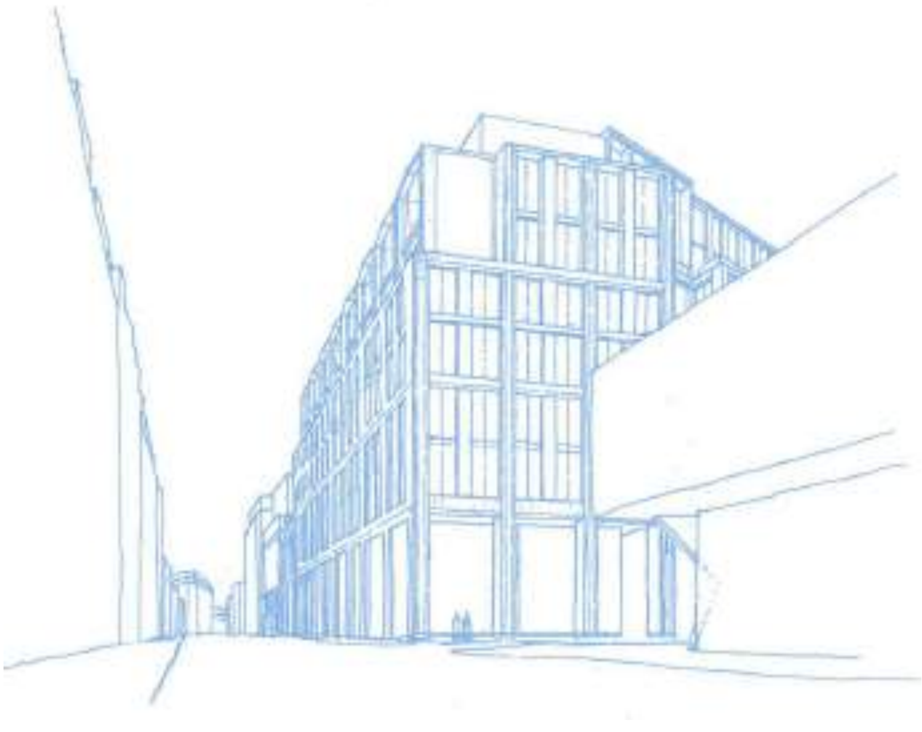
Prepared by REC

On behalf of Royal London Mutual Insurance Society

Air Quality Assessment

Castlewood House & Medius House, WC1A



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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Royal London Mutual Insurance Society to undertake an Air Quality Assessment in support of the proposed redevelopment of Castlewood House and Medius House at New Oxford Street, Camden.

The site is located within an area identified by the London Borough of Camden as experiencing elevated pollutant concentrations. Therefore, the proposals have the potential to introduce future site users into an area of poor air quality. Additionally, the development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works. As such, an Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for the proposed end-use and assess potential impacts as a result of the development.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of demolition, earthworks, and construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and assess potential exposure of future users as a result of road vehicle exhaust emissions. Pollutant concentrations were predicted across both Castlewood House and Medius House at ground to eighth floor. The dispersion modelling indicated high pollutant levels at locations where residential units are proposed within Medius House. As such, appropriate mitigation has been proposed for the affected units, including sealed façades, filtered mechanical ventilation and a high specification of window tightness. This type of mitigation is considered suitable for a development of this size and nature. Pollutant concentrations at Castlewood House were also predicted to exceed the air quality standards therefore although office space is proposed, sealed façades are also proposed to protect future users from elevated concentrations.

The London Plan states that new developments must be considered Air Quality Neutral. Pollutant emissions associated with energy consumption within the development and traffic generated by the development were compared to relevant benchmarks. This indicated that combined transport and energy emissions from the proposals were below the combined benchmark and as such, the development can be considered to be Air Quality Neutral.

Based on the assessment results, the site is considered suitable for the proposed end use subject to appropriate mitigation measures and complies with the London Plan and relevant legislation.

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APPENDIX

1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Royal London Mutual Insurance Society to undertake an Air Quality Assessment for a proposed mixed-use development at New Oxford Street, Camden. The proposals comprise the demolition of the existing building, at Castlewood House, and construction of a replacement ten storey mixed use building, plus ground and two basement levels, including the provision of retail (Class A1 and/or A3) and office (Class B1) floor space. External alterations to Medius House including partial demolition, retention of the existing façade and two floor extension to provide 20 affordable housing units (Class C3), together with associated highway improvements, public realm, landscaping, vehicular and cycle parking, bin storage and other associated works.

1.2 Site Location and Context

The site is located at land off New Oxford Street at approximate National Grid Reference (NGR): 529970, 181380. Reference should be made to Figure 1 for a location plan.

The site is located within an Air Quality Management Area (AQMA), declared by London Borough of Camden (LBoC) due to exceedances of the annual mean and 24-hour mean Air Quality Objective (AQO) for both nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}). Subsequently, there are concerns that the proposals will introduce future site users to poor air quality. Additionally, the development has the potential to cause air quality impacts at sensitive locations which may include fugitive dust emissions from construction works. As such, an Air Quality Assessment was required to quantify baseline conditions, assess suitability for residential use, identify any necessary mitigation to protect future site users from high pollution levels and assess potential impacts as a result of the development. This is detailed in the following report.

1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2. LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_x), sulphur dioxide, lead and PM_{10};
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants. These include:

Limit Values for:

- Sulphur dioxide;
- NO_2;
- Benzene;
- Lead;
- PM_{10};
- $PM_{2.5}$; and
- Carbon monoxide.

Target Values for:

- Ozone;
- $PM_{2.5}$;
- Arsenic
- Cadmium
- Nickel
- Benzo(a)pyrene.

In most UK urban areas the principal pollutants of concern to human health are NO_2 and PM_{10}.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1.] The AQS sets out AQOs that are maximum ambient pollutant

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year

Table 2 summarises the advice provided in Greater London Authority (GLA) guidance LLAQM.TG (16)[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[2] London Local Air Quality Management Technical Guidance 2016 LLAQM.TG (16), GLA, 2016.

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV), Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 National Planning Policy

2.4.1 National Planning Policy Framework

The National Planning Policy Framework[3] (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

> "The planning system should contribute to and enhance the natural and local environment 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
>
> 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

[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.

decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

The implications of the NPPF have been considered throughout this assessment.

2.4.2 National Planning Practice Guidance

The National Planning Practice Guidance[4] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

2.4.3 The London Plan

The Minor Alterations to The London Plan[5] were published in March 2016 and a consolidated version published. This sets out a fully integrated economic, environmental, transport and social framework for the development of the capital until 2031. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

The London Plan policies relating to air quality are outlined below:

"Policy 3.2 Improving health and addressing health inequalities

Strategic

- The Mayor will take account of the potential impact of development proposals on health and health inequalities within London. The Mayor will work in partnership with the NHS in London, boroughs and the voluntary and community sector as appropriate to reduce health inequalities and improve the health of all Londoners, supporting the spatial implications of the Mayor's Health Inequalities Strategy.

- The Mayor will promote London as a healthy place for all – from homes to neighbourhoods and

[4] http://planningguidance.planningportal.gov.uk/.
[5] The London Plan, Minor Alterations to the London Plan, Greater London Authority, March 2016.

across the city as a whole – by:

- Coordinating planning and action on the environment, climate change and public health to maximise benefits and engage a wider range of partners in action

[...]

- The impacts of major development proposals on the health and wellbeing of communities should be considered, for example through the use of Health Impact Assessments (HIA).

Planning decisions

- New developments should be designed, constructed and managed in ways that improve health and promote healthy lifestyles to help to reduce health inequalities.

Policy 5.3 - Sustainable design and construction

Strategic

- The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning decisions

- Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

- Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

[...]

- Minimising pollution (including noise, air and urban run-off)

[...]

Policy 7.14 - Improving air quality

Strategic

- The Mayor recognises the importance of tackling air pollution and improving air quality to London's development and the health and well-being of its people. He will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality and Transport strategies to achieve reductions in pollutant emissions and minimise public exposure to pollution.

Planning decisions

Development proposals should:

- 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).
- 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 Council's 'The control of dust and emissions from construction and demolition'.
- 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).
- 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."

These policies have been considered throughout the completion of this Air Quality Assessment.

2.5 London Borough of Camden Local Planning Policy

The London Borough of Camden Local Plan is currently under independent examination from the Secretary of State for Communities and Local Government and as such, the Core Strategy currently provides the basis for planning decisions and future development in the borough.

A review of the Core Strategy indicated that the following policies should be considered in relation to air quality:

> "CS9 - Achieving a successful Central London
>
> The Council will support and promote the Central London area of Camden as a successful and vibrant part of the capital to live in, work in and visit. We will:
>
> [...]
>
> k) continue to designate Central London as a Clear Zone Region to reduce congestion, promote walking and cycling and improve air quality;

[…]"

And

"CS16 - Improving Camden's health and well-being

The Council will seek to improve health and well-being in Camden. We will:

[…]

e) recognise the impact of poor air quality on health and implement Camden's Air Quality Action Plan which aims to reduce air pollution levels. "

As mentioned previously, the LBoC Local Plan is currently under independent examination however a round of consultation was undertaken in February 2015. As a result of this consultation, a Draft Local Plan[6] is currently available and includes the following policies, in relation to air quality:

"Policy CC1 Climate Change Mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a) Require all development proposals of five or more dwellings and/or 500m sq of any floorspace to show in an energy statement how the energy hierarchy has been applied;
b) Ensure that the location of the development and mix of land uses minimises the need to travel by car and help support local energy networks;
c) Support and encourage sensitive energy efficiency improvements to existing buildings; and
d) Ensure that developments maximise resource efficiency

[…]

We will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions".

And

"Policy CC4 Air Quality

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of a development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

[6] Draft Camden Local Plan 2015, London Borough of Camden, February 2015

> Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless mitigation measures are adopted to reduce the impact to acceptable levels. Similarly, development in locations of poor air quality will not be acceptable unless designed to mitigate the impact to within acceptable limits.
> Development which involves significant demolition, construction or earthworks will also be required to assess the impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.
>
> The Council will only grant planning permission for development in Camden's Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of the development are incorporated.

The policies contained within both the existing Core Strategy and future Local Plan have been considered throughout this assessment by assessing air quality impacts across the proposed development site.

3. METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction phase in addition to exposing future site users to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the GLA document 'The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance'[7].

Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- 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 assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

3.1.2 Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

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[7] The Control Of Dust And Emissions During Construction And Demolition Supplementary Planning Guidance, GLA, 2016.

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m^3 • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total building volume 20,000m^3 to 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes

Magnitude	Activity	Criteria
Medium	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Demolition	• Total building volume under 20,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground level • Demolition during wetter months
	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 20,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

Step 2B defines the sensitivity of the area around the development site for demolition, construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 4.

Table 4 Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	**Ecological Receptors**
High	• Users expect of high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10} e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 5.

Table 5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table 6 outlines the sensitivity of the area to human health impacts.

Table 6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	More than 10	High	Medium	Low	Low	Low
	-	1 - 10	Medium	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
Low	-	1 - 10	Low	Low	Low	Low	Low

Table 7 outlines the sensitivity of the area to ecological impacts.

Table 7 Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

Table 9 outlines the risk category from demolition activities

Table 8 Dust Risk Category from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table 9 outlines the risk category from earthworks and construction activities.

Table 9 Dust Risk Category from Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 10 outlines the risk category from trackout.

Table 10 Dust Risk Category from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

3.1.3 Step 3

Step 3 requires the identification of site specific mitigation measures within the GLA guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

3.1.4 Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The GLA[6] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

3.2 Operational Phase Assessment

3.2.1 Future Exposure

The proposed development includes sensitive land use and is located adjacent to New Oxford Street, a significant source of road vehicle exhaust emissions. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling was therefore undertaken to quantify NO_2 and PM_{10} concentrations across the site and determine suitability for the proposed use. Reference should be made to Appendix II for details of the assessment inputs.

3.2.2 Road Traffic Exhaust Emission Impacts

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site. A screening assessment was therefore undertaken using the criteria contained within the Design Manual for Roads and Bridges (DMRB)[8] and Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) 'Land-Use Planning & Development Control: Planning for Air Quality (2015)'[9] guidance documents to determine the potential for trips generated by the development to affect local air quality.

The DMRB[7] provides the following criteria for determination of road links potentially affected by changes in traffic flow:

- Daily Annual Average Daily Traffic (AADT) flows change by 1,000 or more;
- Daily Heavy Duty Vehicle (HDV) AADT flows change by 200 or more;
- Daily average speed changes by 10km/hr or more; or
- Peak hour speed changes by 20km/hr or more.

The EPUK and IAQM guidance[8] document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- Proposals that will cause a change in Light Duty Vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 elsewhere;
- Proposals that will cause a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 elsewhere;
- Proposals that would realign roads within an AQMA by more than 5m;
- Proposals that will introduce new junctions or remove existing junctions near relevant receptors;
- Proposals that will introduce or change a bus station or change flows of buses by more than 25 AADT within an AQMA or more than 100 AADT elsewhere;
- Proposals which will include an underground car park with extraction system which will be within 20m of a relevant receptor and have more than 100 movements per day;
- Proposals which include either a centralised plant using biofuel, a combustion plant with single or thermal input >300KWh or a standby emergency generator associated with a centralised energy centre; and,
- Proposals which include combustion processes of any size.

Should these criteria not be met, then the DMRB[8] and EPUK and IAQM guidance[9] documents consider air quality impacts associated with a scheme to be **negligible** and no further assessment is required.

Should screening of the traffic data indicate that any of the above criteria are met, then potential impacts at sensitive receptor locations can be assessed by calculating the predicted change in NO_2 and PM_{10} concentrations as a result of the proposed development. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the EPUK and IAQM guidance[9].

3.3 Impact Assessment

The proposals include sensitive land use, as defined in Table 2, and as such there is the potential to

[8] Design Manual for Roads and Bridges Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.
[9] Land-Use Planning & Development Control: Planning for Air Quality, EPUK and IAQM, 2015.

introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling was therefore undertaken to quantify NO_2 and PM_{10} concentrations across the site. The results of the dispersion modelling assessment were compared against the Air Pollution Exposure Criteria (APEC) contained within the London Councils Air Quality and Planning Guidance[10] from the London Air Pollution Planning and the Local Environment (APPLE) working group. These are outlined in Table 11.

Table 11 Air Pollution Exposure Criteria

Category	Applicable Range	Recommendation
APEC - A	Below 5% of the annual mean AQO	No air quality grounds for refusal; however mitigation of any emissions should be considered
APEC - B	Between 5% below or above the annual mean AQO	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g. maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised
APEC - C	Above 5% of the annual mean AQO	Refusal on air quality grounds should be anticipated, unless the LA has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures

It should be noted that a significant area of London would fall under APEC - C due to high NO_2 concentrations throughout the city. As such, a presumption against planning consent in these locations may result in large areas of land becoming undevelopable and prevent urban regeneration.

The inclusion of suitable mitigation measures to protect future site users is therefore considered a suitable way to progress sustainable schemes in these locations and has been considered within this assessment.

3.4 Air Quality Neutral

An assessment was undertaken to compare benchmark emissions with the proposed site use emissions in accordance with the methodology outlined within the GLA guidance 'Air Quality Neutral Planning Support GLA 80371'[11]. The methodology is summarised in the following Sections.

3.4.1 Air Quality Neutral Assessment

The following potential scenarios have been considered within the assessment:

- Benchmark; and
- Development.

[10] London Councils Air Quality and Planning Guidance, London Councils, 2007.
[11] Air Quality Neutral Planning Support: GLA 80371, Air Quality Consultants Ltd in association with ENVIRON UK Ltd, 2014.

The benchmark scenario is representative of annual NO_x and PM_{10} benchmark emissions, which are target emissions as defined by the GLA Guidance[11]. The development scenario is representative of the annual NO_x and PM_{10} emissions from the operation of the proposed development only.

The following emission sources were considered during the assessment:

- Road vehicles travelling to and from the site; and
- On-site emissions from energy used in the provision of heating and hot water.

3.4.2 Road Vehicle Exhaust Emissions

The proposed development has the potential to cause variations in exhaust emissions associated with vehicles travelling to and from the site. These were assessed by calculating annual emissions based on the anticipated traffic generated by the site and standard emission factors provided in the Air Quality Neutral Planning Support GLA 80371[11], as shown in Table 12.

Table 12 Air Quality Neutral Road Transport Emission Factors

Pollutant	g/vehicle-km in Inner London
NO_x	0.3700
PM_{10}	0.0665

3.4.3 Energy Emissions

The proposed redevelopment has the potential to change NO_x emissions as a result of variations in boiler technology used in the provision of heating and hot water. This was assessed by calculating annual emissions based on the anticipated energy usage of the site and standard release rates provided by the Air Quality Neutral Planning Support GLA 80371[11].

4. BASELINE

Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

As required by the Environment Act (1995), LBoC has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that concentrations of the annual mean and 24-hour mean for NO_2 and PM_{10} are above the AQOs within the borough. As such, an AQMA has been declared for these pollutants and is described as:

"London Borough of Camden - The whole borough"

The proposed development is therefore located within an existing area of air quality concern. This has been considered within this assessment.

LBoC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

4.2 Air Quality Monitoring

LBoC monitors pollutant concentrations using continuous and periodic methods throughout their area of administration. The closest automatic monitor to the development is located at Shaftsbury Avenue, approximately 110m south east of the proposed site. Additionally, there is an automatic urban background monitoring station at London Bloomsbury, approximately 640m north-east of the proposed development. Monitoring results for both monitoring stations from recent years are shown in Table 13. Exceedences of the relevant AQO are highlighted in **bold**.

Table 13 Automatic Monitoring Results

Site Name		Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)		Annual Mean PM_{10} Concentration ($\mu g/m^3$)	
			2013	2014	2013	2014
CD3	Shaftesbury Avenue	Roadside	**74**	**69**	29	25
LB	London Bloomsbury	Urban Background	**44**	**45**	18	20

As indicated in Table 13, the annual mean AQO for NO_2 was exceeded at Shaftesbury Avenue and London Bloomsbury during recent years. This is to be expected due to their roadside and background locations, respectively, within in an AQMA. Reference should be made to Figure 2 for a graphical representation of the monitoring locations.

LBoC also utilise passive diffusion tubes to monitor NO_2 concentrations throughout the borough. A review of the most recent monitoring data indicated that there are currently two diffusion tubes located within the vicinity of the site. The Tottenham Court Road site is located approximately 520m north-west and the Bloomsbury Street diffusion tube is positioned approximately 220m north of the proposed development. Recent results are shown in Table 14 and exceedances of the relevant AQO are highlighted in **bold**.

Table 14 Diffusion Tube Monitoring Results

Site Name		Type	Annual Mean NO_2 Concentration (µg/m^3)	
			2013	2014
CA11	Tottenham Court Road	Kerbside	**88.09**	**86.75**
CA21	Bloomsbury Street	Roadside	**76.08**	**80.82**

As Indicated in Table 14, the annual mean AQO for NO_2 was exceeded at both diffusion tube locations in recent years. This is to be expected due to their kerbside and roadside locations, respectively, within an AQMA. Reference should be made to Figure 2 for a graphical representation of the diffusion the diffusion tube monitoring locations.

4.3 Background Pollutant Concentrations

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 529500, 181500. Data for this location was downloaded from the DEFRA website[12] for the purpose of this assessment and is summarised in Table 15; for the base year (2014) and the predicted development opening year (2021). Exceedances are highlighted in **bold**.

Table 15 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m^3)	
	2014	2021
NO_x	97.13	70.89
NO_2	**51.20**	39.71
PM_{10}	23.27	21.38

As shown in Table 15, background concentrations of NO_2 exceed the relevant AQO in 2014. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

4.4 Sensitive Receptors

[12] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These may include residential dwellings, places of work and footpaths. These have been defined for construction dust impacts in the following Sections.

Receptors sensitive to potential dust impacts during demolition, earthworks and construction were identified from a desk-top study of the area up to 350m[7] from the development boundary. These are summarised in Table 16.

Table 16 Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	Less than 10	0
20 - 50	Less than 10	0
50 - 100	10 - 100	-
100 - 350	More than 100	-

Reference should be made to Figure 3 for a graphical representation of demolition, earthworks and construction dust buffer zones.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m[7] of the site access route. These are summarised in Table 17. The exact construction vehicle access routes are provided in the Construction Phase Plan Initial Considerations Report produced by Arup and suggest that the following routes within the vicinity of the site will be utilised:

- A40 New Oxford Street;
- A40 Oxford Street;
- A40 Bloomsbury Way
- A400 Bloomsbury Street;
- A4200 Southampton Way;
- Earnshaw Street;
- Bucknall Street; and
- Dyott Street.

Table 17 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
20	Less than 10	0
20 - 50	More than 100	0

Reference should be made to Figure 4 for a graphical representation of trackout dust buffer zones.

There are no ecological receptors within 50m of the site or trackout boundary. As such, ecological impacts have not been assessed further within this report.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 18.

Table 18 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a densely populated area As such, history of dust generation is likely to be associated with the development of the area
The likelihood of concurrent dust generating activity on nearby sites	A review of the LBoC planning portal indicated that there are a number of planning applications in the vicinity of the proposed site. As such, concurrent dust generation may occur should the construction phases overlap
Pre-existing screening between the source and the receptors	The proposed development is located in a densely populated area and as such dust screening is limited
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south-west of the development, as shown in Figure 5. As such, properties to the north-east of the site would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area is very built up. As such, there may be constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The development opening year of 2021 suggests the duration of the construction phase is likely to extend over three years. As such potential impact to receptors is medium
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was considered to be **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1.2, is shown in Table 19.

Table 19 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low

5. ASSESSMENT

There is the potential for air quality impacts as a result of the demolition and construction works at the proposed development in addition to the exposure of future site users to elevated pollution levels. These are assessed in the following Sections.

5.1 Construction Phase Assessment

5.1.1 Step 1

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the demolition and construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

5.1.2 Step 2

Demolition

Demolition will involve the removal of Castlewood House. It is anticipated that the demolition will include heights greater than 20m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from demolition is therefore **large**.

Table 5 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **high** risk site for dust soiling as a result of demolition activities.

Table 6 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for human health as a result of demolition activities.

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The ground conditions at the site are underlain by Lynch Hill Gravel however given the urban locality some Made Ground is likely to be present above the gravels. Furthermore, the superficial deposits are underlain by the London Clay Formation, Lambeth Group, Thanet Sands and the White Chalk.

The proposed development site is estimated to cover a total area of less than 2,500m^2. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **low.**

Table 5 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of earthworks activities.

Table 6 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health as a result of earthwork activities.

Construction

Due to the size of the development the total building volume is likely to be greater than 100,000 m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**

Table 5 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **medium** risk site for dust soiling as a result of construction activities.

Table 6 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it is anticipated that the unpaved road length is likely to be less than 50m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **small**.

Table 5 indicates the sensitivity of the area to dust soiling effects to people and property is **medium**. In accordance with the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for dust soiling as a result of trackout activities.

Table 6 indicates the sensitivity of the area to human health is **low**. In accordance within the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health as a result of trackout activities.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 20.

Table 20 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	Low	Medium	Negligible
Human Health	Medium	Negligible	Low	Negligible

As indicated in Table 20, the potential risk of dust soiling is **high** for demolition, **low** for earthworks, **medium** for construction and **negligible** from trackout. The potential risk of human health impacts is **medium** for demolition, **low** for construction and **negligible** for earthworks and trackout activities.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

5.1.3 Step 3

The GLA guidance[7] provides a number of potential mitigation measures to reduce impacts during the demolition and construction phase. These measures have been adapted for the development site as summarised in Table 21. The mitigation measures outlined in Table 21 can be reviewed prior to the commencement of construction works and are in line with those measures proposed as part of the Construction Phase Plan Initial Considerations report which has been submitted as part of this application.

Table 21 Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	• Record all dusty and air quality complaints and make the complaints log available to the LA when asked • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation • Make complaints log available to LA when asked

Issue	Control Measure
Monitoring	• Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust • Carry out regular site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out
Preparing and Maintaining the Site	• Plan site layout so that machinery and dust causing activities are located away from receptors • Fully enclose site or specific operations where there is a high potential for dust production and the site as actives for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible • Cover, seed or fence stockpiles to prevent wind whipping Use water as dust suppressant where applicable
Operating Vehicle/ Machinery and Sustainable Travel	• All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol powered generators where practicable • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph in unsurfaced haul roads
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on site to clean any spillages
Waste Management	• No bonfires
Demolition	• Soft strip buildings before demolition. • Ensure effective water suppression is used during demolition operations. • Avoid explosive blasting - use appropriate manual alternatives • Bag or remove any debris
Earthworks and Construction	• Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas

Issue	Control Measure
	• Ensure vehicles leaving are covered to prevent escape of materials. • Inspect on-site routes for integrity, instigate necessary repairs and record in site log book • Implement a wheel washing system at a suitable location near site exit

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 21 are implemented, the residual effect from all dust generating activities is predicted to be not significant, in accordance with the GLA guidance[9].

5.2 Operational Phase Assessment

Dispersion modelling was undertaken with the inputs described in Section 4.2. Reference should be made to Figures 6 to 15 for graphical representations of NO_2 and PM_{10} concentrations across the development site. It should be noted that the ground floor was not included in this case as the proposals for Medius House indicate that this floor will be utilised for retail space, for which there is not a relevant exposure level. Similarly, the annual mean NO_2 and PM_{10} concentrations at Castlewood House have not been discussed within this report as the proposals indicate that all floors will be utilised for office space, for which there is also not a relevant exposure level.

5.3 Nitrogen Dioxide

5.3.1 Annual Mean

Figures 6 to 13 display the contour plots for the predicted annual mean NO_2 concentrations at 4.5m to 25.5m, to represent exposure across first to eighth floor level of the proposed development. It should be noted that concentrations at levels above 22.5m were not included within this report. This is because there are no residential receptors proposed at heights above this level.

Predicted annual mean NO_2 concentrations across Medius House are summarised in Table 22.

Table 22 Predicted Annual Mean NO_2 Concentrations at Medius House

Floor	Predicted 2021 Annual Mean NO_2 Concentration Range (μg/m^3)	APEC Category
First (4.5m)	57.52 - 86.39	C
Second (7.5m)	55.35 - 85.73	C
Third (10.5m)	53.20 - 84.96	C
Fourth (13.5m)	51.43 - 84.09	C
Fifth (16.5m)	50.04 - 83.33	C
Sixth (19.5m)	48.95 - 82.67	C

Floor	Predicted 2021 Annual Mean NO_2 Concentration Range ($\mu g/m^3$)	APEC Category
Seventh (22.5m)	48.10 - 82.08	C
Eighth (25.5m)	47.44 - 81.62	C

Table 22 indicates predicted concentrations are considered to be APEC - C across Medius House, in accordance with the London Councils' Air Quality and Planning Guidance[10]. Exceedances of the annual mean AQO were predicted at all residential units.

5.3.2 1-Hour Mean

1-hour mean NO_2 concentrations were predicted across the development site for the proposed development opening year. Concentrations were predicted to be above the relevant AQO at all floors at the façades of Castlewood House and Medius House facing New Oxford Street and that façade of Medius House facing Dyott Street, as shown in Figure 14. It should be noted that figures at levels below 25.5m were included within this report as it is likely that the 1-hour mean is also exceeded at levels below.

Based on the dispersion modelling results, the site requires the implementation of mitigation measures at first to eighth floor to protect future site users from poor air quality. These are detailed in Section 6.

5.4 Particulate Matter

Annual mean PM_{10} concentrations were predicted across the development, as shown in Figure 14. However, similarly to NO_2, PM_{10} concentrations for Medius House only have been considered within this report. This is due to the residential nature of this part of the development. Dispersion modelling indicates that there were no exceedances of the AQO at locations of relevant exposure, with concentrations ranging from 20.91$\mu g/m^3$ to 23.40$\mu g/m^3$. These are categorised as APEC - A, in accordance with the London Councils' criteria and are considered acceptable without the inclusion of mitigation measures. Reference should be made to Figure 14 for a graphical representation of PM_{10} concentrations at first floor level.

It should be noted that figures showing PM_{10} concentrations above 4.5m were not included within this report as concentrations were predicted to be below the annual mean AQO.

5.5 Road Traffic Exhaust Emissions

Based on the information provided by ARUP, the appointed transport consultant for this project, it is not anticipated the development will result in a change of AADT flows of more than 100, produce over 25 HDV movements per day or significantly affect average speeds on the local road network. Additionally, it is unlikely that the proposed development will generate or increase traffic congestion, give rise to a significant change in AADT or peak traffic flows or in vehicle speed, significantly alter the traffic composition on local roads or include significant new car parking. As such, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **negligible**, in accordance with the DMRB[8] and EPUK and IAQM[9] screening criteria detailed in Section 3.2.2.

5.6 Boiler Emissions

The existing plant on-site will be completely replaced by new units with significantly improved energy/emission efficiency. As such, the proposals are expected to result in the reduction of actual process contribution associated with the operation of the current plant on-site. It is therefore considered that the impact associated with this aspect of the proposals is an improvement of the current situation and as such, would result in reduction of the overall emission footprint of the site.

5.7 Air Quality Neutral Assessment

The proposals comprise the demolition of the existing building, at Castlewood House, and construction of a replacement ten storey mixed use building, plus ground and two basement levels, including the provision of retail (Class A1 and/or A3) and office (Class B1) floor space. External alterations to Medius House including partial demolition, retention of the existing façade and two floor extension to provide 20 affordable housing units (Class C3), together with associated highway improvements, public realm, landscaping, vehicular and cycle parking, bin storage and other associated works.

Existing and proposed areas are detailed in Table 23 below:

Table 23 Proposed Floor Spaces

Castlewood House	Existing GEA	Proposed GEA	Existing GIA	Proposed GIA
Retail	0	2,304*	0	2,173*
Office	13,099	18,905*	11,651	18,126*
Residential	0	0	0	0
TOTAL	13,099	21,209	11,651	20,299

Medius House	Existing GEA	Proposed GEA	Existing GIA	Proposed GIA
Retail	652*	525*	594*	469*
Office	1,610*	0	1,466*	0
Residential (20 units)	0	2147*	0	1,931*
Total	2,262	2,672	2,060	2,400

Total Combined	Existing GEA	Proposed GEA	Existing GIA	Proposed GIA
Retail	652*	2,829	594*	2,642

Office	14,709*	18,905	13,117*	18,126
Residential	0	2147	0	1,931
Total	15,361	23,881	13,711	22,699

5.7.1 Road Transport

Benchmarks

The Transport Emissions Benchmark (TEB) has been calculated using the GLA Air Quality Neutral Planning Support[11] guidance document based on the land-use class of the proposed development.

The floor area and number of dwellings were provided by Gerald Eve, the planning consultants for the project. The TEBs are those provided in the GLA Air Quality Neutral Planning Support document and are detailed in Table 24.

Table 24 Transport Emission Benchmarks

Land Use	Quantity (m^2 or number of dwellings)	NO_x		PM_{10}	
		TEB ((NO_x ($g/m^2/year$) /(g/dwelling/ year))	NO_x per Land Use (kg/year)	TEB ((PM_{10} ($g/m^2/year$) /(g/dwelling/ year))	PM_{10} per Land Use (kg/year)
Retail	2,642	219.0	578.6	39.30	103.8
Office	18,126	11.4	206.6	2.05	37.2
Residential	20 units	558.0	11.2	100.0	2.0
Total	-	-	796.4	-	143.0

As indicated in Table 24, the total annual NO_x emission TEB is 796.4kg/year and the total annual PM_{10} emission TEB is 143.0kg/year.

Development Emissions

Development road transport emissions were calculated using traffic data provided by ARUP, the Transport Consultants for the project.

The number of daily trips was used to calculate annual NO_x and PM_{10} based on emission factors provided in the GLA Air Quality Neutral Planning Support document, as shown in Table 12. A summary of the traffic data used in the assessment is provided in Table 25. A joint trip rates was provided for the office and retail uses and therefore this was assumed to be split equally between the 2 uses.

Table 25 Development Emissions - Traffic Data

Land use	24-hour AADT Flow	Road Type	Average Distance (km/m_2/annum) or (km/dwelling/annum)
Retail	39	London - Inner	5.9
Office	39	London - Inner	7.7
Residential	4	London - Inner	3.7

The inputs outlined in Table 25 and Table 12 were utilised to calculate development road vehicle exhaust emissions. This is summarised in Table 26.

Table 26 Development Emissions - Road Vehicle Exhaust Emissions

Land Use	NO_x Emission (kg/year)	PM_{10} Emission (kg/year)
Retail	31.08	5.59
Office	40.56	7.29
Residential	2.00	0.36
Total	**73.63**	**13.23**

The TEB and development road traffic exhaust emissions were calculated using the inputs and methodology outlined in Section 3.4.2. These are summarised in Table 27.

Table 27 Development Road Vehicle Exhaust Emissions

Scenario	NO_x Emission (kg/year)	PM_{10} Emission (kg/year)
TEB	796.39	142.99
Development Emissions	73.63	13.23
Difference	**-722.77**	**-129.76**

As indicated in Table 27, annual NO_x and PM_{10} road vehicle exhaust emissions are below the TEB by 722.77kg/year and 129.76kg/year respectively and as such, further action will not be required.

5.7.2 Energy Emissions

Similarly to the TEB, the Building Emissions Benchmark (BEB) has been calculated using the GLA Air Quality Neutral Planning Support[11] guidance document based on the land-use class of the proposed development.

The floor areas and number of dwellings was provided by Gerald Eve, the planning consultants for the project. The BEBs are those provided in the GLA Air Quality Neutral Planning Support document. This is detailed in Table 28.

Table 28 Energy Emission Benchmarks

Land Use	Quantity (m^2)	NO_x	
		BEB (NO_x ((g/m^2/year))	NO_x per Land Use (kg/year)
Retail	2,642	22.6	50.6
Office	18,126	30.8	558.3
Residential	1,931	26.2	59.7
Total	22,699	-	**608.9**

As indicated in Table 28, the total annual NO_x emission BEB is 608.9/year.

Development Emissions

Development energy emissions were calculated using the annual energy input provided by GDM Partnership, the Energy Consultants for the project. Conservative assumptions based on the size of the development were made for the emission rates and number of the proposed gas boilers. Detailed information on the precise design of the energy provisions was not available at the time of this assessment.

The relevant input data is outlined in Table 29.

Table 29 Development Energy Emissions

Source	Emission Rate (mg/KWh)	NO_x emissions (kg/yr)
Boiler - Castlewood	40	6.8
Boiler - Medius Refurbishment	40	3.8
Boiler - Medius New Extension	40	1.0
Total	-	**46.40**

The BEB and development energy emissions were calculated using the inputs and methodology outlined in Sections a 3.4.3. These are summarised in Table 30.

Table 30 Energy Emissions

Scenario	NO_x Emission (kg/year)
BEB	608.9
Development Emissions	46.4
Difference	**-562.5**

As indicated in Table 30, annual development NO_x emissions from the energy provision are below the BEB by 562.5 kg/year and therefore **no further action** will be required.

5.7.3 Air Quality Neutral Assessment Summary

Overall comparison of the TEB and BEB with the development emissions are summarised in Table 31.

Table 31 Benchmark vs. Development Emissions

Scenario	Source	Annual NO_x Emissions (kg/yr)	Annual Total NO_x Emissions (kg/yr)	Annual PM_{10} Emissions (kg/yr)	Annual Total PM_{10} Emissions (kg/yr)
Benchmark	Road Vehicles	796.4	1405.3	143.0	143.0
	Energy	608.9		-	
Development Emissions	Road Vehicles	73.6	120.0	13.2	13.2
	Energy	46.4		-	
Difference	Road Vehicles	-722.8	-1285.2	-129.8	-129.8
	Energy	-562.5		-	

As indicated in Table 31, annual NO_x emissions from road vehicles are predicted to be below the TEB by 722.8kg/yr. NO_x emissions from energy generating activities are predicted to be above the BEB by 562.5kg/yr. In total, NO_x emissions are predicted to be below the combined TEB and BEB by 1285.2kg/yr. PM_{10} emissions are predicted to be below the TEB by 129.8kg/yr. As such, further action is not required and the development can be considered to be Air Quality Neutral.

6. MITIGATION

There are a number of air quality mitigation options available to reduce potential exposure of future site users to elevated pollutant concentrations. However, all techniques have financial implications and therefore, may affect scheme viability.

6.1 Construction Phase

The GLA guidance provides a number of potential mitigation measures to reduce potential impacts from the construction phase. As risks were identified resulting from, demolition, earthworks and construction activities, mitigation measures are required. These are in line with the Construction Phase Plan Initial Considerations report and are summarised in Table 21. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by LBoC.

6.2 Operational Phase

Detailed dispersion modelling undertaken at heights equivalent to the proposed building floors indicated that all residential units at Medius House are likely to be exposed to elevated concentrations of NO_2. Therefore, in accordance with the London Councils' Air Quality and Planning Guidance, the inclusion of appropriate mitigation measures throughout the development is proposed in order to reduce the potential for exposure of future users to elevated pollutant concentrations.

It is proposed that all habitable rooms within Medius House include mechanical ventilation. These residential units have been predicted to have concentrations with the APEC C category and therefore require mitigation in accordance with relevant guidance[10]. The proposed air inlet should be positioned, where feasible, towards the rear of Medius House, at the highest possible point and a NO_x filtration unit should be included within the ventilation systems. This positioning of the ventilation systems should ensure the supply of clean air within all residential dwellings from first to eighth floor levels across the development.

Furthermore, as predicted NO_2 concentrations exceed the 1-hour mean AQO at sensitive locations at both Castlewood House and Medius House, it is proposed that the façades at all floors of both buildings facing New Oxford Street should be sealed along with the façade of Medius House facing Dyott Street. This will ensure future users are protected from poor air quality.

The proposals include the provision of windows for all residential units however it is proposed that windows located at the façade of both buildings facing New Oxford Street and windows located on the façade of Medius House facing Dyott Stret are non-openable. For the areas of the buildings where windows can be opened, there is the potential for exposure to elevated pollutant concentrations. As such, the development could incorporate a high specification of air tightness so, when these are closed, the offices and residential units will suitably be protected from the pollutants outside. This provides freedom of choice over whether natural ventilation is preferable during certain periods. The key to reducing exposure using this method is to ensure occupants are informed over the potential impacts associated with prolonged exposure to elevated pollutant levels. As such, it may also be possible to provide future users with a welcome pack containing air quality information which will allow them to follow appropriate advice on protection against high concentrations during certain periods.

7. CONCLUSION

REC Ltd was commissioned by Royal London Mutual Insurance Society to undertake an Air Quality Assessment for a proposed mixed-use development at New Oxford Street, Camden. The proposals comprise the demolition of the existing building, at Castlewood House, and construction of a replacement ten storey mixed use building, plus ground and two basement levels, including the provision of retail (Class A1 and/or A3) and office (Class B1) floor space. External alterations to Medius House including partial demolition, retention of the existing façade and two floor extension to provide 20 affordable housing units (Class C3), together with associated highway improvements, public realm, landscaping, vehicular and cycle parking, bin storage and other associated works.

The proposed site is located within the LBoC AQMA, As such, there is the potential for future site users to be exposed to elevated pollutant concentrations. An Air Quality Assessment was therefore required in order to determine baseline conditions, consider location suitability for the proposed end-use and identify any necessary mitigation to protect future site users from high pollution levels and assess potential impacts as a result of the proposed development.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of demolition, earthworks and construction and demolition activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and would reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed development location as a result of emissions from the local highway network. This was used to determine any area of exceedance at the site.

The results of the dispersion modelling predicted concentrations across the development at floors of relevant of exposure were above the AQO for both NO_2. Predicted annual mean NO_2 concentrations were categorised as APEC C at first floor to eighth floor level, in accordance with the London Councils' Air Quality and Planning Guidance. As such, filtered mechanical ventilation should be included in all residential units within Medius House. This should ensure the supply of clean air for future users. Furthermore, 1-hour mean NO_2 concentrations were also predicted to exceed at all floors at the façades of both Castlewood House and Medius House facing New Oxford Street and the façade of Medius House facing Dyott Street. As such, it is proposed that these façades are sealed in order to protect future users from poor air quality. There were no predicted exceedances of the annual mean for PM_{10} at any location across the development site. However, the suggested mitigation measures would also reduce exposure to this pollutant as well.

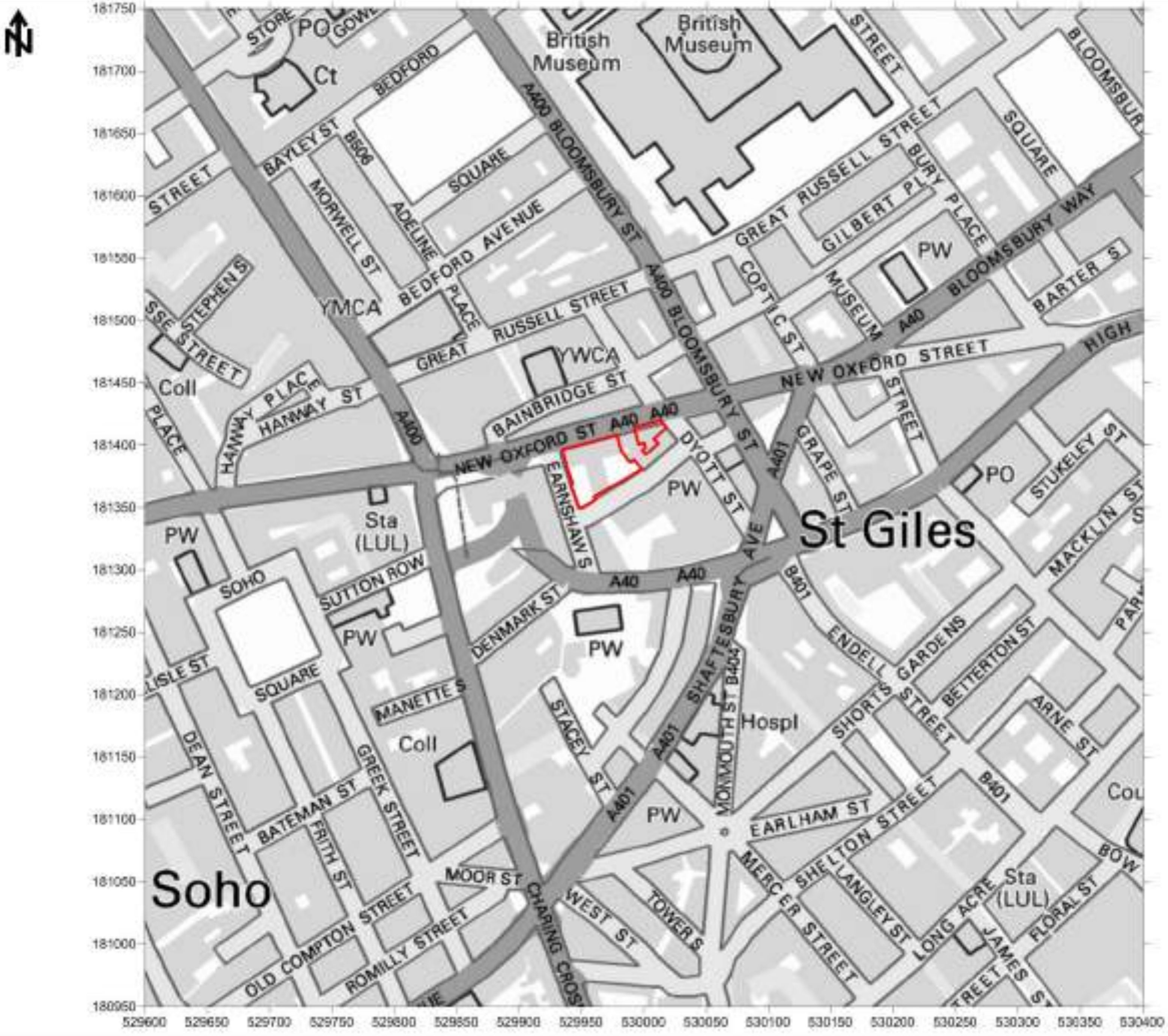
The GLA states that new developments must be considered Air Quality Neutral. Pollutant emissions associated with anticipated traffic flow and energy consumption within the development were compared to relevant benchmarks. This indicated that combined NO_x and PM_{10} emissions from the proposals were below the combined benchmarks and as such, no further action will be required and the development can be considered to be Air Quality Neutral.

Based on the assessment results, the site is considered suitable for the proposed end use subject to the inclusion of relevant mitigation measures and complies with the London Plan and relevant legislation.

8. ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAEI	London Atmospheric Emissions Inventory
LBoC	London Borough of Camden
LLAQM	London Local Air Quality Management
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
REC	Resource and Environmental Consultants
TEMPRO	Trip End Model Presentation Program
z_0	Roughness Length

APPENDIX I FIGURES



Legend

Site Boundary

Title

Figure 1

Site Location

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

Client

Royal London Mutual Insurance Society

REC

Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE

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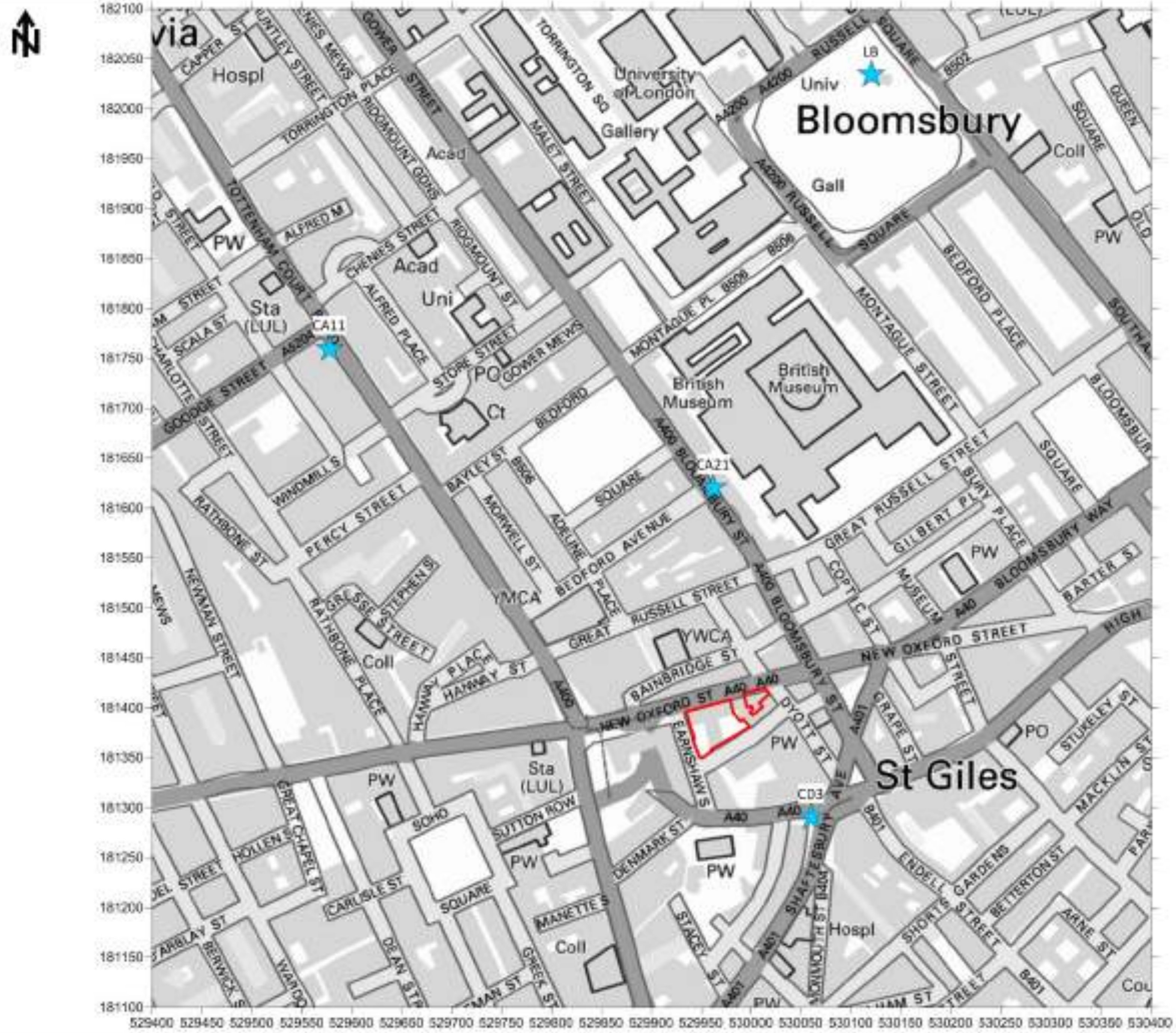

Legend

Site Boundary

Monitoring Locations

Title

Figure 2

Monitoring Locations

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

Client

Royal London Mutual Insurance Society

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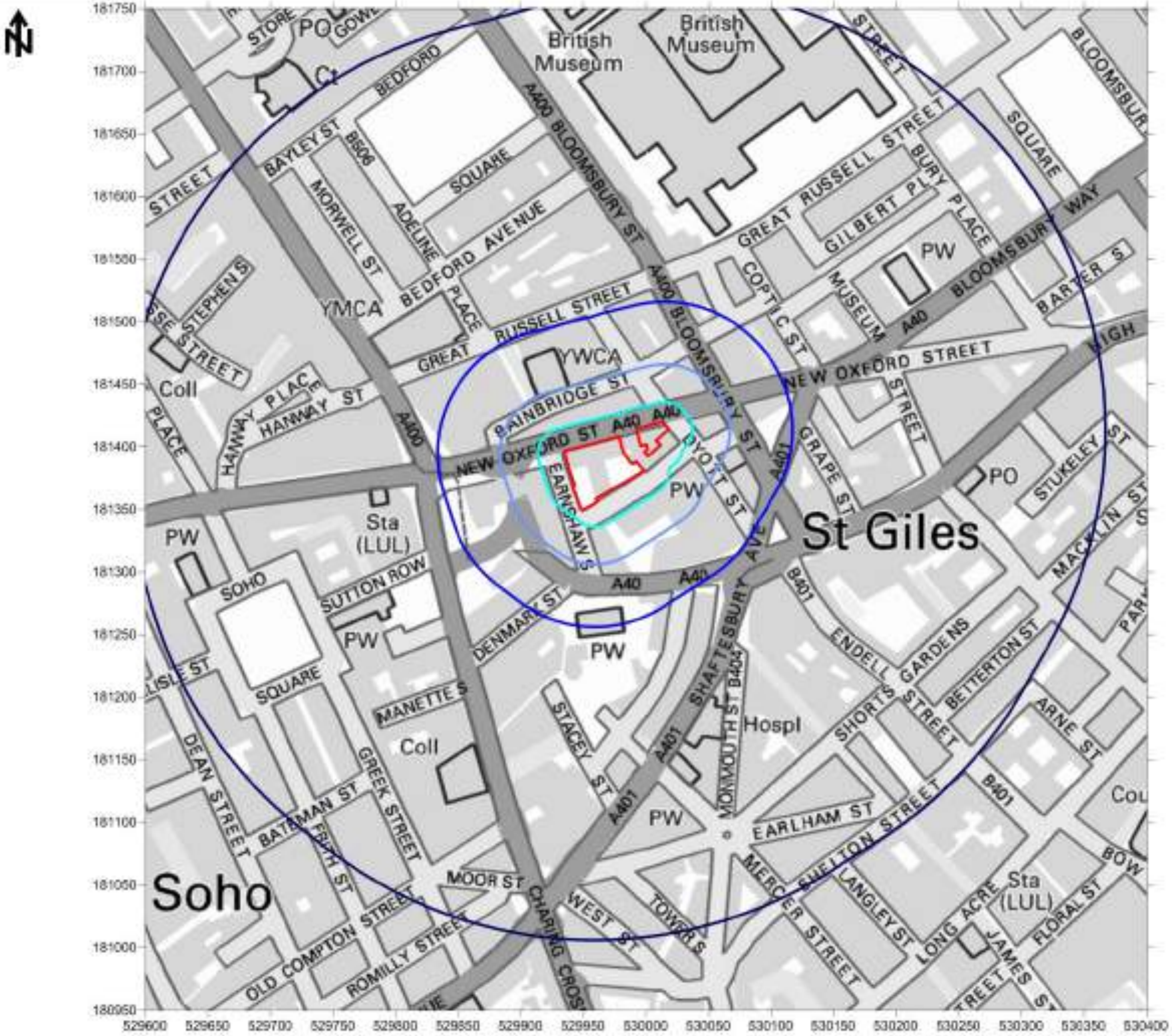

Legend

Site Boundary

20m from Site Boundary

50m from Site Boundary

100m from Site Boundary

350m from Site Boundary

Title

Figure 3

Construction Dust Buffer Zones

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

Client

Royal London Mutual Insurance Society

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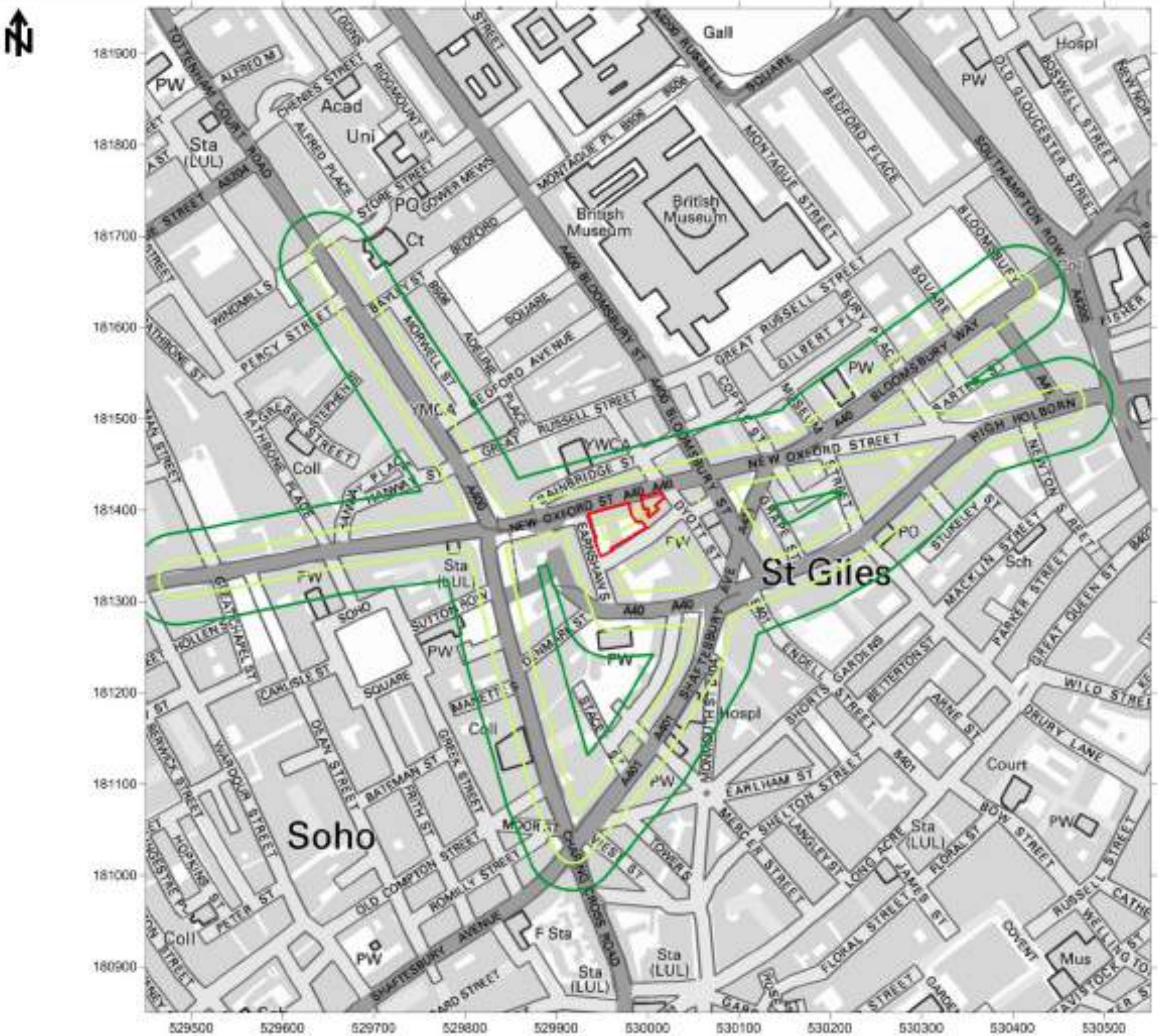

Title

Figure 4

Trackout Dust Buffer Zones

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

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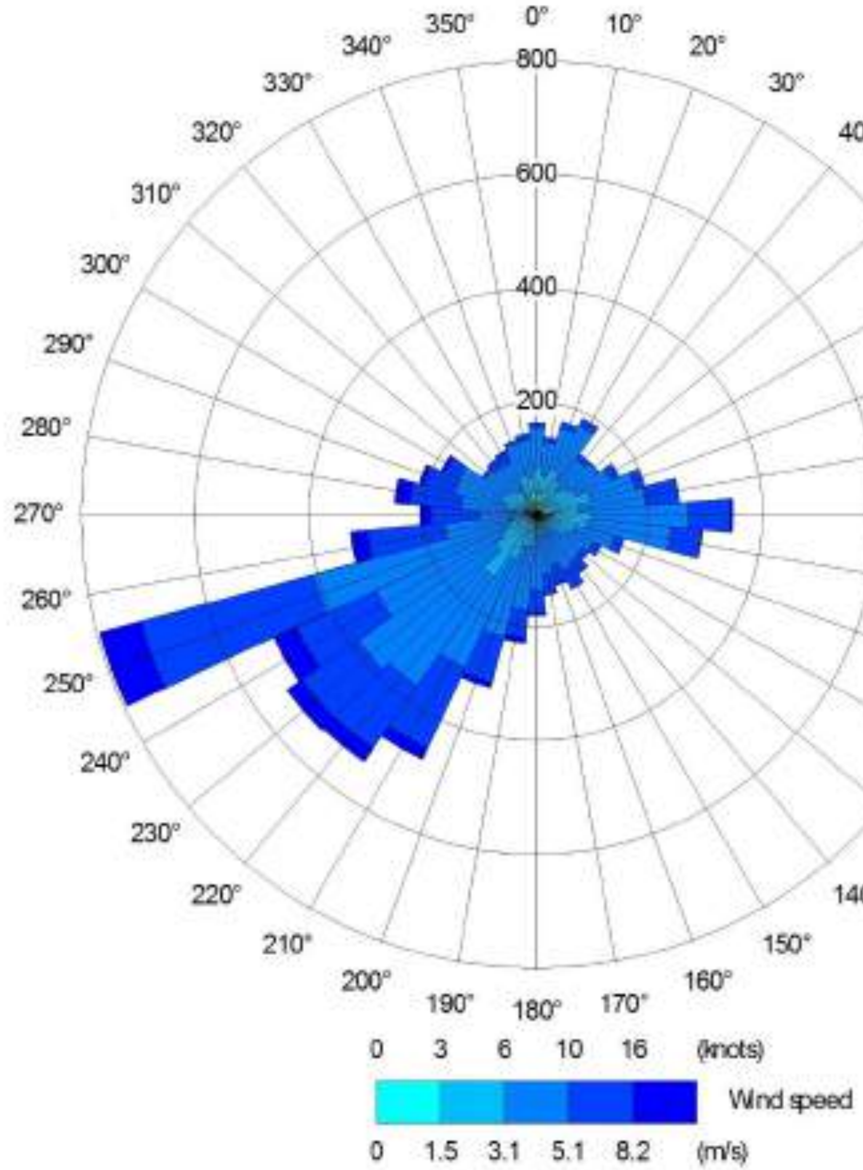

Legend

Title

Figure 5

Wind Rose for London City Meteorological Station

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

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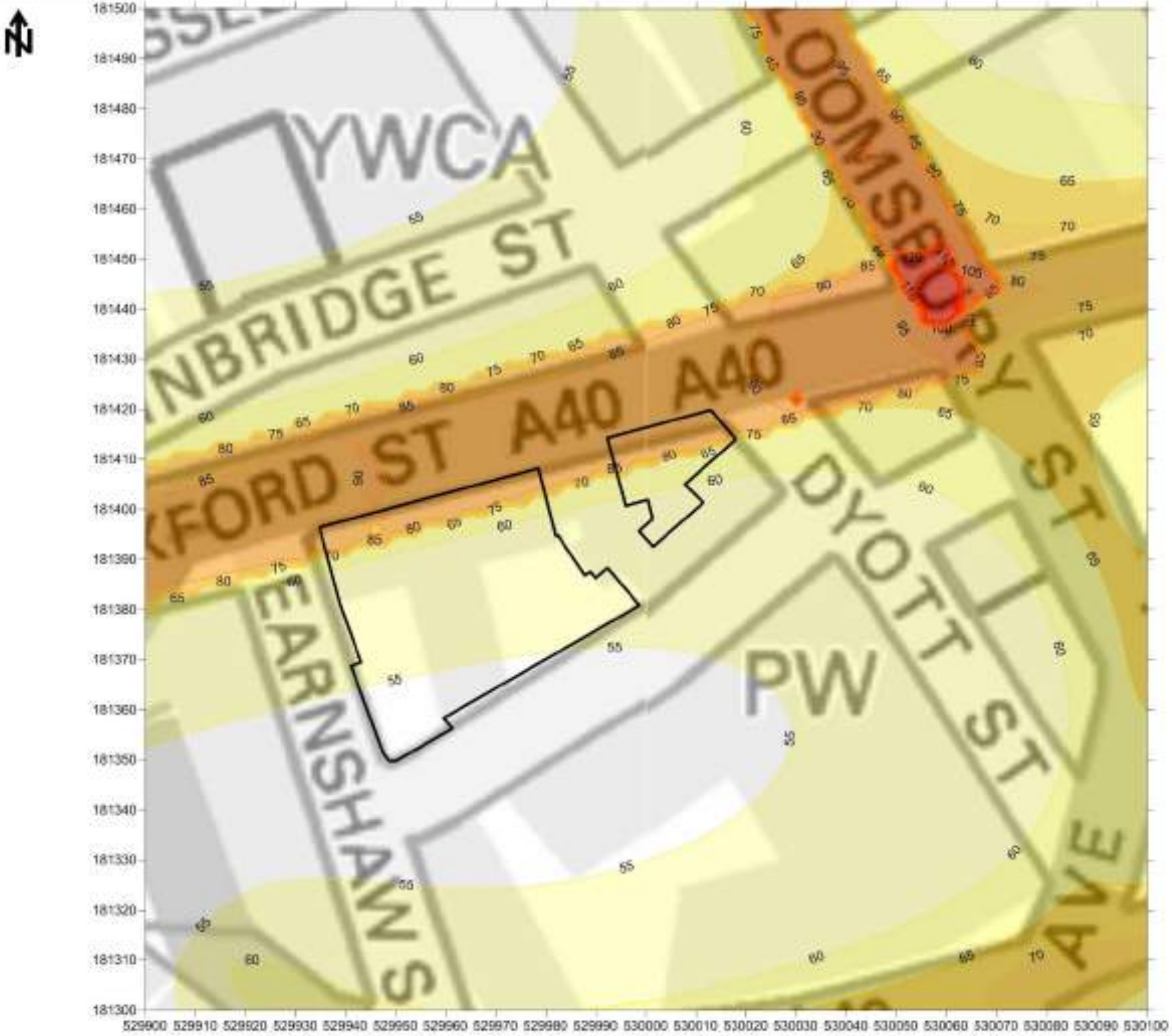

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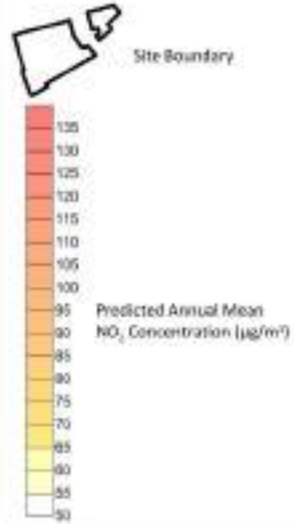

Title

Figure 6

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 4.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

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AQ101830

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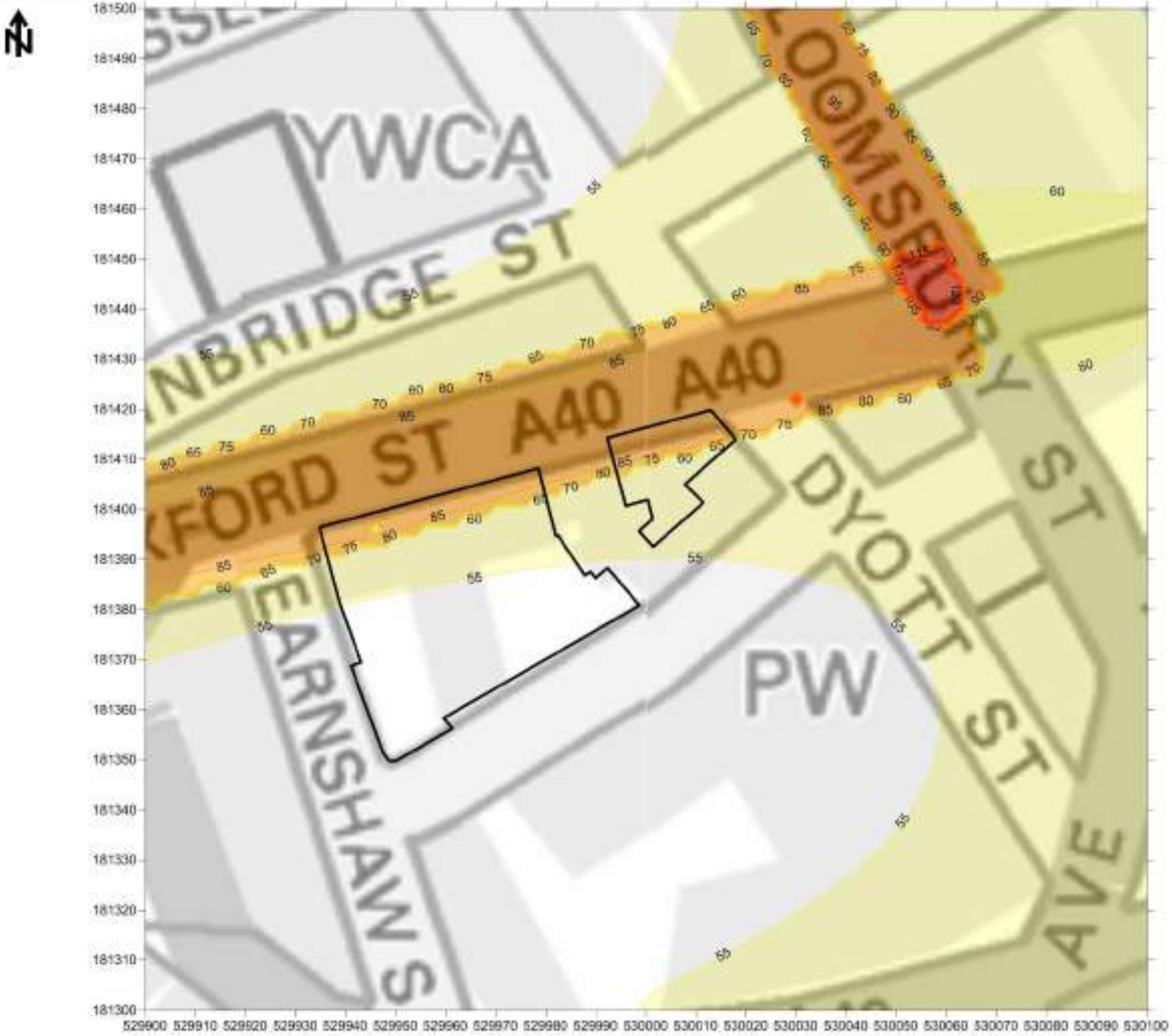

Legend

Site Boundary

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50

Predicted Annual Mean NO_2 Concentration (µg/m³)

Title

Figure 7

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 7.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

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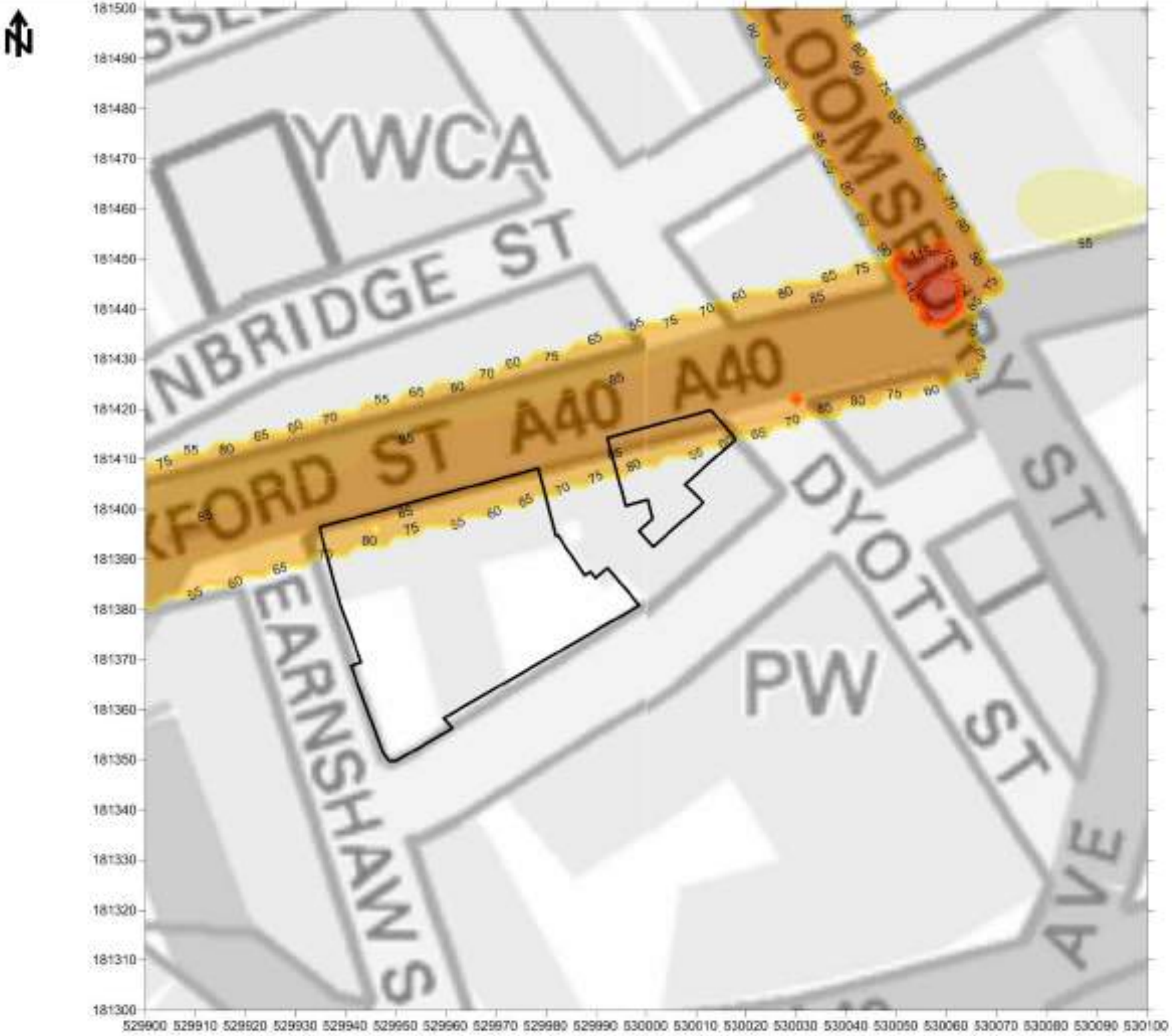

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50

Title

Figure 8

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 10.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

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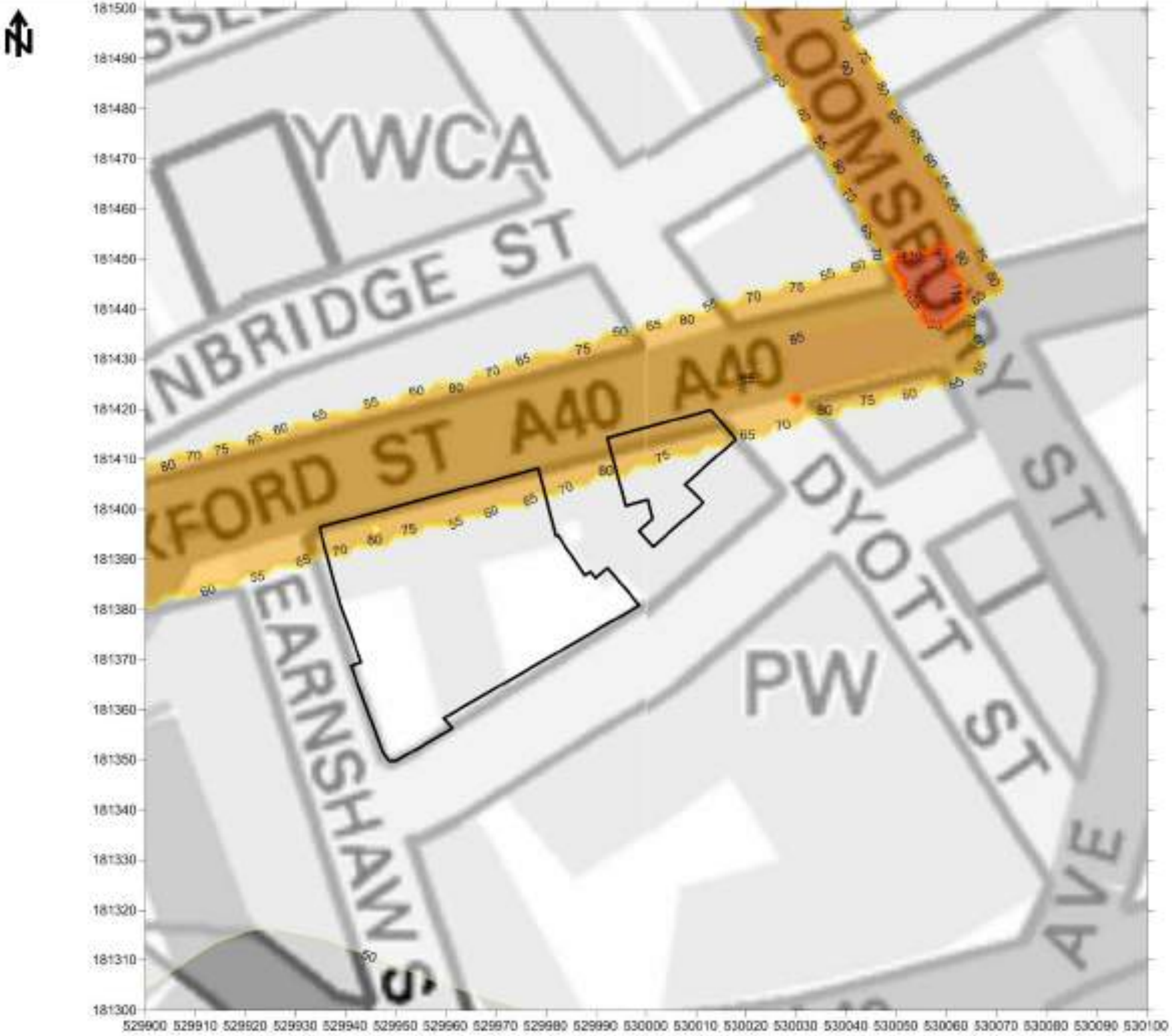

Legend

Site Boundary

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50

Predicted Annual Mean NO_2 Concentration (µg/m³)

Title

Figure 9

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 13.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

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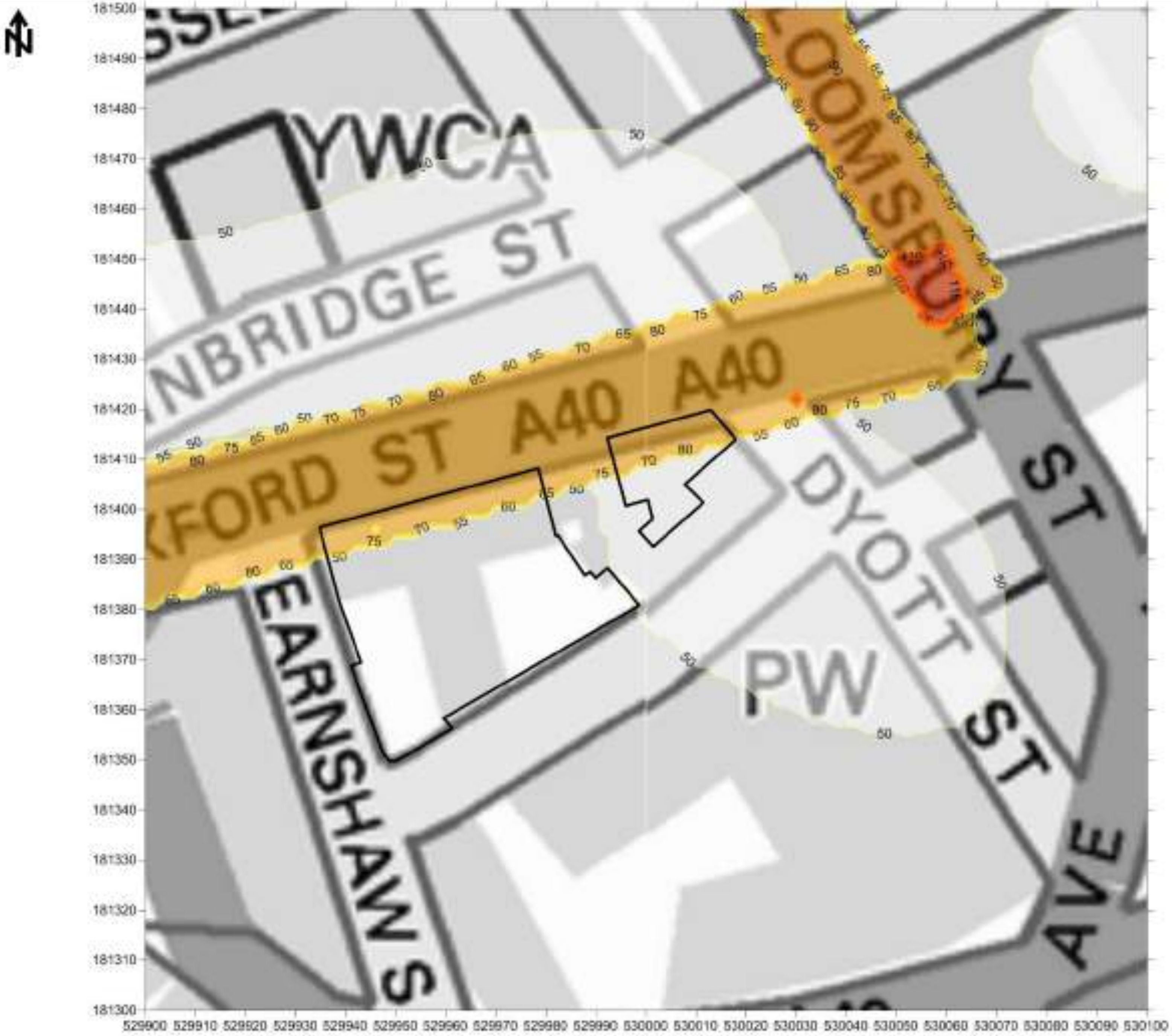

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Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50

Title

Figure 10
Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021
z = 16.5m

Project

Opportunites and Constraints
Air Quality Assessment

New Oxford Street, Camden

Project Number

AQ101830

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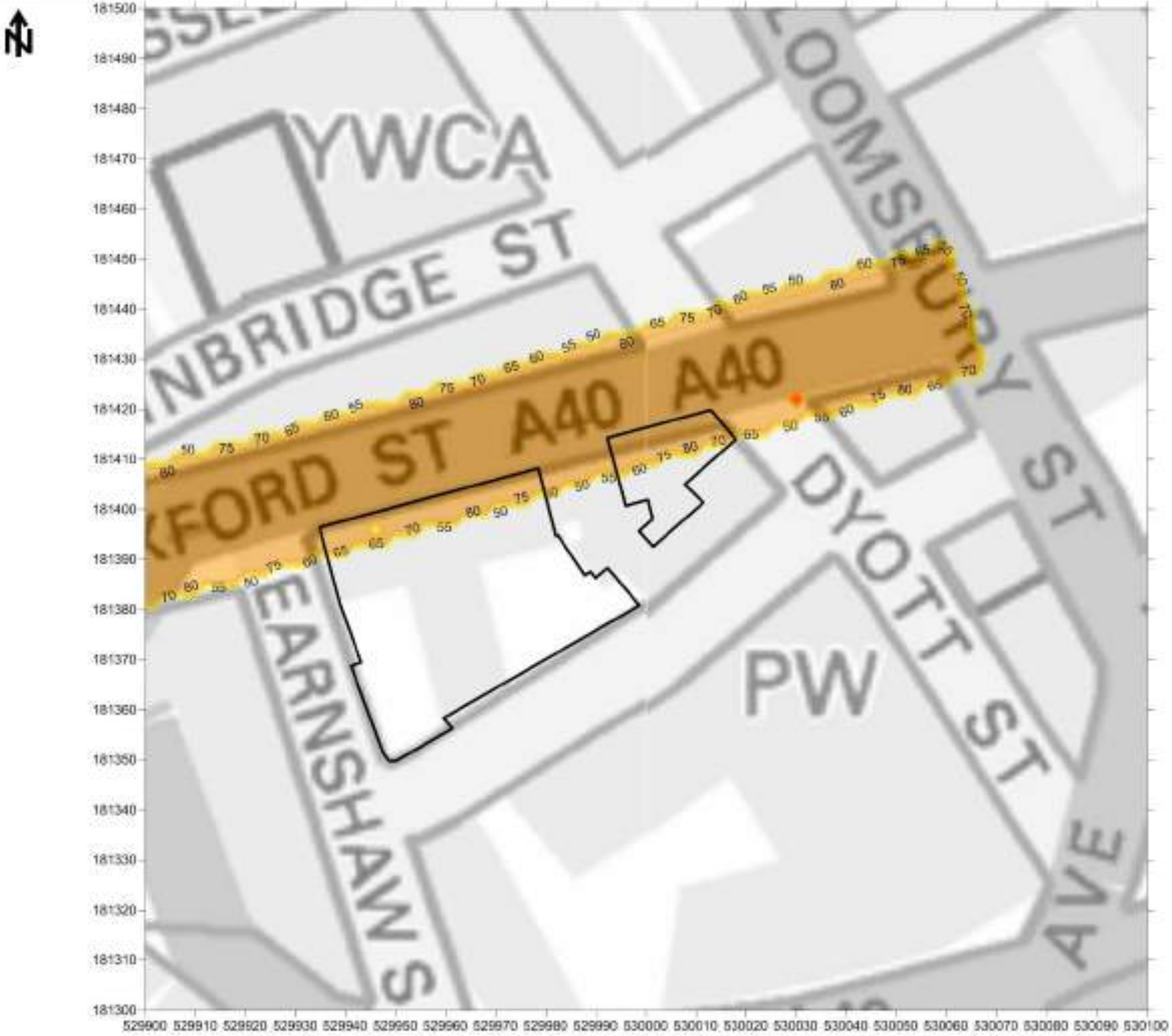

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Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45

Title

Figure 11

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 19.5m

Project

Air Quality Assessment

Castlewood House and Medius House New Oxford Street, Camden

Project Number

AQ101830

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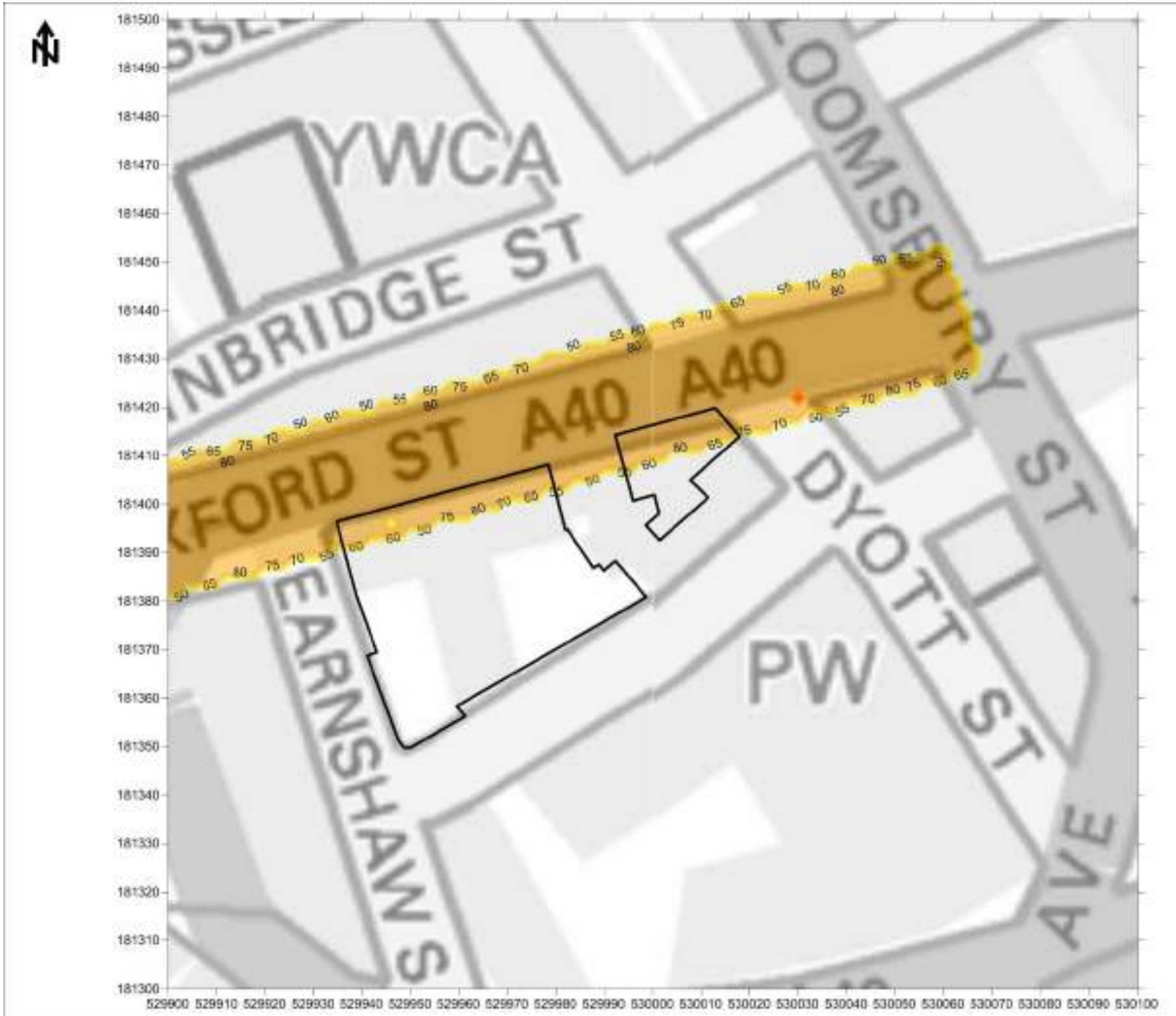

Legend

Site Boundary

135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45

Predicted Annual Mean NO_2 Concentration (µg/m³)

Title

Figure 12

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021

z = 22.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

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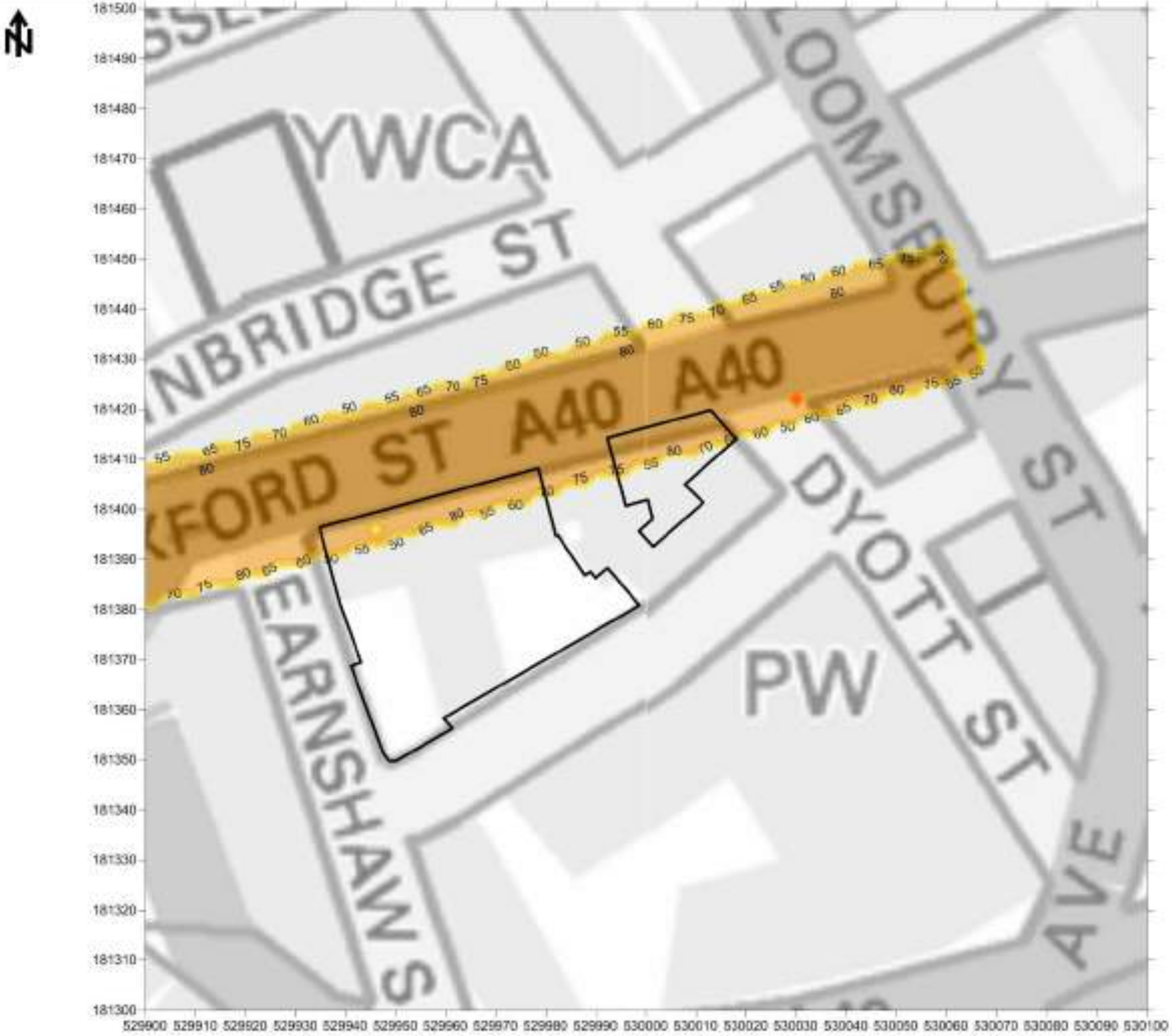

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m³)

135, 130, 125, 120, 115, 110, 105, 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45

Title

Figure 13
Predicted Annual Mean NO_2 Concentrations (µg/m³) 2021
z = 25.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

Client

Royal London Mutual Insurance Society

REC

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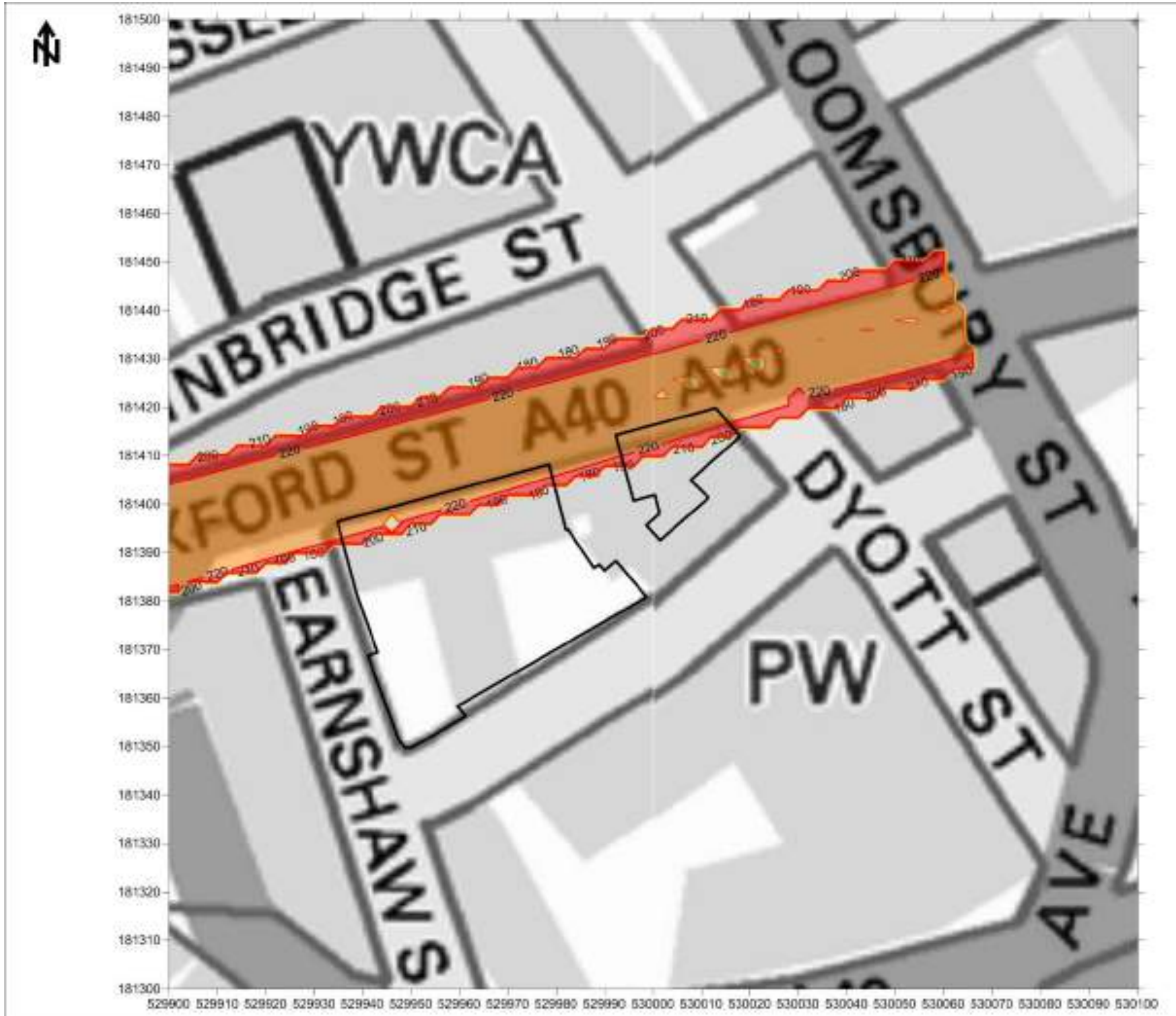

Legend

Site Boundary

Predicted 1-Hour Mean NO_2 Concentration (μg/m³)

220
210
200
190
180

Title

Figure 14

Predicted 1-Hour Mean NO_2 Concentrations (μg/m³) 2021

z = 25.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

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Title

Figure 15

Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2021

z = 4.5m

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

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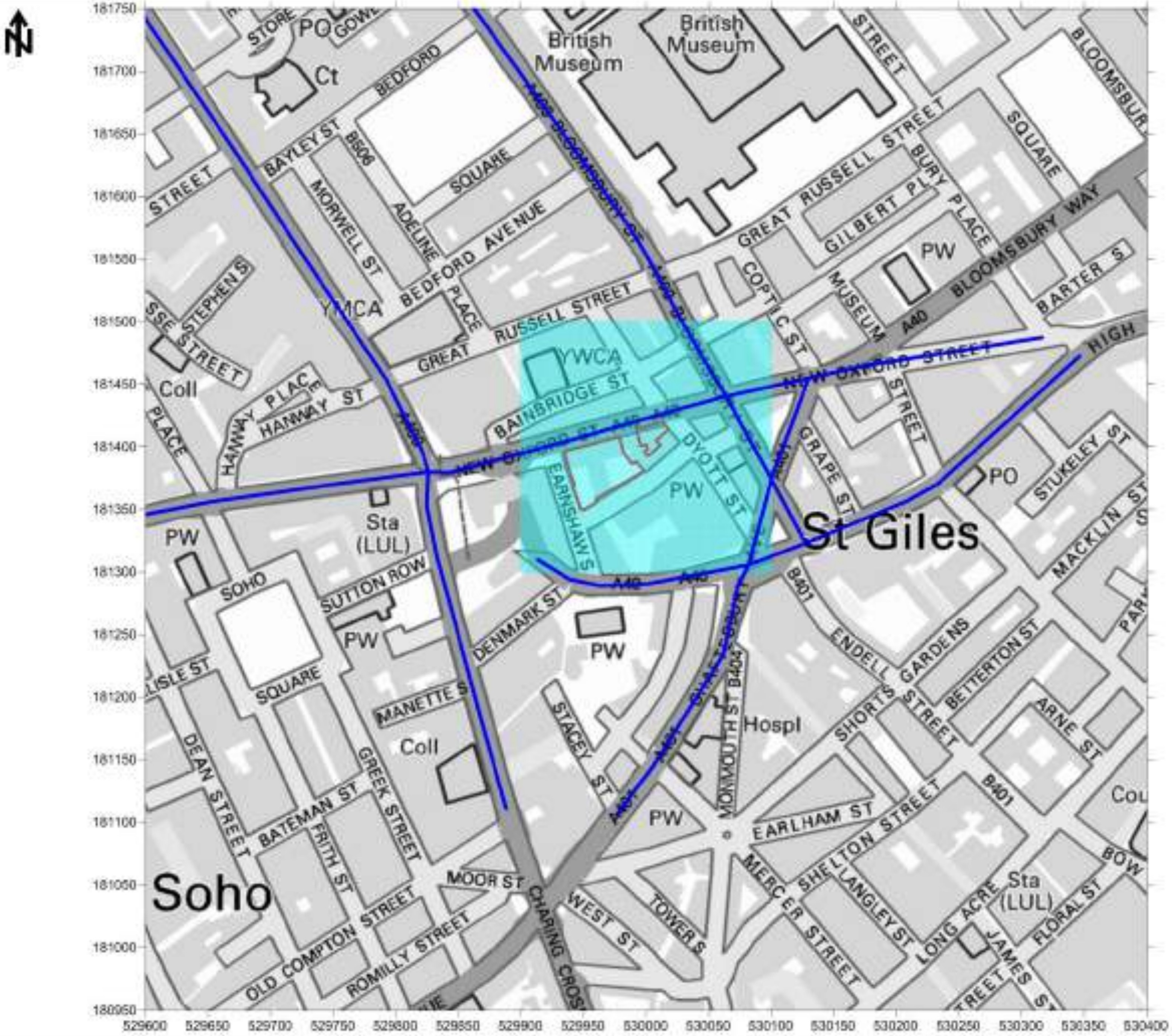

Legend

Site Boundary

Modelled Road Link

Cartesian Grid

Title

Figure 16

ADMS-Roads Input

Project

Air Quality Assessment

Castlewood House and Medius House
New Oxford Street, Camden

Project Number

AQ101830

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APPENDIX II ASSESSMENT INPUT DATA

ADMS-ROADS ASSESSMENT INPUTS

The proposals are located within an AQMA and therefore there is the potential to expose future users to elevated pollution levels. Dispersion modelling using ADMS-Roads was therefore undertaken to predict NO_2 and PM_{10} across the site in order to predict the exposure of future residents.

The dispersion model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 4.0.1.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 529900, 181300 to 530100, 181500 at a heights representative of residential containing floors. Results were subsequently used to produce contour plots within the Surfer software package.

Reference should be made to Figure 16 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition, was obtained from the London Atmospheric Emissions Inventory (LAEI).

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2014 traffic flow year to 2021, which was used to represent the development opening year.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessment is provided in Table AII.1.

Table AII.1 2014 Traffic Data

Road Link		Road Width (m)	Road Height (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
1	New Oxford Street (East of Site)	9.20	0.00	13,961	27.26	15
2	Bloomsbury Street Slow Down	16.80	19.50	13,024	17.02	15
3	Bloomsbury Street	8.50	0.00	12,867	16.01	32
4	New Oxford Street	26.40	33.00	12,217	31.57	25
5	Tottenham Court Road Slow Down 1	6.90	0.00	13,440	15.61	15
6	Tottenham Court Road	16.00	28.00	13,440	15.61	48
7	Tottenham Court Road Slow Down 2	11.80	0.00	13,440	15.61	15
8	Tottenham Court Road	12.50	0.00	13,440	15.61	48
9	Goodge Street Slow Down	6.40	0.00	5,975	4.67	15
10	Goodge Street	8.80	0.00	5,975	4.67	32
11	Charing Cross Road Slow Down	7.50	0.00	8,007	16.49	15
12	Charing Cross Road	19.80	27.00	8,007	3.48	32
13	Oxford Street	21.30	28.00	15,453	22.61	15
14	Shaftesbury Avenue Slow Down 1	9.20	0.00	6,797	3.68	15
15	Bloomsbury Street	8.30	0.00	13,749	13.66	25
16	Shaftesbury Avenue	8.50	0.00	6,797	3.68	15
17	High Holborn	18.30	33.00	19,070	11.80	25
18	High Holborn Slow Down	15.40	0.00	19,070	11.80	15
19	A40	9.00	0.00	8,546	22.82	15
20	Shaftesbury Avenue Slow Down 2	13.40	0.00	19,474	6.45	15
21	Shaftesbury Avenue	12.20	0.00	19,474	6.45	48
22	New Oxford Street	8.40	0.00	13,961	27.26	32

The road widths, mean vehicle speeds and road heights shown in Table AII.1 remained the same for the 2021 scenario. A summary of the 2021 traffic data is shown in Table AII.2.

Table AII.2 2021 Traffic Data

Road Link		24-hour AADT Flow	HDV Prop. (%)
1	New Oxford Street (East of Site)	15,212	27.26
2	Bloomsbury Street Slow Down	14,191	17.02
3	Bloomsbury Street	14,020	16.01
4	New Oxford Street	13,311	31.57
5	Tottenham Court Road Slow Down 1	14,644	15.61
6	Tottenham Court Road	14,644	15.61
7	Tottenham Court Road Slow Down 2	14,644	15.61
8	Tottenham Court Road	14,644	15.61
9	Goodge Street Slow Down	6,510	4.67
10	Goodge Street	6,510	4.67
11	Charing Cross Road Slow Down	8,724	16.49
12	Charing Cross Road	8,724	3.48
13	Oxford Street	16,837	22.61
14	Shaftesbury Avenue Slow Down 1	7,406	3.68
15	Bloomsbury Street	14,981	13.66
16	Shaftesbury Avenue	7,406	3.68
17	High Holborn	20,778	11.80
18	High Holborn Slow Down	20,778	11.80
19	A40	9,312	22.82
20	Shaftesbury Avenue Slow Down 2	21,218	6.45
21	Shaftesbury Avenue	21,218	6.45
22	New Oxford Street	15,212	27.26

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 7.0) released in 2016, which incorporates updated COPERT4v11 vehicle emissions factors for NO_x and vehicle fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards.

Therefore, 2014 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

Meteorological Data

Meteorological data used in this assessment was taken from London City Airport meteorological station over the period 1st January 2014 to 31st December 2014 (inclusive). London City Airport meteorological station is located at approximate NGR: 543000, 180510 which is approximately 13km east of the proposed development.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 1.5m was used in this dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'large urban areas'.

A z_0 of 0.3m was utilised to represent the morphology of the meteorological station location and is suggested as being suitable for 'agricultural areas (max)'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 100m was used in this dispersion modelling study. This value is considered appropriate for the nature of the meteorological station location and assessment area and is suggested within ADMS-Roads as being suitable for 'large conurbations > 1 million'.

Background Concentrations

An annual mean NO_2 concentration of 45µg/m^3 and PM_{10} concentration of 20µg/m^3, as predicted at the London Bloomsbury urban background monitoring station, was used in the dispersion modelling assessment to represent annual mean pollutant levels in the vicinity of the site.

Similarly to emission factors, background concentrations for 2014 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LLAQM.TG (16)[2].

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of this assessment model verification was undertaken for 2014, using traffic data, meteorological data and monitoring results from this year.

LBoC undertakes monitoring of NO_2 concentrations at three locations suitable for verification purposes within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within IAQM and EPUK guidance LLAQM.TG (16)[2]. The monitored annual mean NO_2 concentration and calculated road NO_x concentration are summarised in Table AII.3.

Table AII.3 2014 NO_2 Monitoring Results

Monitoring Location	Monitored NO_2 Concentration (μg/m^3)	Calculated Road NO_x Concentration (μg/m^3)
CA11	86.75	120.14
CA21	80.82	100.43
CD3	69.00	63.36

The dispersion model was run with the traffic input data previously detailed for 2014 to predict the NO_x concentration at the monitoring locations. The results are shown in Table AII.4.

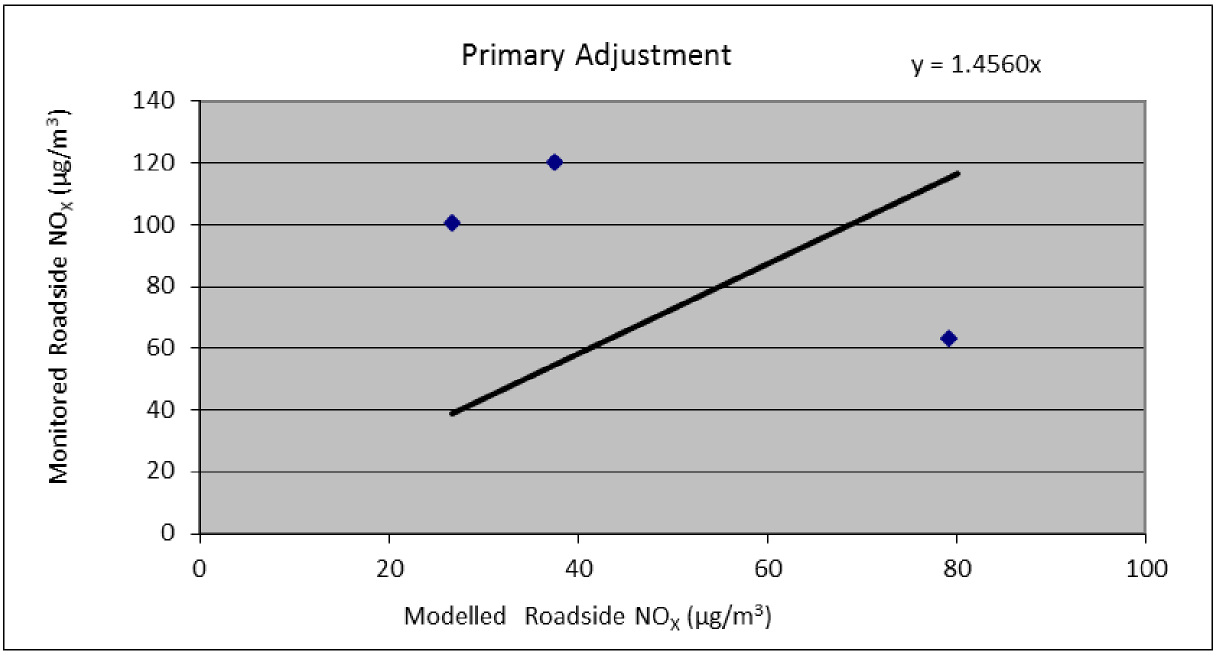
Table AII.4 NO_2 Verification Results

Monitoring Location	Modelled Road NO_x Concentration (μg/m^3)
CA11	37.48
CA21	26.73
CD3	79.12

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated. This indicated a verification factor of **1.4560** was required to be applied to all modelling results as shown in Graph 1. This was followed by a comparison of modelled and monitored NO2 concentrations which resulted in a secondary correction factor of **1.0412**.

PM_{10} monitoring is also undertaken within the assessment extents for which the verification process indicated a factor of **1.250** was to be applied to all modelling results.

Graph 1 Verification



APPENDIX III ASSESSOR'S CURRICULUM VITAE

CONAL KEARNEY

Head of Noise and Air

BEng(Hons), MSc, MIAQM, MIEnvSc

KEY EXPERIENCE:

Conal is Head of Noise and Air with specialist experience in the air quality and odour sector. His key capabilities include:

- Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS and AIRVIRO.
- Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) methodologies.
- Management and delivery of project work on key, land development and urban regeneration projects.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Dust and Odour impact assessments from minerals and waste sites
- Representing clients at public enquiries and planning hearings.

QUALIFICATIONS:

- Bachelor of Engineering
- Master of Science
- Member of Institute of Air Quality Management
- Member of the Institute of Environmental Science (IES)

SELECT PROJECTS SUMMARY:

Industrial Developments

Buck Park, Denholme - AQA and dust assessment for proposed mineral extraction and site restoration project.

Messingham Quarry, North Lincolnshire - AQA and dust impacts for proposed new sand extraction site.

Granta Park, Oxfordshire. Assessment of VOC fume emissions.

University of Birmingham. Permit application for CHP scheme.

Arbroath Road, Carnoustie. Odour and AQA for biogas CHP scheme Coopers Moss, St Helens AQA and dust assessment for materials import and site restoration.

Clayton Hall Landfill, Chorley - AQA and odour assessment for proposed landfill extension and mineral extraction.

Highways Developments

Alderley Edge Bypass, Cheshire - AQA for major new road scheme.

South Heywood – EIA for new link road and mixed use joint development

Residential Developments

Beck's Mill, Silsden – AQA and emissions calculation for proposed residential development

Bredbury Curve, Stockport - AQA assessment for proposed residential development in AQMA.

Hollin Lane, Middlewich – AQA for large scale residential development.

Friars School, Southwark, London. School development for mixed use education and residential building in AQMA.

Abbotsford House, Bearsden, Scotland – AQA and dust assessment for residential development

Kelvedon Street, Newport, South Wale – AQA for new housing development

Westcraig, Edinburgh - EIA for residential development

Public Sector

Technical advisor on Manchester Airport Consultative Committee - advise members on environmental technical matters in relation to the airport's operations.

Cheshire County Council - compile AQ chapters for Local Transport Plan

Cheshire East Council - specialist AQ advice on highways, minerals and waste projects

Local Air Quality Management

Broughton Gyratory, Chester - dispersion model for City Centre detailed assessment report

Congleton town centre - dispersion modelling assessment for detailed and further assessment reports.

Disley - dispersion modelling assessment for detailed and further assessments

Holmes Chapel - dispersion modelling assessment for detailed and further assessment reports for road and rail sources.

Crewe - town centre dispersion modelling for detailed and further assessment reports.

Commercial Developments

Granta Park Daycare Centre, Oxfordshire. AQA for new build daycare centre adjacent to major road.

Curzon Cinema, Colchester. Air quality assessment for town centre new build cinema.

Newfoundland Circus, Bristol - AQA for hotel development in city centre

Salesians School, Chertsey - AQA for school extension near M25

Cathedral Street and Thistle Street, Glasgow. University energy generation emission assessments.