borough of Camden (LBC). The most recent report submitted by the Council, as part of the Review and Assessment process set in regulations made under the Environment Act by the Department of Environment, Food and Rural Affairs and is described in the Local Air Quality Management Policy Guidance (PG09)[4] and Technical Guidance LAQM.TG(09)[2], is the 2010 Air Quality Progress Report[5]. The purpose of the process is to determine whether the Air Quality Objectives will be exceeded by the target dates at any locations in the borough. If a local authority believes that any of the air quality objectives will be exceeded within its borough, it has a duty to declare an AQMA and to devise an action plan outlining measures which will contribute to the achievement of air quality objectives.

The most significant source of air pollution in the borough is road traffic. The most recent air quality management report indicates that concentrations of PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less) are likely to meet the national air quality objectives by their respective deadlines at most locations within the borough, but concentrations of nitrogen dioxide are still likely to be elevated across the borough. As a result, LBC will continue to designate the whole borough as an AQMA for both pollutants, but does not deem it necessary to undertake a detailed assessment for any locations within the borough.

4 **Department of the Environment, Food and Rural Affairs,** Part IV of the Environment Act 1995 Local Air Quality Management Policy Guidance LAQM.PG (09), February 2009.

5 **London Borough of Camden,** 2010 Air Quality Progress Report for the London Borough of Camden, September 2011

3. Air Quality Assessment Approach

3.1. Introduction

3.1.1. Road Traffic Emissions

A screening assessment has been carried out to identify whether or not the site is suitable for introducing potentially sensitive receptors with respect to air quality and to predict the likely impact of the proposed development on air quality in the vicinity of the local road network surrounding the site. The Design Manual for Roads and Bridges[1] (DMRB) screening assessment tool was used. The DMRB procedure was developed by the Highways Agency and is regularly employed to assess the potential impacts of traffic-derived pollutants in close proximity to roads.

The DMRB screening tool has been used to predict concentrations of air pollutants at existing residential properties close to the assessed roads and at potentially sensitive locations at the development site.

The DMRB procedure calculates concentrations of pollutants up to 200 m from the roadside using emission factors for the vehicle mix and traffic speeds on the roadway. The procedure allows for the expected improvement in car design and fuel quality leading to reduced emissions from individual vehicles.

3.1.2. Energy Plant Emissions

3.1.2.1. D1 Stack Height Assessment

Her Majesty's Inspectorate of Pollution (HMIP) Technical Guidance Note D1 was used to identify a preliminary height for the proposed flue stack associated with exhaust from the boiler and CHP plant. The determined stack height would allow for adequate dispersion of the process emissions. The emissions to air of main interest from the gas fired boilers are oxides of nitrogen and PM_{10}.

The main requirements for air quality are in relation to compliance with air quality objectives. The calculation method in the D1 assessment is designed for compliance with air quality objectives over short-term averaging periods only.

The methodology is based on estimating a stack height to limit ground level pollutant concentrations averaged over short periods. As such, the D1 approach does not enable long-term mean concentrations to be assessed. These are potentially important for the assessment of local air quality in relation to air quality standards specified for the protection of health.

3.1.2.2. Dispersion Modelling Study

A detailed dispersion modelling assessment has been carried out to predict the potential impact on local air quality of emissions from the proposed boiler and CHP plant at the Bourne Estate development. This study was based on the stack height recommendations from the D1 assessment.

The assessment was carried out using an atmospheric dispersion modelling package. An industry standard atmospheric dispersion model (ADMS version 4.2) was used to model releases from the boiler and CHP plant at the development.

The ADMS model predicts the dispersion of operational emissions from a specific source (e.g. a stack), and the subsequent ground level concentrations over an identified area (e.g. at ground level) or at specified points (e.g. a boundary fence or residential property). It is widely accepted among environmental agencies that the ADMS model is one of the leading modelling software packages available.

Using information contained within a meteorological data-set and the stack exhaust gas discharge parameters, the ADMS model computes the ground level concentrations associated with each averaged time period at each point within a specified study area. It also computes the long-term average or percentile ground level concentration at each point within the study area.

3.2. Road Traffic Emissions Screening Assessment Methodology

The technique used in this study, as set out in the DMRB, was designed as a screening tool to establish whether a more detailed air quality assessment is necessary. The technique consists of a series of data tabulations that are used to provide estimated levels of traffic pollutants within 200 m of a road. The DMRB does not involve detailed modelling techniques.

The method involves estimating air pollution concentrations at selected locations along the road network. Estimates can be made for concentrations of carbon monoxide, nitrogen dioxide, non-methane hydrocarbons (benzene and 1,3-butadiene) and PM_{10}. It takes into account vehicle flow and speed, the distance of the location being assessed from the roads carrying the traffic and changes in exhaust emissions brought about by new technology and more stringent legislation.

The DMRB tool provides estimates of annual average concentrations of the above substances. Values are derived from these annual averages for comparison with air quality objectives and guidelines. The derivations from annual mean values are based on observed statistical frequency distributions of pollutant concentrations in the UK and take into account the normal variability in traffic activity and weather conditions that give rise to high levels of pollution. The DMRB tool requires the following input data:

- Plans of the site to determine distance from the roads;

- Annual average daily traffic (AADT) flow figures; and
- Information on traffic speeds and vehicle composition.

To calculate the concentrations from any given road network at any given receptor site, the following methodology was applied, as laid down in the DMRB:

- Division of the network of roads into as few continuous sections as possible;
- Measurement of the shortest distance between the receptor (in this case a sensitive location in close proximity to the assessed road) and the centre of the carriageway of the road;
- Estimation of the speed of the traffic at the point nearest the assessed sensitive locations;
- Calculation of the effective traffic flow for the section in terms of 1996 light duty vehicles (LDVs) travelling at 100 kilometres per hour (kph), as follows:
  - Division of the total traffic flow into separate flows of light-duty and heavy-duty vehicles;
  - Determination of the effective flow factors for the two types of vehicles for the year in question;
  - Determination of speed correction factors for the two types of vehicle for the speed estimated;
  - Multiplication of the flow of light and heavy-duty vehicles by the appropriate effective flow factors and by the appropriate speed correction factors;
  - Addition of the effective flows of light and heavy-duty vehicles to give the total effective flow for the section.
- Determination of the section's contribution to pollution at the receptor for each pollutant and addition of the estimated contributions from each section to give the total network contribution to average pollution levels at the receptor;
- Estimation of background pollutant concentrations;
- Comparison of overall levels of pollutants with air quality objectives.

The limitations and methodology of the model are discussed in the DMRB itself. The DMRB methodology has been set up to err on the side of caution, for example, by assuming that all particulate matter is in the fine PM_{10} fraction, and assuming a low average wind speed.

3.2.1. Assessment locations

Levels of air pollutants have been estimated at six potentially sensitive locations, comprising:

- Two existing residential properties adjacent to the assessed roads near to the Bourne Estate site; and

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- Four proposed residential properties at the Bourne Estate site. These were located at the development site boundary chosen to provide an indication of air quality impacts across the whole site.

These assessment locations provide an indication of pollutant levels where they will be of most potential significance (i.e. relative to potentially sensitive locations), and where the impact of the additional traffic as a result of the proposed development will be greatest. The assessed locations are shown on Figure 1 and in Table 1.

- **Table 1 Assessed sensitive locations**

Receptor	Location		Existing/ Proposed	Description
	E	N		
1	531196	181950	Proposed	Northern boundary of proposed development near jct of Portpool Lane and Leather Lane
2	531053	181903	Proposed	North western point of proposed development near jct of Portpool Lane and Gray's Inn Road
3	531079	181837	Proposed	Western boundary of proposed development near jct of Verulam Street and Gray's Inn Road
4	531187	181824	Proposed	Southern point of proposed development adjacent to St Alban's Primary School and Baldwin's Gardens
5	531098	182023	Existing	Existing property on Clerkenwell Road, north of proposed development
6	531055	181862	Existing	Existing property on Gray's Inn Road, west of proposed development

3.2.2. Application of the model

The DMRB tool is a statistical screening model largely based on national averages concerning, for example, traffic composition and site dispersion characteristics. Because of its use as a general screening model for national application, irrespective of local conditions, its approach errs on the side of caution, tending to overestimate predicted concentrations (e.g. by application of worst case meteorological dispersion conditions). Should any of the estimated concentrations exceed the relevant air quality objective (see Table 7) then it is recommended that a more detailed assessment should be made.

3.2.3. Input Data

3.2.3.1. Traffic data

Traffic data for all roads in the vicinity of the Bourne Estate were provided by the transport consultant for the proposed development. The data were provided for the following scenarios:

- AADT flows for the year 2014 without the development-related traffic ("Without Development" scenario); and
- AADT flows for the year 2014 with the development-related traffic ("With Development" scenario).

The traffic data included a breakdown of fleet composition in the form of percentages of Heavy Duty Vehicles (HDV) and Light Duty vehicles (LDV).

The mean vehicle speed on each road link was estimated according to the national speed limit and road layout/nature of the surrounding area.

When the development comes into use, the main impact on air quality is likely to be from vehicle emissions generated from traffic accessing the development and using local roads in the vicinity of the site. Vehicle movements associated with the proposed development have been included within the information relating to the "with development" scenario.

Traffic data for the assessed roads are presented in Table 2. Full traffic data inputs for the screening assessment, including the distance of each sensitive location from the centre of the assessed road link are shown in Appendix A.

- **Table 2 Input traffic data for the DMRB assessment**

Road Link	Without Development			With Development		
	AADT	LDV	HDV	AADT	LDV	HDV
Gray's Inn Road	10,685	9,778	907	10,725	9,818	907
Clerkenwell Road	19,243	18,138	1,105	19,263	18,158	1,105

3.3. Energy Plant Emissions Assessment Methodology

3.3.1. D1 Stack Height Assessment Methodology

The D1 assessment was carried out assuming that both the gas fired boilers and CHP plant were operating simultaneously at maximum load.

The default values given in the D1 guidance note for guideline concentrations and background concentrations were replaced with the relevant air quality objectives for the substances under consideration. Baseline air quality data for nitrogen dioxide used in this assessment are described in Section 3.5. Long-term mean background concentrations were doubled to represent short-term mean concentration values. The relevant emissions data were also input into the calculation. The emissions data used in this assessment were provided by the energy consultant for the scheme and also calculated based on the maximum quantity of natural gas consumed by each boiler (approximately 28 m^3/hour).

In most cases, substances released from the site will not change character significantly as they disperse in the atmosphere. The principal exception is oxides of nitrogen, which are a mix of two substances - nitric oxide (NO), which is less harmful, and nitrogen dioxide (NO_2) which is the more harmful of the two. These substances convert from one to the other in the presence of sunlight, and by reaction with other trace constituents in the atmosphere.

Oxides of nitrogen emitted from the site are mainly in the form of NO, with a relatively small proportion in the form of NO_2 – typically 5%[6]. In the atmosphere, the nitric oxide is converted to nitrogen dioxide. In the vicinity of the source, this atmospheric conversion process does not continue to completion.

For the purposes of this study it has been assumed that no more than 70% of the NO_x emitted from the site will be present as nitrogen dioxide for determining the annual mean and 35% for determining the 1-hour mean. This approach is in line with guidance produced by the Environment Agency's Air Quality Modelling and Assessment Unit (AQMAU)[7]. This approach is described by AQMAU as the "worst case scenario".

The assessment was carried out following the guidance provided in Section 6.4 of the D1 guidance document "Multiple sources, nearby sources and combining discharges". The two stacks were combined using the approach for "Discharge stacks in close proximity" in D1 Section 6.4.3. This involved summing the Pollution Index, Heat Release and Discharge Momentum values for each flue.

The D1 input data are shown in Table 3.

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6 Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM. TG(09), February 2009.

7 Environment Agency Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NO_x and NO_2'. 2003

Table 3 Input data for the gas CHP and gas boiler

Release Parameters	Unit	CHP	Boilers
Temperature	^oC	120	80
Stack area	m^2	0.018	0.098
Efflux velocity (w)	m/s	13.4	3.67
Volumetric flow (actual) (V)	m^3/s	0.24	0.36
Stack diameter	m	0.15	0.35
Pollutant information	**Unit**	**Nitrogen dioxide**	
Emission Concentration	mg/m^3	500[1]	33 mg/kWh
Discharge rate (D)	g/s	0.03	0.002
Guideline concentration or EAL (Gd)	mg/m^3	0.2	0.2
Background concentration (Bc)	mg/m^3	0.1	0.1
Pollution Index (Pi)	-	129	10
Heat Release (Q)	MW	0.02	0.02
Discharge Momentum (M)	m^4/s^2	2.27	1.06

Note 1: Emission concentrations specified at reference conditions of 273K.

There is a requirement within D1 that the potential effects on dispersion of nearby buildings must be taken into account. It is proposed that the stack will be located on Block 1, which is 17.6m in height. Block 1 will be the tallest structure in close proximity to the proposed stacks; therefore a building height of 17.6 m was used in the D1 calculation as the most significant adjacent building.

D1 Assessment results

The values calculated in the D1 assessment are shown in Table 4. In accordance with D1, results are based on the summation of the contribution from the boiler and CHP plants.

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▪ **Table 4 Results of the D1 Stack Height Assessment**

Parameter	Value
Pollution Index (Pi)	139
Heat release (Q)	0.05 MW
Uncorrelated discharge stack height based on buoyancy (Ub)	1.5 m
Discharge momentum (M)	3.33 m^4/s^2
Uncorrected discharge stack height based on momentum (Um)	1.77 m
Uncorrected discharge stack height	1.5 m
Height of most significant adjacent building	17.6 m
Uncorrected discharge stack height more than 2.5 times the height of the tallest building?	No
Final discharge height (C)	18.9 m
Final discharge height (C) rounded up to nearest metre	**19 m**

The results indicate that a preliminary estimated stack height adequate for dispersing polluting emissions over a short-term period is 19m.

D1 Conclusions

The assessment has used a preliminary screening technique to estimate the stack height that will be required for the new stacks associated with gas CHP and boilers at the Bourne Estate development. The results indicate that a stack height of 19 m is required. However, information provided in Section 6.2.2 of the D1 technical guidance note states that *"No discharge stack should be less than 3m above...any adjacent area to which there is general access"*. It is understood that roof access at Block 1 of the development is available for maintenance purposes. As a result, it is recommended that a stack height of 20.6 m (3 m above roof height) is implemented at the development.

3.3.2. Dispersion Modelling Study Methodology

3.3.2.1. Overview of methodology

The dispersion model used (ADMS 4.2) is described in more detail in Appendix B. The modelling assessment was undertaken with due consideration to relevant guidance[8]. A summary of the dispersion modelling procedure is set out below:

1) Information on plant location, plant emission characteristics and building layout was obtained from the developer and technology supplier;

[8] Environment Agency, Air Quality Modelling and Assessment Unit (AQMAU), Air dispersion modelling report requirements (for detailed air dispersion modelling) (not dated).

2) The meteorological data used for the original air quality assessment was five years of hourly sequential data recorded at London City Airport (2007 – 2011);

3) Ground level concentrations were calculated on a grid of receptor points and also at several specified receptor locations in the vicinity of the site. The grid data is also used for the generation of dispersion contour plots;

4) The above information was entered into the dispersion model;

5) The dispersion model was run to provide the Process Contribution (PC). The PC is the estimated maximum environmental concentration of substances due to releases from the plant alone. The results were then combined with baseline concentrations to provide the Predicted Environmental Concentration (PEC) of the substances of interest;

6) The PECs were then assessed against the appropriate air quality objective for each substance to determine the nature and extent of any adverse effects;

7) The modelled pollutant concentrations were processed using a widely used plotting package (SURFER version 8) to produce contour plots of the model results. These are provided for illustrative purposes only; assessment of the model results was based on the numerical values at the relevant assessment locations.

A review of existing ambient air quality in the area has been undertaken to understand the baseline conditions with respect to the above mentioned pollutants. These existing conditions were determined by review of the extensive data already available for the area. The baseline information considered is presented in Section 3.5.

3.3.2.2. Dispersion model inputs

The emissions data used to represent the boiler and CHP plant are set out in Table 5 below.

Table 5 Dispersion modelling parameters

Parameter	Unit	CHP	Boilers
Stack location	m	531141, 181869	
Stack height	m	20.6	
Stack diameter	m	0.15	0.35
Flue gas temperature	°C	120	80
Volumetric flow rate (actual)	m^3/s	0.24	0.36
NO_x emission concentration[1]	mg/Nm^3	500	33 mg/kWh
NO_x emission rate[1]	g/s	0.072	0.0054

Note 1: Emission rate presented is for oxides of nitrogen rather than nitrogen dioxide, and so differs from the nitrogen dioxide emission rate presented in Table 3

3.3.2.3. Meteorological data

Meteorological data sets in ADMS format are available from a limited number of meteorological stations located around the UK.

Five years of hourly sequential data (from 2007 to 2011 inclusive) for London City Airport was purchased from Atmospheric Dispersion Modelling Ltd. London City Airport is the closest meteorological monitoring station to the site and is located approximately 11 km to the southeast. Land use in the vicinity of the meteorological station is similar in many respects to that which will be present at the Bourne Estate development, being located within central London.

A wind rose for the 2007 – 2011 data is presented in Figure 2. Notwithstanding the influence of structures close to the point of release, it is expected that emissions to atmosphere from the energy plant will disperse primarily in a north-easterly direction from the stack.

It is expected that the weather data monitored at the London City Airport site will include all likely worst case weather conditions (with regards to dispersion of pollutants), and therefore the maximum short term increments to ground level pollutant concentrations discussed below are likely to be representative.

3.3.2.4. Assessment Locations

Due to the relative heights of the buildings surrounding the energy plant compared to the stack height, it is envisaged that the maximum modelled pollutant concentrations will be located in close proximity to the plant location. As such, concentrations have been modelled at potentially sensitive locations across the Bourne Estate and surrounding buildings, namely; Block 1 (proposed development), Block 2 (proposed development), Buckridge Building, Kirkeby House, Nigel Building, Redman House, Block to the west of Gooch House, Properties along the southern side of

Verulam Street, Properties along the southern side of Baldwin's Gardens and St Albans Primary School. Concentrations were modelled at each location at 5 metre intervals between ground level and 15 metres above ground.

3.3.2.5. Buildings

In line with guidelines for the use of the ADMS model, buildings less than one third of the stack height are not considered to influence dispersion and therefore are not required to be incorporated within the dispersion modelling study. Given that the stack is only 3 m taller than the roof height, plume dispersion is likely to be affected by a number of surrounding residential blocks.

Buildings or structures close to a stack can have a significant influence on local airflows so that, under certain circumstances, an emission plume may be drawn down towards ground level. This is referred to as "building downwash," and can result in released substances reaching ground level at higher concentrations than would otherwise be the case without building interference. The model parameters used to describe the considered buildings are set out in Table 6. As the installation's stack will be 20.6 m in height, only buildings above one third of this height were included within the dispersion modelling study.

Table 6 Buildings Incorporated within Dispersion Modelling Study

Building	Length (m)	Width (m)	Height (m)	Angle of Length to North (°)	Centre point co-ordinate
Block 1	45	12	17.6	165	531134, 181888
Block 2 (western wing)	29	10	17.1	165	531195, 181846
Block 2 (central component)	10	9	17.1	75	531208, 181840
Block 2 (eastern wing)	28	10	17.1	165	531215, 181852
Buckridge Building	44	9	15.2	165	531181, 181892
Kirkeby House	45	9	15.8	165	531201, 181898
Nigel Building	95	9	17.2	75	531178, 181922
Redman House[1]	187	73	17.6	75	531115, 181964
Laney Building (adjacent to Leather Lane)	88	12	16.8	165	531234, 181888
Gooch House	37	10	16.0	165	531103, 181885
Block to the west of Gooch House	34	14	15.5	165	531060, 181867
Properties along southern side of Verulam Street	60	8	16.0	75	531098, 181838
Block on Gray's Inn Road between Verulam St and Baldwin's Gardens	39	12	14.0	165	531085, 181807
Properties along southern side of Baldwin's Gardens	133	30	11.6	75	531195, 181792

Note 1: Parameters for Redman House also include adjoining properties from the estate to the north

3.3.2.6. Surface roughness

The turbulent atmosphere caused by wind movements across structures and other surface features such as crop, forestry and bodies of water is described in terms of the surface roughness. Surface roughness ranges from 0.001 m for areas over the sea, to 1 m for built-up city centre areas.

Given the location of Bourne Estate, in central London, a surface roughness of 1.0m has been selected. This corresponds to cityscapes and is deemed to be most representative of the area. A value of 1.0m was also used to represent the surface roughness at the London City Airport weather station.

3.4. Air quality objectives

As agreed through correspondence with LBC[9], concentrations of nitrogen dioxide and PM_{10} have been predicted. To assess the likely significance, the predicted concentrations were compared with the relevant air quality objectives in the UK Air Quality Strategy[10] and the most recent Air Quality Regulations[11].

- **Table 7 Air quality objectives**

Pollutant	Averaging Period	Frequency	Criterion Value
Nitrogen dioxide	1 year	Annual mean	40 $\mu g/m^3$
	1 hour	99.79th percentile of 1 hour mean concentrations	200 $\mu g/m^3$
PM_{10}	24 hours	Number of days when the 24hr mean concentration exceeds 50 $\mu g/m^3$	35 Days
	1 year	Annual mean	40 $\mu g/m^3$

$\mu g/m^3$ = microgrammes per cubic metre

3.5. Background data

LBC undertakes automatic monitoring of a number of air pollutants at locations across the borough. Monitoring is carried out using both automatic and passive techniques.

Background concentrations for oxides of nitrogen (NO_x – the collective term for nitric oxide and nitrogen dioxide), nitrogen dioxide and PM_{10} were also obtained from background concentration maps provided by Defra via the UK Air Information Resource (UK-AIR; http://uk-

[9] Email correspondence between Philip Rogers (London Borough of Camden Sustainability Officer) and Thomas Dean (SKM), 24 September 2012

[10] **Department for Environment, Food and Rural Affairs,** The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007.

[11] **The Air Quality Standards Regulations 2010**, Crown Copyright, 2010

air.defra.gov.uk/). These background data account for general pollution in the vicinity of the site and are provided for each 1km by 1km grid square across the UK.

The nearest background monitoring location to the proposed development site is the LBC – Bloomsbury site, located at Russell Square Gardens, approximately 940 m west of the site. This monitoring station was not considered representative of background pollutant exposure expected at the proposed Bourne Estate development. No suitable passive monitoring locations were identified close to the site.

It was confirmed with the Environmental Health Officer (EHO) at LBC that background concentrations would be sourced from the UK-AIR background concentration maps as these concentrations appeared to be most representative of conditions at the development site.

The background pollutant data were obtained for 2015, the predicted year of completion of the development, in accordance with current best practice guidance. The background concentration values used are shown in Table 4.

- **Table 8 Background pollutant levels used in this assessment**

Substance	Background concentration (µg/m^3)	Year	Source
Oxides of nitrogen	103.8	2015	Maximum concentration of grid square corresponding to the site location (531500,181500), and eight surrounding grid squares
Nitrogen dioxide	51.3		
PM_{10}	22.9		

3.6. Assessment criteria

The analysis of significance of pollutant emissions effects was undertaken based on the comparison of absolute concentrations with the relevant air quality objectives set out in Table 7, as well as professional judgement.

4. Results

4.1. Assessment Results

4.1.1. Road Traffic Assessment

4.1.1.1. Results

The results of the DMRB screening assessment are shown in Table 9 for both the "without development" and "with development" scenarios.

▪ **Table 9 Predicted pollutant concentrations for 2015; Without and With the development**

Receptor	Scenario	Predicted Pollutant Concentration (µg/m^3) (% increase)		No. Days PM_{10} >50µg/m^3
		Annual mean nitrogen dioxide	Annual mean PM_{10}	
1	Without development	52.6	23.2	9
	With development	52.6 (0.000%)	23.2 (0.000%)	9
2	Without development	55.8	24.0	10
	With development	55.8 (0.000%)	24.0 (0.005%)	10
3	Without development	55.3	23.8	10
	With development	55.3 (0.000%)	23.8 (0.005%)	10
4	Without development	51.7	23.0	8
	With development	51.7 (0.025%)	23.0 (0.001%)	8
5	Without development	59.4	25.1	13
	With development	59.4 (0.000%)	25.1 (0.002%)	13
6	Without development	56.8	24.2	11
	With development	56.8 (0.000%)	24.2 (0.007%)	11

4.1.1.2. Discussion

The results presented in Table 9 indicate that the annual mean and short-term air quality objectives for PM_{10} are forecast to be complied with at all assessment locations.

The results also indicate that the annual mean air quality objective for nitrogen dioxide is forecast to be exceeded at all assessment locations. This exceedance is as a result of elevated background pollution levels in the vicinity of the Bourne Estate. The maximum predicted concentration was 59.4 µg/m^3 predicted to occur at Receptor 5 adjacent to Clerkenwell Road.

The maximum predicted increase as a percentage of the relevant air quality objective for either annual mean nitrogen dioxide or PM_{10}, as a result of increased vehicle flows due to the development, was +0.025% at Receptor 4.

Guidance set out in LAQM.TG(09) states that the 1-hour mean objective for nitrogen dioxide is likely to be achieved if predicted annual mean concentrations are less than 60 µg/m^3. The annual mean concentration of nitrogen dioxide is predicted to be below the threshold value of 60 µg/m^3 at all assessed locations, thus complying with the short-term air quality objective for nitrogen dioxide.

4.1.2. Dispersion Modelling Study for Energy Centre Emissions

4.1.2.1. Results

The results of the dispersion modelling assessment are shown in Table 10 and Table 11.

- **Table 10 Modelled annual mean nitrogen dioxide concentrations from the proposed energy plant**

Receptor Location	Air Quality Objective (µg/m^3)	Background Concentration (µg/m^3)	PC (µg/m^3)	PEC (µg/m^3)	PC/AQO %	PEC/AQO %
Block 1			2.85	54.2	7%	135%
Block 2			1.10	52.4	3%	131%
Buckridge Building			2.83	54.2	7%	135%
Kirkeby House			1.87	53.2	5%	133%
Nigel Building			1.57	52.9	4%	132%
Redman House1			0.81	52.1	2%	130%
Gooch House	40	51.3	2.33	53.7	6%	134%
Block to the west of Gooch House			1.14	52.5	3%	131%
Properties along southern side of Verulam Street			2.07	53.4	5%	134%
Properties along southern side of Baldwin's Gardens			2.07	53.4	5%	134%
St Albans Primary School			1.93	53.3	5%	133%

PC = Process Contribution – Pollutant concentration as a result of emissions from the proposed plant

PEC = Predicted Environmental Contribution – Combination of the Process Contribution and existing background concentrations

AQO = Air Quality Objective

- **Table 11 Modelled 99.8th percentile of hourly mean nitrogen dioxide concentrations from the proposed energy plant**

Receptor Location	Air Quality Objective (µg/m^3)	Background Concentration (µg/m^3)	PC (µg/m^3)	PEC (µg/m^3)	PC/AQO %	PEC/AQO %
Block 1	200	102.7	21.9	124.6	11%	62%
Block 2			11.3	114.0	6%	57%
Buckridge Building			13.0	115.6	6%	58%
Kirkeby House			13.0	115.6	6%	58%
Nigel Building			13.0	115.6	6%	58%
Redman House1			4.6	107.2	2%	54%
Gooch House			21.8	124.4	11%	62%
Block to the west of Gooch House			9.8	112.5	5%	56%
Properties along southern side of Verulam Street			4.2	106.8	2%	53%
Properties along southern side of Baldwin's Gardens			7. 8	110.5	4%	55%
St Albans Primary School			12.2	114.9	6%	57%

4.1.2.2. Discussion

The results presented in Table 10 indicate that the annual mean air quality objective for nitrogen dioxide is forecast to be exceeded at all assessed locations. This is as a result of existing background concentrations already being above the air quality objective value. The maximum contribution from the proposed energy plant was 2.85 µg/m^3; 7% of the annual mean air quality objective. A contribution of 7% is of reasonable significance to already elevated concentrations. This contribution is likely to be higher because of the relatively low flue stack associated with the development. However, due to the development being located in a conservation area, it is not possible to increase the height of the flue stack.

Liaison with LBC indicated that an impact of 1% of the air quality objective, or below, would be acceptable. Given the restrictions on increasing the flue stack height to improve dispersion, there are limited improvements that can be made from an air quality perspective. However, the assessment has been based on the performance of a hypothetical CHP and boiler system, as the final design has not yet been confirmed. A number of options to improve the energy plant performance have been provided. These options would need to be assessed by the Mechanical and Electrical Engineers for the development:

- Refine the performance requirements of the proposed CHP and Boiler system so that the correct size can be specified;
- Utilisation of the lowest NO_x emitting system should be included in the plant design to reduce emissions (usually natural gas turbine system);
- Use of abatement technology to reduce emissions from the energy plant if other options to not deliver the required reduction in pollutant emissions e.g. Selective Catalytic Reduction;
- Back-up boilers must be "low-NO_x" and energy efficient.

Once a detailed design is produced for the proposed energy plant, a further assessment of air quality impacts must be conducted to ensure compliance with the relevant air quality objectives.

The results presented in Table 11 indicate that the short-term air quality objective for nitrogen dioxide is forecast to be complied with at all assessment locations.

5. Construction Impacts

Major construction sites can give rise to increasing long term and short term PM_{10} concentrations and may also cause annoyance due to the soiling of surfaces by dust unless the appropriate mitigation measures are implemented. The impacts of dust therefore need to be addressed.

The assessment of dust during construction has been carried out on a qualitative basis with reference to the site's location in relation to sensitive locations; the planned process; site characteristics; material handling procedures and prevailing winds.

5.1. Potential Sources

The key potential construction air quality emission sources are:

- Excavation/demolition activities;
- Earthworks;
- Construction vehicle movement: vehicles moving in and around the site emitting exhaust fumes and re-suspending loose material on the road;
- Material transfer: spillage from transferring material around the site, wind picking up dust from material stock piles, particulate lifted from open container vehicles by the wind generated from the vehicle movement; and
- Passing vehicles: Material tracked out on the wheels of site traffic and re-suspended by passing traffic.

The temporary nature of construction differentiates it from other fugitive dust sources as to the estimation and control of emissions. The construction process consists of a series of different operations, each with its own duration and potential for dust generation. Emissions from any single construction site can be expected to have a definable beginning and end and to vary substantially over different phases of the construction process and over different tasks within each phase.

5.2. Environmental Risk

The Institute of Air Quality Management (IAQM)[12] provides guidance on the risk posed by construction sites in terms of dust emissions.

The guidance considers four types of construction activities:

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[12] **The Institute of Air Quality Management (IAQM)**. Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance January 2012

- Demolition
- Earthworks;
- Construction; and
- Trackout (transport of material from a construction site onto the local road network, where it may be deposited and then be re-suspended by other vehicles passing over it on the local road network).

The methodology in the guidance provides an assessment on three separate dust effects, these are:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

The methodology for the assessment of the construction impacts is based on a four step approach. These steps are summarised below:

Step 1: Screen the requirement for a more detailed assessment, i.e. whether to proceed to Steps 2-4.

Step 2: Assess the risk of dust effects based on nature and scale of the works and proximity to sensitive receptors.

Step 3: Is to determine the site-specific mitigation for each of the four potential activities used in Step 2.

Step 4: Is to assess the significance of the dust effects, generally undertaken after applying the site-specific mitigation.

5.2.1. Step 1: Screen the need for a detailed assessment

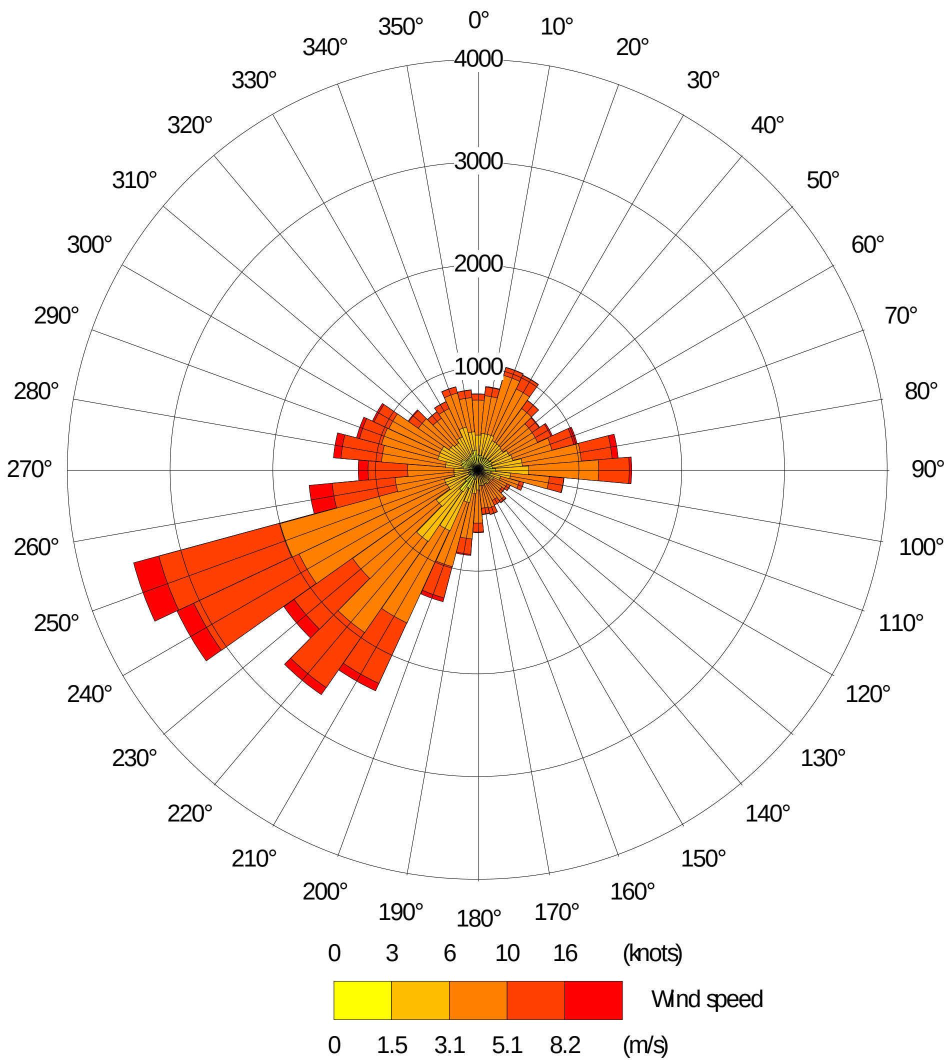
Based on the IAQM guidance, the impact on ecological receptors can be screened out as there are no habitat sites within 350 m from the site. The risk of health effects due to significant increases in exposure to PM_{10} can also be screened out as the PM_{10} concentrations are less than 90% of the relevant air quality objectives. However, as there are receptors within 350 m of the site boundary and 100 m of the access route(s) used by construction vehicles on the public highway, up to 500 m from the site entrances the annoyance due to dust soiling requires further assessment, Step 2-Step 4.

5.2.2. Step 2: Assess the risk of dust effects arising

Description of the site and surroundings

The closest potentially sensitive locations to the proposed works are the residential units located on the Bourne Estates and the adjacent St Alban's Primary School , and residential properties immediately surrounding the Bourne Estate. Other sensitive receptors are located further from the development in different directions. If the construction phase of the development were to produce excessive dust emissions it is possible that significant impacts may be experienced at these properties if suitable mitigation measures are not employed. Figure 2 shows a wind rose covering the period 2007 – 2011, for the London City Airport meteorological station, approximately 11 km southeast of the site. This shows that the predominant wind direction is from the southwest, meaning that the existing residential properties on the Bourne Estate (Nigel Building, Buckridge House, Kirkeby Building and Laney Building) to the east would be most susceptible to any potential fugitive dust emissions during construction.

- **Figure 2 Wind rose for the London City Airport meteorological station, 2007-2011**



A summary of the estimated number of receptors based on the descriptors in the guidance is shown in Table 7.

- **Table 12 Summary of receptors**

Distance from the site	Number of receptors from site	Number of receptors from access roads
Less than 20 m	10 - 100	10 - 100
20 m to 40/50 m	10 - 100	10 - 100
40/50 m to 100 m	100 - 500	100 - 500
100 m to 350 m	100 - 500	100 - 500

Demolition

Demolition activities are proposed for existing structures at the site. The extent of demolition activities at the site is not yet fully known. However, as a worst case assumption, the total volume of buildings to be demolished has been estimated as being more than 50,000 m^3. Therefore, based on the guidance, the dust emission class is "Large".

A matrix of Risk Categories for demolition activities is shown in Table 8.

- **Table 13 Risk category from demolition activities**

Distance to nearest receptor (m)[1]	Dust emission class		
	Large	Medium	Small
Less than 20	**High risk site**	High risk site	Medium risk site
20 to 100	High risk site	Medium risk site	Low risk site
100 - 200	Medium risk site	Low risk site	Low risk site
200 - 350	Medium risk site	Low risk site	Negligible

Note 1 – Approximate distance from the site boundary. Distance to activities on site is likely to be greater

Using the dust emission class and the distance to the closest receptor being less than 20 m from the site, the risk category for demolition activities is "High Risk".

Earthworks

The extent of earthworks occurring at the site is likely to be approximately 7,700 m^2. The proposed earthworks have been classified as “Medium” with regard to dust emission class, representing a site area of between 2,500 m^2 and 10,000 m^2.

A matrix of Risk Categories for earthwork activities is shown in Table 11.

- **Table 14 Risk category from earthwork activities**

Distance to nearest receptor (m)[1]	Dust emission class		
	Large	Medium	Small
Less than 20	High risk site	**High risk site**	Medium risk site
20 to 50	High risk site	Medium risk site	Low risk site
50 – 100	Medium risk site	Medium risk site	Low risk site
100 - 200	Medium risk site	Low risk site	Negligible
200 - 350	Low risk site	Low risk site	Negligible

Note 1 – Approximate distance from the site boundary. Distance to activities on site is likely to be greater

Using the dust emission class and the distance to the closest receptor being less than 20 m from the site, the risk category for earthwork activities is “High Risk”.

Construction

The proposed site will involve the construction of residential units and community space. The overall volume of the proposed development is not yet known. However, the volume of new buildings is likely to be between 25,000 m^3 and 100,000 m^3. Therefore based on the guidance the assessment is based on a dust emission class of “Medium”.

A matrix of Risk Categories for construction activities is shown in Table 10.

Table 15 Risk category from construction activities

Distance to nearest receptor (m)[1]	Dust emission class		
	Large	Medium	Small
Less than 20	High risk site	**High risk site**	Medium risk site
20 to 50	High risk site	Medium risk site	Low risk site
50 – 100	Medium risk site	Medium risk site	Low risk site
100 - 200	Medium risk site	Low risk site	Negligible
200 - 350	Low risk site	Low risk site	Negligible

Note 1 – Approximate distance from the site boundary. Distance to activities on site is likely to be greater

Based on the dust emission class and the distance to the closest receptor being less than 20 m from the site, the risk category for construction activities is "High Risk".

Trackout

Trackout is used to describe the possible transport and deposition of soil and dust by construction vehicle movements on local roads. The construction traffic for this development will likely access the site via Gray's Inn Road (west of the site). Only receptors within 100 m of the route(s) used by vehicles on the public highway and up to 200 m from the site entrances are considered to be at risk.

The number of vehicles required for the construction activities are unknown; however, as a worst-case assumption the assessment is based on more than 100 HDV movements per day accessing/leaving the site. Therefore based on the guidance the assessment is based on a dust emission class of "Large".

A matrix of Risk Categories for Trackout is shown in Table 11.

Table 16 Risk category from trackout

Distance to nearest receptor (m)[1]	Dust emission class		
	Large	Medium	Small
Less than 20	**High risk site**	Medium risk site	Medium risk site
20 to 50	Medium risk site	Medium risk site	Low risk site
50 – 100	Low risk site	Low risk site	Negligible

Note 1 – Approximate distance from the roads used by construction traffic up to a distance of 200m from the site entrance

Using the dust emission class and the distance to the closest receptor to the access roads being less than 20 m the risk category then the risk category for Trackout is "High Risk".

Summary of the risk of dust effects

A summary of the risk of dust effects described in this assessment are summarised in Table 12.

- **Table 17 Summary risk effects table with no mitigation**

Source	Dust Risk
Demolition	High risk site
Earthworks	High risk site
Construction	High risk site
Trackout	High risk site

5.2.3. Step 3 – Identify the need for site specific mitigation

During the construction phase of the development it will be important to control dust levels for high risk sources. In order to avoid significant impacts from dust during the construction phase, measures such as the following should be adopted. These measures have been specified in the London Code of Construction Practice[13] as measures suitable to mitigate dust emissions for sites such as the proposed development.

Measures such as these would normally be sufficient to reduce construction dust nuisance to a minor impact:

Demolition Works

- Use water as dust suppressant;
- Cutting equipment to use water as suppressant or suitable local extract ventilation;
- Use enclosed chutes and covered skips; and
- Wrap building(s) to be demolished.

Earthworks

- Minimising dust generating activities;

[13] **The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance**. Greater London Authority and London Councils. November 2006

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- Use water as dust suppressant where applicable;
- Cover, seed or fence stockpiles to prevent wind whipping;
- Re-vegetate earthworks and exposed areas; and
- If applicable, ensure concrete crusher or concrete batcher has permit to operate.

Construction

- Erect solid barriers to site boundary;
- No bonfires;
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors;
- All site personnel to be fully trained; and
- Trained and responsible manager on site during working times to maintain logbook and carry out site inspections.

Construction Traffic

- All vehicles to switch off engines – no idling vehicles;
- Use nearby rail or waterways for transportation to/from site;
- Effective vehicle cleaning and specific wheel-washing on leaving site and damping down of haul routes;
- All loads entering and leaving site to be covered;
- No site runoff of water or mud;
- On-road vehicles to comply to set emission standards;
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available and be fitted with appropriate exhaust after-treatment from the approved list;
- Minimise movement of construction traffic around site; and
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site.

5.2.4. Step 4 – Define effects and their significance

A summary of the risk of dust effects described in this assessment following the implementation of the appropriate mitigation are summarised in Table 13.

- **Table 18 Summary risk effects table with mitigation**

Source	Dust Risk
Demolition	Medium/Low Risk

Earthworks	Low Risk
Construction	Low Risk
Trackout	Low Risk

5.3. Conclusions

A qualitative assessment of dust levels associated with the construction of the proposed development at the Bourne Estate site shows that, although dust is likely to occur from site activities, this can be reduced through appropriate mitigation measures. The predominant wind direction is south-westerly and any dust generated could potentially be blown towards the northeast from the site towards existing residential units at the Bourne Estate under these prevailing conditions. Some degree of dust impact is possible at these properties and other nearby properties if the dust is not properly mitigated.

In our experience, the use of measures such as those specified above is normally sufficient to control any dust generated during the construction programme to an acceptable level. The measures to control dust emissions would normally be agreed formally with the local authority as part of a construction management plan or equivalent environmental management plan.

6. Other Air Quality Issues

There is one installation designated as a Part A1 activity, as specified by the Environmental Permitting (England and Wales) Regulations 2010[14] (EPR) as amended, within 2 kilometres of the application site, which is permitted for releases of substances to air. The Citigen (London) Ltd plant is permitted to release certain pollutants to air under the conditions of its operating permit. However, the distance between the process and the Bourne Estate should allow sufficient dispersion of pollutant emissions so that no significant effects on air quality would be experienced at the development. Contributions to localised levels of air pollutants from this source have been included in this study through the selection of appropriate background air quality data. The environmental impacts of any emissions from these processes are monitored and regulated by the Environment Agency (EA).

There are approximately 67 Part B processes, as specified by the EPR regulations, within the borough of Camden. Of this list, three are located close to the Bourne Estate comprising two dry cleaners and one scrap metal melting furnace.

It is unlikely that significant impacts on air quality at the Bourne Estate development will be experienced as a result of these processes due to the relatively low level of emissions from these processes, and the distance between them and the development providing sufficient pollutant dispersion.

[14] **Environmental Protection, England and Wales.** The Environmental Permitting (England and Wales) Regulations 2010, Statutory Instrument 2010 No.675

7. Conclusions

An assessment of potential impacts on air quality has been undertaken for proposed redevelopment works at the Bourne Estate, London Borough of Camden.

The potential development-related impacts on local air quality were predicted to be those arising from additional vehicle movements on the local road network travelling to and from the completed development, and also emissions from the proposed CHP and boiler energy plant at the development.

The assessment of road traffic impacts was undertaken using the DMRB screening tool. The results indicated that the annual mean and short-term air quality objectives for PM_{10}, and the short-term air quality objective for nitrogen dioxide were forecast to be complied with at all assessed locations. The results also indicated that the annual mean air quality objective for nitrogen dioxide would be exceeded as a result of existing background concentrations already being elevated above the relevant air quality objective value. The maximum contribution to existing levels of nitrogen dioxide as a percentage of the air quality objective value was 0.025%. In view of this contribution, the impact of development related road traffic emissions is deemed insignificant.

The assessment of impacts from the proposed energy plant at the development was undertaken using the ADMS version 4.2 detailed dispersion modelling software. The results indicated that the short-term air quality objective for nitrogen dioxide would be complied with at all assessed locations. The results indicated that the annual mean air quality objective would be exceeded at all assessed locations as a result of elevated existing background concentrations. The maximum contribution to existing levels from the proposed energy plant was 7% of the air quality objective. Due to limitations placed on the development design by the development location, increasing the flue stack height to improve pollutant dispersion was not deemed feasible. A number of measures to be considered by the Mechanical and Electrical Engineering consultants for the development to consider have been put forward, to improve the efficiency of the proposed plant.

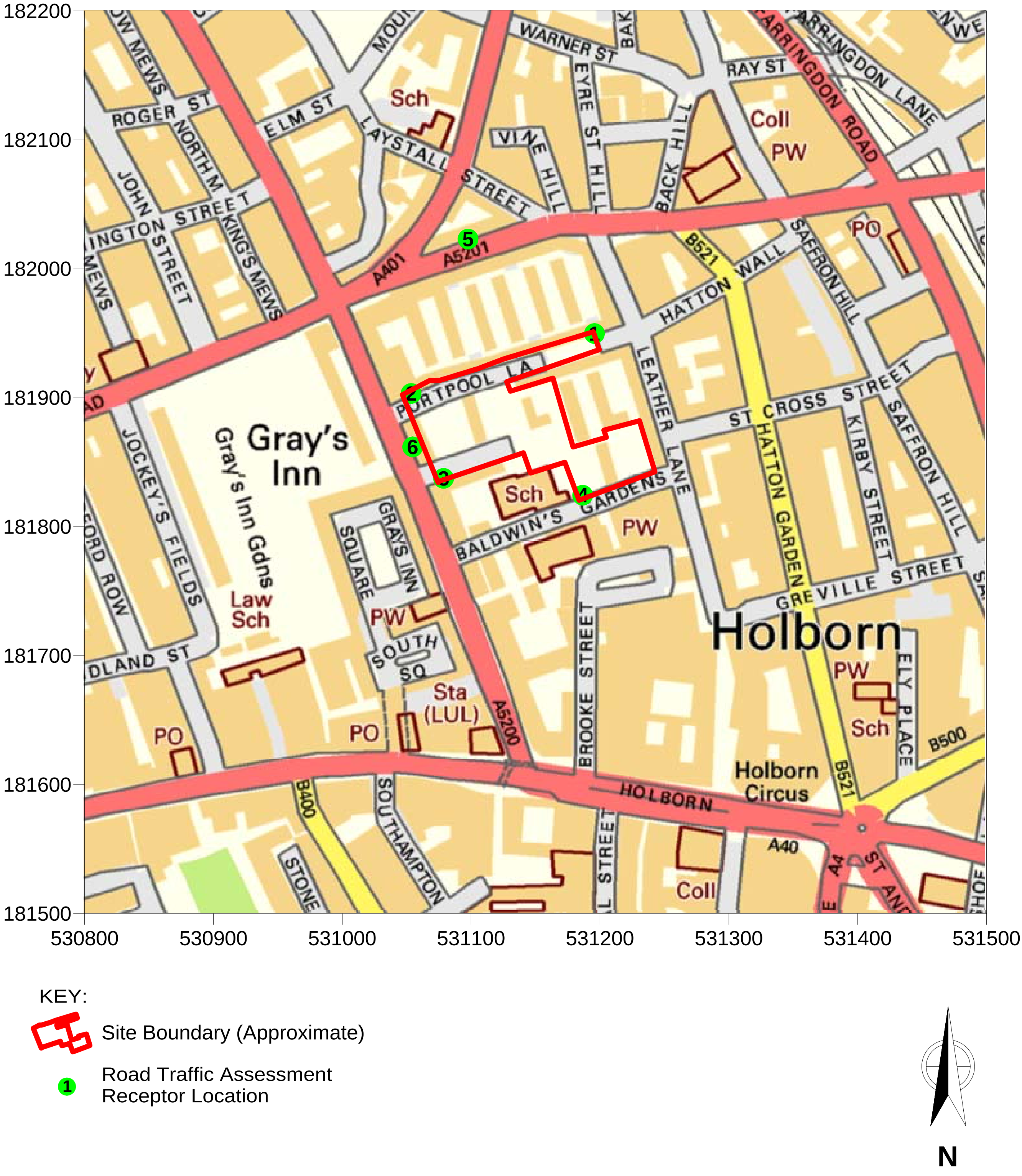
It is recommended that further assessment of air quality impacts is considered once the proposed energy plant design is refined to ensure compliance with the relevant air quality requirements.

A qualitative assessment of the impact of dust generated through construction, demolition and earthworks activities was carried out for the application site. Although it is probable that dust will be generated during these phases of the development, it will only last for a defined period and is not likely to cause any residual impacts. The use of prescribed mitigation measures should be sufficient to keep generated dust levels to a minimum.

A review of industrial processes near to the development was undertaken. One Part A1 process was identified within 2 kilometres of the development site. A number of Part B processes were also identified within the area. It is unlikely that significant impacts on air quality at the Bourne Estate will be experienced due to the distance between the processes and the development site enabling sufficient dispersion of emissions.

This assessment indicates that, based on the current outline design of the energy plant, further modifications and improvement to the environmental performance of the energy plant may be required to reduce the potential impact on local air quality to an acceptable level.

Figure 1 Site boundary and location of assessed sensitive receptors (traffic)



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Bourne Estate, Camden, London

Air Quality Figure 1

Site Location and Assessed Sensitive Receptors (Road Traffic Assessment)

SCALE:	1:4,490	CAN:	JE30656
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Appendix A DMRB Inputs

Table A1 DMRB Input data

Receptor	Distance of receptor from centre of road link (m)		Estimated average vehicle speed (km/hr)	
	Gray's Inn Road	Clerkenwell Road	Gray's Inn Road	Clerkenwell Road
1	175	85.6	38.0	30.0
2	25.9	90.1	38.0	17.5
3	21.4	159	38.0	17.5
4	117	-	38.0	-
5	114	8.7	16.0	30
6	10.4	128	38.0	17.5

Appendix B Description of Dispersion Modelling Software

This appendix sets out the methodology for assessing the potential effects of the energy plant emissions to atmosphere on the environment. It provides a detailed description of the air quality modelling used to assess the single point of process emissions from the proposed facility.

Main Stack Dispersion Methodology

The main approach used to assess emissions to air from the proposed development via the exhaust stacks was an atmospheric dispersion modelling technique. A current UK industry standard atmospheric dispersion model, ADMS (Version 4.2), was used[15.] A further description of ADMS is given below.

The modelling procedure is summarised as follows:

- Information on the proposed plant operational parameters and building layout are obtained, together with information on emissions (flow rates and concentrations) from the exhaust stacks. Several of the parameters relating to the flue gas flow rate, temperature etc for the modelled scenarios were provided by TGA;
- Meteorological data is obtained for use in the assessment. The meteorological data used are discussed in more detail in this Appendix;
- Receptor points were specified at which concentrations of nitrogen dioxide were modelled. These points represented locations of relevant exposure to the assessed pollutant i.e. residential locations and the adjacent primary school;
- The dispersion model is run to provide calculated concentrations of the released substances due to the proposed plant emissions. Interpretation of the results for the main assessment was based on the highest modelled concentration at any modelled location. The post-processing of the results files produced by ADMS 4.2 was carried out using Microsoft Excel;
- Information is gathered on baseline levels of air quality – that is, the levels of air pollutants which arise in the absence of the Development. The information on baseline air quality is obtained from the local authority and national air monitoring records; and
- The modelled concentrations of pollutants due to emissions from the energy plant are combined with the baseline concentrations of air pollutants in the vicinity of the proposed development.

The modelled results are then used to determine the potential effects of the emissions from the energy plant on air quality in the vicinity of the development, as described below:

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[15] Cambridge Environmental Research Consultants Ltd, ADMS 4 (version 4.2).

- The modelled airborne contribution of each substance released from the plant is referred to as the "Process Contribution" (PC). The combined concentration due to the PC and baseline levels of airborne pollutants is referred to as the Predicted Environmental Concentration (PEC). Both PC and PEC values were assessed against the relevant UK air quality objectives and air quality guidelines (these are set out in Section 3.4 of this report).

Description of the Dispersion Model

The dispersion modelling study supported the evaluation of health and environmental effects. As discussed above, the model used in the study was ADMS 4 (version 4.2). ADMS 4 is accepted in the UK as a current industry standard model for dispersion from point sources, such as the emission points within the Development. The model has been validated against field measurements and is routinely used in air quality studies in support of planning and Environmental Permit applications for facilities such as that proposed.

The main alternative system to ADMS is AERMOD. AERMOD is a model which has been developed in the United States using similar principles to ADMS. Both ADMS and AERMOD are widely used in studies of this nature. In situations where dispersion may be affected by the presence of a building, the models use differing algorithms to account for these effects. The ADMS system uses a more detailed representation of dispersion downwind of buildings (six downwind wake zones, compared to two zones used in AERMOD). In view of these considerations, ADMS was marginally preferred to AERMOD for use in this assessment.

The model takes, as a starting point, information on emissions from each source, including:

- Release rate;
- Release temperature;
- Release velocity;
- Release point location;
- Release point height;
- Release point diameter; and
- The location and dimensions of nearby buildings.

Information characterising a set of meteorological conditions is also required.