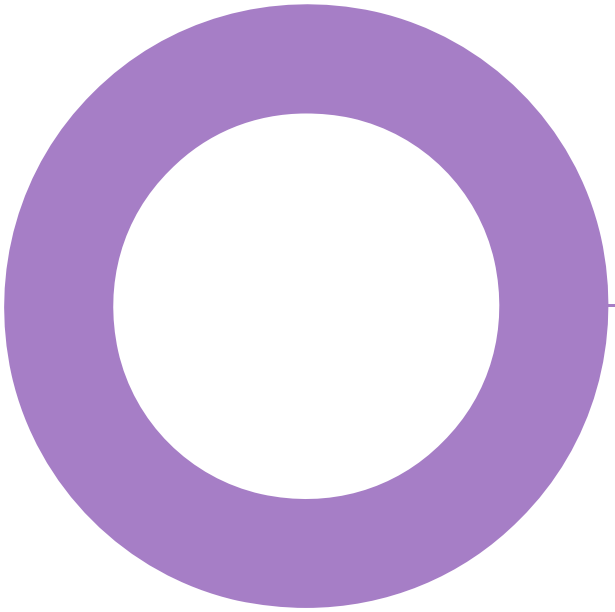
HOARE LEA

Equitable Buildings.
St Ann's Square, Manchester.
Henry Boot Developments.

AIR QUALITY
AIR QUALITY ASSESSMENT

REVISION 3 – 12 OCTOBER 2018



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
1	13/09/2017	First draft	GG	CR	CH/CR
2	13/12/2017	First Issue	GG	CR	CR
3	12/10/2018	Second issue- Comments from NJL Consulting	MJ	CR	CR

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Contents.

Audit sheet.	**2**
Executive summary	**5**
1. Introduction	**6**
1.1 Proposed Development	6
1.2 Scope of Assessment	8
2. Legislation, Policy and Guidance Documents	**9**
2.1 Air Quality Strategy and Local Air Quality Management	9
2.2 EU limit values	10
2.3 Greater Manchester's Air Quality Action Plan	10
2.1 Planning Policy	11
2.2 Manchester City Council Local Plan	12
2.3 Guidance Documents	13
3. Methodology of Assessment	**14**
3.1 Consultation	14
3.2 Existing Air Quality in the Study Area	14
3.3 Construction Phase Impacts	14
3.4 Operational Phase Impacts	15
3.5 Assessment of Significance	15
4. Baseline Air Quality	**16**
4.1 LAQM Review and Assessment	16
4.2 Local Air Quality Monitoring	16
4.3 Industrial Pollution	18
4.4 Background Concentrations	18
4.5 UK Ambient Air Quality Interactive Map (Defra)	19
4.6 Defra's Nitrogen Dioxide Fall Off With Distance	19
4.7 Summary of background data	20
5. Impact Assessment	**21**
5.1 Construction phase	21
5.2 Operational Phase	23
6. Mitigation	**24**
6.1 Construction Phase	24
6.2 Operational Phase	26

7. Residual Impacts **27**
7.1 Construction Phase 27
7.2 Operational Phase 27

8. Summary and Conclusions **28**

9. Glossary of terms **29**

10. References **30**

11. Annexes **31**
11.1 Annex 1 – Proposed Development Plans 31
11.2 Annex 2 – Professional Experience 32

Executive summary

This report describes the potential air quality impacts associated with the redevelopment of Equitable Buildings for residential use. It is located on St Ann's Square in the centre of Manchester.

The site is within an air quality management area (AQMA) declared for exceedances of the nitrogen dioxide (NO_2) objectives by Manchester City Council (MCC).

A risk assessment of the potential impacts of the construction of the development has been undertaken to identify appropriate mitigation measures. Provided these are implemented, for example through a planning condition, the residual impacts are considered to be not significant.

The potential impact of existing air quality on the exposure of future residents has been also been assessed and found to be not significant.

There is unlikely to be a material impact of the emissions from the traffic and boiler for the proposed development.

Overall the air quality effects on the Proposed Development are judged to be not significant.

1. Introduction

1.1 Proposed Development

Hoare Lea has been commissioned by Henry Boot Developments to undertake an assessment of the potential air quality impacts arising from the redevelopment of a building from office use to residential, hereafter referred to as the 'Proposed Development'.

The Proposed Development is located in the south west part of St Ann's Square, in the centre of Manchester (post code M2 7JB) as shown in Figure 1.

There are a number of commercial and residential units in St Ann's Square. The majority of the buildings in the vicinity of the development are four storeys high. Approximately 29 m to the west of the Proposed Development is Deansgate (A56) road. To the north is Manchester Cathedral, and approximately 90 m to the east is Cross Street with Piccadilly Gardens further to the east. To the south of the development are a number of office, retail and residential buildings.

The Proposed Development is for new retail units and 23 residential units, in place of the existing four-storey building consisting of smaller retail and office units. Retail uses are proposed to be retained at the ground floor level, with the residential use in the place of the current office use at floors 1 to 4. The Proposed Development plan and the existing site plans are provided in appendix 11.1

The development is within an Air Quality Management Area (AQMA) declared by Manchester City Council (MCC) with respect to exceedances of the annual mean NO_2 objective.



Figure 1 Approximate location of the Proposed Development within Manchester City Centre. Contains OS Data © Crown Copyright and Database rights 2018

This assessment describes the potential air quality impacts associated with the construction phase of the development, known as Equitable Buildings and exposure of future users of the Proposed Development to existing air quality.

A glossary of terms is provided in section 9.

1.2 Scope of Assessment

Graeme Souter, Principal Environmental Health Officer at MCC was consulted via telephone and email on the 01 September 2017. As part of this consultation the following approach to the assessment was agreed via email on the 6th September 2017 –

- The assessment will consider qualitatively the impact of existing traffic emissions on the exposure of future residents of the Proposed Development.
- It is anticipated that the traffic associated with the Proposed Development will be less than the current use[1] and less than 100 annual average daily traffic (AADT), the threshold in Table 6.2 of the Environmental Protection United Kingdom (EPUK) & Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning & Development Control: Planning for Air Quality'. Therefore, the traffic associated with the development will not be assessed.
- The boiler to be installed in the building has not been finalised, however, for the purposes of this assessment the project engineers at Hulley & Kirkland have advised that the gas fired boiler will be similar to the Hamworthy Wessex Modumax 147/441 with the flue extract located above roof level. The maximum NOx emission rate for this type of plant is approximately 5.12mg/s. Given the dispersion that occurs with a release above roof level and that the NOx emission is similar to the indicative criteria in Table 6.2 of the EPUK and IAQM guidance (5 mg/s,) it is unlikely that the boiler emissions will to give rise to a material impact.
- A construction air quality impact assessment in line with the Institute of Air Quality Management (IAQM) document 'Guidance on the assessment of dust from demolition and construction' will be undertaken.

2. Legislation, Policy and Guidance Documents

2.1 Air Quality Strategy and Local Air Quality Management

The Environment Act 1995 (Part IV) requires the Secretary of State to publish an air quality strategy and local authorities to review and assess the quality of air within their boundaries. The latter has become known as Local Air Quality Management (LAQM).

The Air Quality Strategy[2] provides the policy framework for air quality management in the UK. It sets out air quality standards and objectives for key air pollutants. These standards and objectives are designed to protect human health and the environment. The Strategy also sets out how the different sectors of industry, transport and local government, can contribute to achieving these air quality objectives.

Local authorities are seen to play a particularly important role in the air quality management process and the technical guidance document, LAQM.TG16[3], produced by Defra, provides advice that local authorities should follow.

Local authorities are required to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If the objectives are not achieved, the authority must declare an AQMA and should prepare an action plan within 12 months. An action plan must identify appropriate measures and policies that can be introduced in order that the objective(s) will be achieved.

The air quality objectives set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations 2000[4], and the Air Quality (England) (Amendment) Regulations 2002[5].

The objectives for NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) are set out in Table 1. The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. It should be noted that local authorities in England have a flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$.

Table 1: Air Quality Criteria for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	1-hour Mean	200 µg/m^3 Not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
Fine Particles (PM_{10})	24-hour Mean	50 µg/m^3 Not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m^3
Fine Particles ($PM_{2.5}$)*	Annual Mean	25 µg/m^3

* The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to assess it, although they are encouraged to do so.

The objectives apply at locations where members of the public are likely to be regularly present and exposed over the averaging period of the objective. Examples of where the annual mean objectives should apply are provided in LAQM.TG16, and include: building facades of residential properties, schools, hospitals. The annual mean objectives are not relevant for the building facades of offices or other places of work where members of the public do not have regular access, kerbsides or gardens.

The 24-hour objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels.

The 1-hour objective for NO_2 also applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations, pavements of busy shopping streets, car parks and bus stations which are not fully enclosed. The 1-hour objective does not apply at kerbside sites where the public do not have regular access.

2.2 EU limit values

The European Union has also set limit values for NO_2, PM_{10} and $PM_{2.5}$; these are legally binding and have been implemented into English legislation (The Air Quality Standards Regulations 2010)[6]. Achievement of these values is a national obligation rather than a local requirement.

The limit values for NO_2, PM_{10} and $PM_{2.5}$ are the same as the English objectives (Table 1), but applied from 2010 for NO_2, 2005 for PM_{10} and 2015 for $PM_{2.5}$. The limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway).

The EU directive (Directive 2008/50/EC) has added additional $PM_{2.5}$ exposure reduction targets, see Table 2. These objectives are set at the national level and are based on the average exposure indicator (AEI). AEI is determined as a 3-year running annual mean $PM_{2.5}$ concentration averaged over the selected monitoring stations in agglomerations and larger urban areas. The AEI is concerned with urban background locations so that the $PM_{2.5}$ exposure to the general population can be assessed.

Table 2 $PM_{2.5}$ objectives introduced in EU Directive 2008/50/EC

Title	Metric	Averaging period	Legal nature
$PM_{2.5}$ exposure concentration obligation	20 $\mu g/m^3$ (AEI)	Based on 3-year average	Legally binding in 2015 (years 2013, 2014, 2015)
$PM_{2.5}$ exposure reduction target	Percentage reduction*	Based on 3-year average	Reduction to be attained where possible in 2020, determined on the basis of the value of exposure indicator in 2010

* The percentage reduction in AEI is dependent on the AEI in 2010. It was 13 $\mu g/m^3$ and therefore the UK exposure reduction target is 15% to be achieved by 2020.

2.3 Greater Manchester's Air Quality Action Plan

The latest Air Quality Action Plan[7] (AQAP) produced by the Greater Manchester Combined Authority sets out three key objectives relating to air quality to be achieved across the city:

- Air quality across Greater Manchester will improve.
- Low-emission behaviours will have become embedded into the culture of our organisations and lifestyles by 2025.
- We will support the UK Government in meeting and maintaining all EU thresholds for key air pollutants at the earliest date to reduce ill-health in Greater Manchester.

The overall strategy for achieving the targets set out across Greater Manchester defined in the Action Plan focus on:

- Increasing travel by sustainable modes.
- Reducing acute pollution incidents from traffic.
- Improving vehicle efficiency, including vehicle and fuel technology and efficient driving techniques.
- Encouraging smarter travel through improved fares, ticketing and information, management of demand for car travel and promotional campaigns.
- Better integration of transport and new development.
- Reducing trips by motor vehicles by improvements to public transport and to infrastructure for walking and cycling.

Improving network efficiency.

2.1 Planning Policy

2.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) 2018[8] sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Paragraph 170: "Planning policies and decisions should contribute to and enhance the natural and local environment by: preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality"

Paragraph 120: "To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."

Paragraph 181: "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

Paragraph 54: "Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."

The NPPF is supported by Planning Practice Guidance (PPG)[9].

The PPG states that:

Paragraph 001 (Reference ID: 32-001-20140306): "Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the

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

Paragraph 005 (Reference ID: 32-005-20140306): "Whether or not air quality is relevant to a planning decision will depend on the Proposed Development and its location. Concerns could arise if the development is likely to generate an air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."

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

Paragraph 007 (Reference ID: 32-007-20140306): "Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."

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

Paragraph 008 (Reference ID: 32-008-20140306): "Mitigation options where necessary will be locationally specific, will depend on the Proposed Development and should be proportionate to the likely impact."

2.2 Manchester City Council Local Plan

The Manchester Core Strategy Development Plan[10] states in policy EN 16 relating to air quality that:

"*The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.*

*When assessing the appropriateness of locations for new developments the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Area*s"

2.3 Guidance Documents

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) produced guidance on the assessment of dust from demolition and construction[11]. This document provides a risk-based methodology for assessing construction impacts, including demolition and earthworks where appropriate.

2.3.2 Guidance on the Assessment of Operational Impact of New Developments

Guidance produced by Environmental Protection UK (EPUK), and IAQM in January 2017 entitled 'Land-Use Planning & Development Control: Planning for Air Quality'[12] aims to ensure that air quality is properly accounted for in the development control process. The main foci of the guidance are the assessment of the impact of traffic emissions and advice on how to describe air quality impacts and their significance.

3. Methodology of Assessment

3.1 Consultation

The Principal Environmental Health Officer, at the MCC was contacted by telephone and email to discuss the proposed methodology and criteria for the assessment. The proposed scope and methodology was provided in an email from Chris Rush of Hoare Lea to Graeme Souter of MCC on the 1st September 2017, and subsequently agreed on the 6th September 2017.

3.2 Existing Air Quality in the Study Area

A baseline air quality review was undertaken to determine the existing air quality in the vicinity of the site.

This desk-top study was undertaken using the following sources:

- Air quality data for Manchester, including a review of the MCC air quality reports and local monitoring data;
- The UK Pollutant Release and Transfer Register[13];
- Background pollution maps from Defra's Local Air Quality Management (LAQM) website[14];
- The UK Ambient Air Quality Interactive Map[15];
- Defra's Nitrogen Dioxide Fall Off With Distance calculator[16]
- Aerial photography from Google Maps.

3.3 Construction Phase Impacts

Fugitive dust emissions during the construction may give rise to increased PM_{10} concentrations and dust deposition, albeit this is a temporary impact. These impacts have been assessed using the IAQM methodology to identify appropriate mitigation measures commensurate with the risk.

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 risk of dust emissions was assessed for each activity with respect to:

- Potential loss of amenity due to dust soiling;
- The risk of health effects due to a significant increase in exposure to PM_{10}

It was assumed that there are no relevant ecological receptors close to the site.

First the potential dust emission magnitude was defined based on the scale of the anticipated works and is classified as Small, Medium or Large. Then the sensitivity of the area was defined based on the receptor sensitivity, number of receptors, and the distance from the source.

Receptors were identified within distance bands from the site boundary using aerial imagery and maps of the surrounding area. The receptors identified are detailed within Figure 3 of this report. The PM_{10} background concentration was also taken into account. The area was then defined as High, Medium or Low sensitivity.

The potential dust emission magnitude and the sensitivity of the area were combined to define the risk of impacts.

3.4 Operational Phase Impacts

A qualitative review of the air quality in the vicinity of the development has been undertaken to inform the assessment of exposure of the users of the Proposed Development.

3.5 Assessment of Significance

3.5.1 Construction Dust

The IAQM guidance on the assessment of dust from demolition and construction states that the primary aim of the risk assessment is to identify site specific mitigation that, once implemented, should ensure that there will be no significant effect. Therefore, the assessment has been used to determine an appropriate level of mitigation for the construction phase.

3.5.2 Operational Impacts

There is no guidance in the UK on how to assess the significance of the effects of air quality on new developments.

For the proposed receptors the predicted concentrations have been assessed against the NO_2 objectives shown in Table 1. Where an exceedance of an objective is predicted, mitigation measures are recommended to reduce exposure to below the objective value.

The determination of the significance of the effects includes elements of professional judgement and the professional experience of the consultant preparing the report is set out in

4. Baseline Air Quality

This section sets out the available information on air quality for the study area.

4.1 LAQM Review and Assessment

MCC has declared parts of the city centre as an AQMA with respect to exceedances of the annual mean NO_2 objective The Equitable Buildings development is within Manchester's AQMA, see Figure 1.

4.2 Local Air Quality Monitoring

MCC operates two air quality monitoring sites, with real time analysers at Piccadilly Gardens (x 384310 y 398337) an urban background site, approximately 540 m west of the site and Oxford Road (x 384233 y 397287) a kerbside site, approximately 1,200 m south of the site.

In addition, there is a network of NO_2 passive samplers (diffusion tubes). MCC complies with all the air quality objectives, other than those for NO_2. Currently there is no evidence that there are exceedances of the PM_{10} objectives at locations with relevant exposure.

Table 3 presents the NO_2 and PM_{10} monitoring data for these two sites for the past five years.

Table 3 Automatic monitor data for Piccadilly Gardens and Oxford Road site. Concentration in µg/m^3, 1-hour and 24-hour measurements show number of exceedances of the concentration i.e. 200 µg/m^3 for NO_2 and 50 µg/m^3 for PM_{10}.

Monitoring site	Objective	2012	2013	2014	2015	2016
NO_2						
Piccadilly Gardens	Annual mean (µg/m^3)	41	39	40	39	42
	Number of hours with concentrations >200 µg/m^3	101	97	-	-	153
Oxford Road	Annual mean (µg/m^3)	62	55	68	66	66
	Number of hours with concentrations >200 µg/m^3	13	-	14	60	90
PM_{10}						
Piccadilly Gardens	Annual mean (µg/m^3)	21	22	20	20	20
	Number of Daily Means >50 µg/m^3	-	-	-	-	3
Oxford Road	Annual mean (µg/m^3)	30	31	28	28	27
	Number of Daily Means >50 µg/m^3	28	21	18	25	16
$PM_{2.5}$						
Piccadilly Gardens	Annual Mean (µg/m^3)	14	13	12	10	-

The Piccadilly Gardens monitor is in an urban background location and the concentrations measured here are likely to be a good representation of the conditions for the Proposed Development in St Ann's Square. The NO_2 annual objective is has been in the range 39-42 µg/m^3 i.e. close to the objective for all years. The short term objective has been met in all the previous five years.

NO_2 concentrations are significantly higher at the Oxford Road monitoring station which is located on the roadside and the concentrations measured here are unlikely to be representative of the Proposed Development.

The PM_{10} annual mean concentrations have remained fairly consistent across the past five years for which ratified data is available at the Piccadilly Gardens site, and there have been no exceedances of the objectives at both monitoring sites. The short term objective for PM_{10}, has not been exceeded for the previous five years.

Annual mean $PM_{2.5}$ concentrations have appeared to decline over the same period and the objective is achieved albeit only having four years of data which is insufficient to determine a trend.

In addition to automatic monitoring stations, MCC currently have 236 diffusion tube monitoring sites that measure NO_2 concentrations across the Greater Manchester. The annual mean concentrations for those located within 1 km of the Proposed Development (see Figure 2) are shown in Table 4.

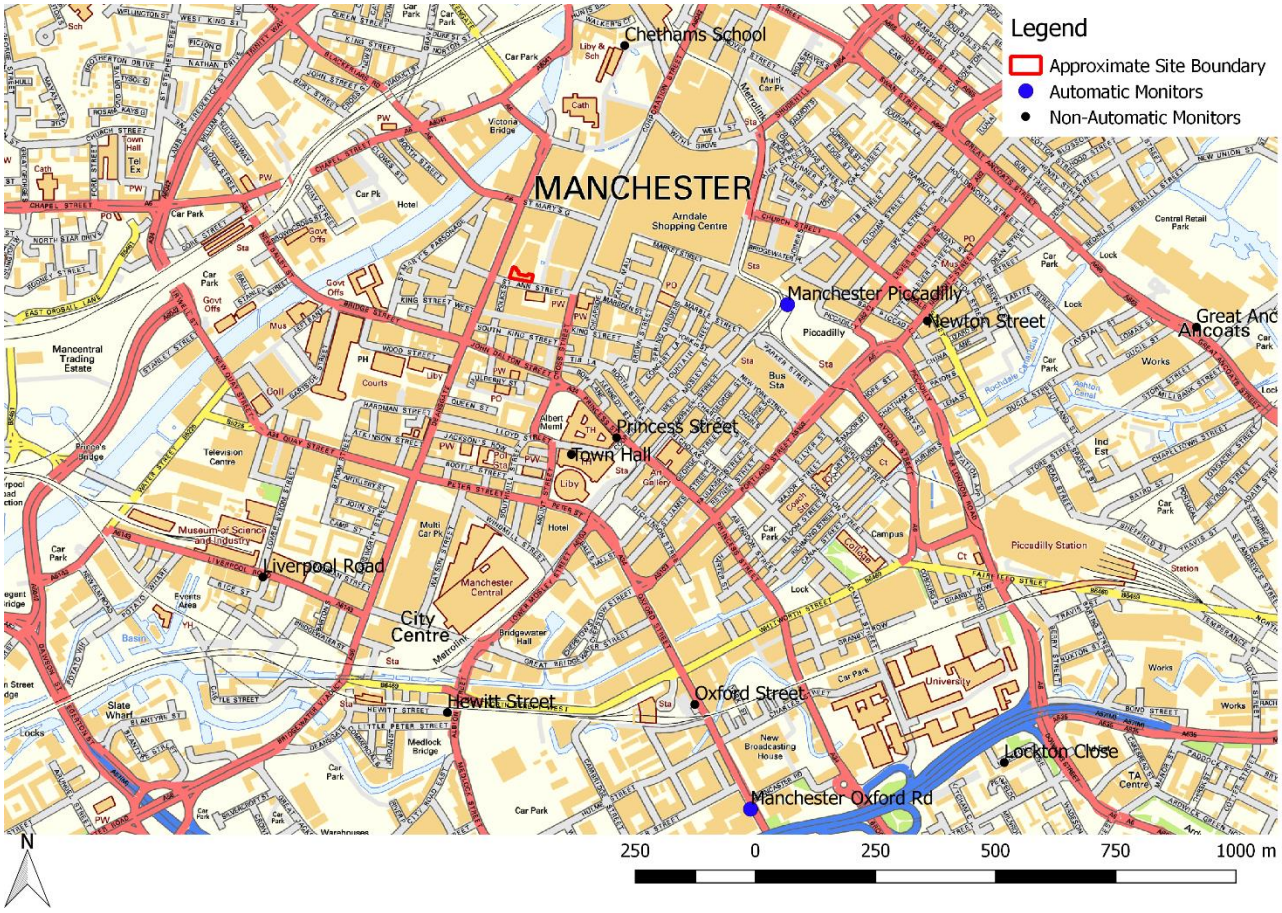


Figure 2 Local Authority automatic and non-automatic monitoring locations in vicinity of the development site. Contains OS Data © Crown Copyright and Database rights 2018

Table 4 Diffusion tube data (annual mean NO_2 concentrations µg/m^3) for the diffusion tubes located within approximately 1km from the development site

Site	Site Type	Distance (m) from site (approx.)	2013	2014	2015	2016	2017
Town Hall	Urban Background	380	32	33	31	-	-
Princess Street	Kerbside	380	47	50	55	45	45
Chethams School	Urban Centre	520	34	35	33	37	36
Liverpool Road	Urban Centre	830	41	40	41	-	-
Newton Street	Kerbside	830	53	56	56	52	52
Hewitt Street	Urban Centre	920	40	39	38	44	40
Oxford Street	Kerbside	960	52	53	57	70	60

The annual mean NO_2 objective has been exceeded at all kerbside sites and two out of the three urban centre sites over the past five years. This objective is achieved at the urban background site at the Town Hall, and the urban centre site at Chethams School which are likely to be more representative of the conditions at the proposed development than the other diffusion tube sites.

An annual mean concentration of 60µg/m^3 or above is often used to indicate a possible exceedance of the hourly mean NO_2 objective. It is considered unlikely that the one-hour objective will be exceeded at the development site based on the monitoring data provided.

4.3 Industrial Pollution

A desk based review of potential industrial sources using the UK Pollutant Release and Transfer Register, and the Environment Agency's 'what's in your backyard' websites[17] did not identify any significant industrial or waste management sources of air pollution that are likely to affect the Proposed Development with regard to air quality.

4.4 Background Concentrations

The baseline projections for concentrations of NO_2 and oxides of nitrogen (NOx) across the UK in the years 2017 - 2030 inclusive, have been calculated as part of a Pollution Climate Mapping (PCM) model assessment for the development of the 2017 Air Quality Plan[18] and shown in Table 5.

The background concentrations for PM_{10} and $PM_{2.5}$ have been obtained from the national maps published by Defra[14]. These estimated concentrations are produced on a 1km by 1km grid square basis for the whole of the UK. The baseline projections for all pollutants represent the projected concentrations assuming no further action beyond the air quality measures that were committed by the reference year (2015). The development site falls into grid square x 383500 y 398500 and the predicted concentrations for this grid square for PM_{10} and PM_{25} are provided in Table 5.

These maps are a modelled average of all pollution sources in the grid area and so the difference between the concentrations in Table 5 and those recorded at the diffusion tube locations in Table 4 is a consequence of the difference between the 1km by 1km area average and the localised measurements at a single location.

Table 5 Estimated annual mean background concentrations in 2015, 2017 and 2018 in μg/m^3

Year	NO_2*	PM_{10}	$PM_{2.5}$
2015	38.0	17.1	12.3
2017	36	16.6	11.8
2018	34	16.4	11.7

*Data Collected from Census ID: 16536.

It can be seen that these predicted background concentrations are all well below the annual mean objective levels provided in Table 1. The modelled NO_2 and PM_{10} concentrations in 2017 were lower than those measured at the urban background monitoring station in Piccadilly Gardens.

4.5 UK Ambient Air Quality Interactive Map (Defra)

Defra provides modelled NO_2, PM_{10} and $PM_{2.5}$ concentrations alongside major roads across the UK to assess compliance with the EU limit values using the Pollution Climate Mapping (PCM) model. This model predicts concentrations at 4m from the roadside.

In ClientEarth's challenge to this plan, the High Court found that the Secretary of State had adopted an overly optimistic model for future emissions, and therefore there is uncertainty regarding the accuracy of this data. It was calibrated using 2013 monitoring data and therefore the predicted concentration for this year is likely to be more robust than for future years.

There is data available for Deansgate (A56), approximately 29 m west from the Proposed Development. The modelled concentrations for NO_2, PM_{10} and $PM_{2.5}$ are predicted to be 42.3 μg/m^3, 19.5 μg/m^3 and 13.8 μg/m^3 respectively for the year 2013. These data are below the annual mean objective for PM_{10} and $PM_{2.5}$, but exceed the annual mean objective for NO_2.

As the annual mean NO_2 concentration is predicted to be 42.3 μg/m^3, it is therefore considered unlikely that the hourly objective will be exceeded where the annual mean is below 60 μg/m^3, therefore the one-hour objective will be unlikely to be exceeded at the Proposed Development.

4.6 Defra's Nitrogen Dioxide Fall Off With Distance

An estimated value for the roadside air quality can be calculated for Deansgate (A56). With the façade of the Proposed Development being approximately 29 m from the roadside the estimated annual NO_2 concentration at the Barton Square façade of the proposed building is calculated to be 39.8 μg/m^3 using Defra' calculator.

However, this calculator was designed to estimate the reduction in measured concentrations with distance from a road, and is not able to take account change in concentrations where there are buildings between the kerbside and the point of interest.

The figures were calculated using 2015 data which represents a worse case data set compared with the more recent and most available data set of 2015. The roadside NO_2 concentration on Deansgate is likely to be higher than that around the Proposed Development, when coupled with the use of 2015 data which assumes no improvement in air quality since 2015, this calculated figure is likely to be less in reality.

4.7 Summary of background data

In summary, the baseline assessment has shown that the air quality in parts of the centre of Manchester is poor. The annual mean NO_2 objective is widely exceeded, particularly at kerbside locations. Concentrations are lower further away from major roads, but the objective is exceeded at the closest urban background monitoring station to the Prosed Development.

The 1-hour NO_2 objective is unlikely to be exceeded at the development site.

Both the air quality objectives for PM_{10} and $PM_{2.5}$ are achieved across the city.

5. Impact Assessment

The potential for air quality impacts during construction and operation of the Proposed Development are discussed in this section.

5.1 Construction phase

This sub section provides the results for demolition, earthworks, construction and trackout activities associated with the Proposed Development. Based on the impact assessment appropriate mitigation has been identified.

The risk of dust impacts is based on the potential dust emissions magnitude and the sensitivity of the area as described in Section 5.1.3. The two factors are then combined to determine the risk of dust impacts with no mitigation applied. In the absence of any site-specific information a highest risk category has been applied to represent the worst-case scenario.

5.1.1 Potential Dust Emission Magnitude

Demolition

The demolition works will be very minor as only a single storey outbuilding will be demolished which is approximately 291 m^3 in volume. The potential dust emission magnitude from demolition activities is considered to be small.

Earthworks

It is unlikely that substantial earthworks will be required as the majority of the existing building will be retained. Since the site is relatively small, approximately 800 m^2, and based on the limited earthworks proposed, the potential dust emission magnitude is considered to be small.

Construction

The total building volume for the Proposed Development is unknown. Assuming a height of 19.5 m the total building volume will be approximately 15,600 m^3. Based on this volume the potential dust emission magnitude from construction is considered to be small.

Trackout

Information on the number of outward Heavy-Duty Vehicle (HDV) trips to be generated during the construction phase per day was not available at the time of writing of this report. There may be short distances of unpaved road / tracks proposed as part of the development. However, given the dimension of the site and the existing areas are surfaced, they are likely to be less than 50 m in length and considered unlikely that there will be significant track-out of mud from the site. The potential dust emissions magnitude from trackout is considered to be small.

5.1.2 Summary of Potential Dust Emission Magnitude

As outlined in the IAQM guidance, the scale and nature of the works has been assessed to determine the potential dust emissions magnitude for the Proposed Development site. Table 6 shows a summary of the classifications for the Proposed Development for each of the activities.

Table 6 Dust Emission Magnitude for the Proposed Development

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Small
Construction	Small
Trackout	Small

5.1.3 Sensitivity of the Study Area

The area surrounding the site consists primarily of commercial and residential premises. Figure 3 shows the development site (red line) and a series of distance bands from the boundary of the site. Note that receptors identified at a greater distance than 350 m have not been included as the IAQM Guidance[11] does not consider that there will be a material impact beyond this distance.



Figure 3 IAQM distance from site boundary criteria. Contains Ordnance Survey Data © Crown Copyright 2018

5.1.4 Sensitivity of the Study Area to Dust Soiling

Residential areas are considered to be highly sensitive to dust soiling. There between 10 to 100 residential receptors within 50 m of the Proposed Development, and therefore the area surrounding the site is considered to be medium sensitivity to dust soiling for the activities of demolition, construction and earthworks.

For trackout, the distances are measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 50 m from small development sites, as measured from the site exit, and up to 50 m from the edge of the road. The sensitivity of the area to dust soiling effect associated with trackout from the Proposed Development site has been classified as medium.

5.1.5 Sensitivity of the Study Area to the Health Effects of PM_{10}

Defra's modelled background PM_{10} concentrations for 2015 is 17.1 µg/m^3 and the roadside concentration is 16.4 µg/m^3. As the local PM_{10} concentration is under 24 µg/m3 the area is considered to be of low sensitivity to the health effects of PM_{10} for all four activities.

5.1.6 Summary of Sensitivity

The sensitivity of the area is summarised for each activity in Table 7.

Table 7 Sensitivity of the Surrounding Area

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

5.1.7 Risk of Dust Effects

The dust emissions magnitude (section 5.1.1) is combined with the sensitivity of the area (section 5.1.3) to determine the risk of impacts with no mitigation applied. A summary of the unmitigated risk during each activity is provided in Table 8.

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 the worst-case assumption that all works will be undertaken at the site boundary closest to each receptor area. Therefore, the actual risk is likely to be lower than that predicted during the majority of the construction phase.

Table 8 Summary of Potential Unmitigated Dust Risks

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

5.2 Operational Phase

The exposure of future users of the proposed residential development have been assessed qualitatively based on the available data.

The closest main road to the development site is Deansgate (A56) which is 29m from the closest façade of the Proposed Development. Between the site and this road is an existing four storey building. Annual mean concentrations are likely to be close to the objective at the closest façade of the Proposed Development on the ground floor, with concentrations lower on the other building facades.

No residential development is proposed for the ground floor, and typically concentrations from road transport sources decline with height to reach the background concentration. In this case the background is estimated to be 34 μg/m^3, i.e. significantly lower than the objective. It is considered likely that the concentrations will be between the objective and this value above the ground floor where the residential units are proposed.

The 1-hour NO_2, both PM_{10} and $PM_{2.5}$ objectives are also anticipated to be achieved at the development site.

It is therefore considered that future residents will not be exposed to unacceptable air quality.

6. Mitigation

6.1 Construction Phase

To mitigate the potential impacts during the construction phase it is recommended that mitigation measures consistent with the IAQM guidance are implemented. These mitigation measures have been carefully selected for the development site at the Assembly and are based upon the dust risk categories outlined in 6.1.3 of this report.

It is recommended that the local planning authority approve a Dust Management Plan prior to works commencing on site, and that this is implemented using an appropriately worded planning condition. The table below details the measures that should be incorporated in the Dust Management Plan.

Table 9 Fugitive dust mitigation measures that are applicable to the Proposed Development

Issue	Mitigation Measure
Communication	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
Dust Management Plan	Develop and implement a Dust Management Plan (DMP), which may include measures to control emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken
	Make the complaints log available to the Local Authority when asked
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling check of surfaces such as street furniture, cars, window sills within 100 m of the site boundary, with cleaning to be provided if necessary
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority when asked

Issue	Mitigation Measure
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
Preparing and maintaining the site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active 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, unless being re-used on site. If they are being re-used cover as described below
	Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the Local Authority, where applicable)
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate
	Use enclosed chutes and conveyors and covered skips
	Minimize drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Waste management	Avoid bonfires and burning of waste materials
Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)
	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems,

Issue	Mitigation Measure
	manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground
	Avoid explosive blasting, using appropriate manual or mechanical alternatives
	Bag and remove any biological debris or damp down such material before demolition
Construction	Avoid scrabbling (roughening of concrete surfaces) if possible
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in continuous use
	Avoid dry sweeping of large areas
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
	Record all inspections of haul routes and any subsequent action in a site log book
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)

6.2 Operational Phase

No mitigation is proposed. The height of the flue extract for the energy system is to be located above roof level. At this time the precise location and height above roof level is unknown. To ensure effective dispersion this should take account of best practice at the time of detailed design.

7. Residual Impacts

7.1 Construction Phase

Assuming the relevant mitigation measures outlined in the mitigation section are implemented through, for example, a planning condition, the residual effect from dust generating activities associated with this phase of the development is considered to be not significant.

7.2 Operational Phase

The residual impact of the operational phase of the Proposed Development is not significant.

8. Summary and Conclusions

This report describes the potential air quality impacts associated with the redevelopment of an existing building from retail and office use to retail and residential use, known as Equitable Buildings, in the centre of Manchester.

The development site is within an air quality management area (AQMA) declared for exceedances of the nitrogen dioxide (NO_2) objectives.

The need to undertake a detailed assessment of road traffic emissions associated with both the construction and operation of the Proposed Development and the emissions from the boilers systems have been screened out. This is because the traffic generated by the development are below the criteria set in the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) planning guidance. The emissions from the anticipated boiler system are likely to be in line with the criteria set in the IAQM guidance and as such detailed assessment have not been undertaken.

The impacts of the construction work on dust and ambient PM_{10} concentrations have been assessed and the risk of dust causing a loss of local amenity and increased exposure to PM_{10} concentrations during construction works has been used to identify appropriate mitigation measures. Provided these are implemented, for example through a planning condition, the residual impacts are considered to be not significant.

Given the distance from Deansgate (A56), the closest major road, it is considered unlikely that the existing concentrations on the site will be significantly elevated above the background concentration, which are likely to be below the objectives for the relevant uses.

Overall, the operational air quality impacts of the Proposed Development are judged to be not significant.

9. Glossary of terms

AADT	Annual Average Daily Traffic
AQMA	Air Quality Management Area
CHP	Combined Heat and Power
Defra	Department for Environment, Food and Rural Affairs
EHO	Environmental Health Officer
HDV	Heavy Duty Vehicles (> 3.5 tonnes gross vehicle weight)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
MCC	Manchester City Council
µg/m^3	Micrograms per cubic metre
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM_{10}	Particulate matter with an aerodynamic diameter less than 10 micrometres
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than 2.5 micrometres
PPG	Planning Practice Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site

10. References

[1] Mode Transport Limited (2017), draft Transport Statement, 1st September 2017
[2] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra
[3] Defra (2016) Local Air Quality Management Technical Guidance (LAQM-TG16), [Online], Available: https://laqm.defra.gov.uk/supporting-guidance.html
[4] The Stationary Office (2000) Statutory Instrument 2000, No 921, The Air Quality (England) Regulations 2000, London
[5] The Stationary Office (2002) Statutory Instrument 2002, No 304, The Air Quality (England) (Amendment) Regulations 2002, London
[6] The Statutory Office (2010) Statutory Instrument 2010, No 1001, The Air Quality Standards Regulations 2010, London
[7] Greater Manchester Air Quality Action Plan 2016-2021.
[8] National Planning Policy Framework, Department for Communities and Local Governments, July 2018
[9] Planning Practice Guidance Notes (PPG) – [online], (Last accessed: 02/01/18), Available: https://www.gov.uk/guidance/air-quality--3
[10] Manchester Local Development Framework Core Strategy Development Plan, July 2012.
[11] Institute of Air Quality Management (2016), IAQM Guidance on the Assessment of Dust from Demolition and Construction version 1.1. [Online] Available: www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf (29/08/17)
[12] Environmental Protection UK and Institute of Air Quality Management (2017), Land-Use Planning & Development Control: Planning For Air Quality. [Online] Available: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf (29/08/17)
[13] Defra (2014) UK Pollutant Release and Transfer Register, [Online], Available: https://www.gov.uk/guidance/uk-pollutant-release-and-transfer-register-prtr-data-sets
[14] Defra Background Pollution Maps – [Online] Available: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html (29/08/17)
[15] UK Ambient Air Quality Interactive Maps – [Online] Available: https://uk-air.defra.gov.uk/data/gis-mapping (29/08/17)
[16] Defra Nitrogen Dioxide fall off with distance– [Online] Available: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html (29/08/17)
[17] Environment Agency (2013) 'what's in your backyard', [Online], Available: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=airpollution (29/08/17)
[18] Air quality plan for nitrogen dioxide (NO_2) in UK (2017) [Online], Available: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017 (8/09/2017)

11. Annexes

11.1 Annex 1 – Proposed Development Plans

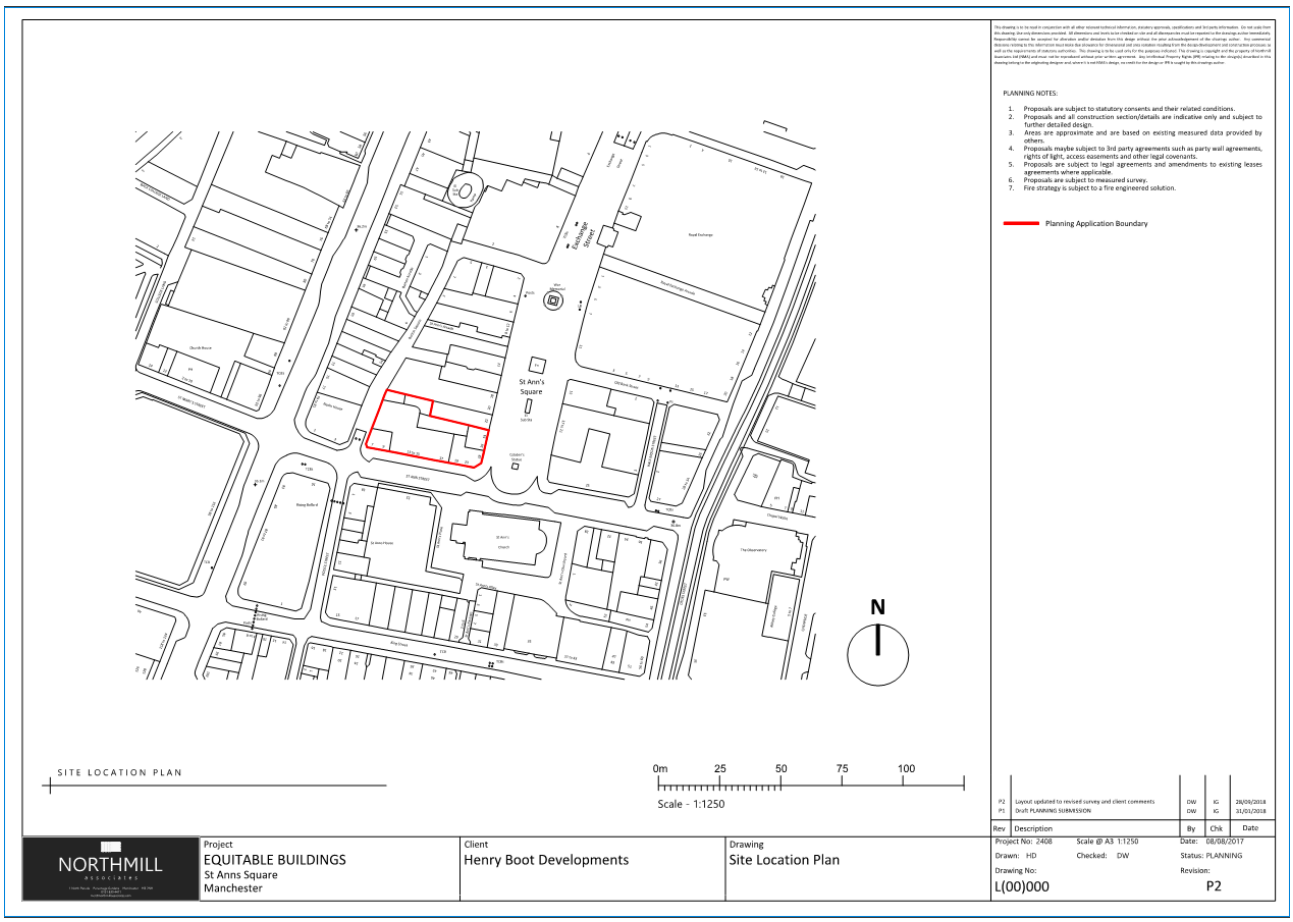


Figure 4 *Proposed development site plan – Source: Land Registry copy of title plan Equitable Buildings - MAN46285*

11.2 Annex 2 – Professional Experience

Dr Claire Holman (Brook Cottage Consultants Ltd), BSc (Hons), PhD, CSci, CEnv, FCIWEM, FIEnvSc, FIAQM

Claire is a Director and owner of Brook Cottage Consultants Ltd., which provides air quality expertise to a range of industrial and public sector clients. She provides an advisory role with review and input at key stages of projects for Hoare Lea.

Claire has worked on air quality management for over 35 years. She has experience of developing emission inventories, emission control, ambient monitoring, dispersion modelling, cost benefit and cost-effectiveness analysis and policy development. She has undertaken numerous air quality assessments for new developments. She also advised governments in Europe, Asia and Africa, as well as the European Commission and the Japan Clean Air Program on strategic air quality and climate change issues for the development of policy and new regulations. She is currently the chair of the Institute of Air Quality Management (IAQM).

She is a Chartered Scientist and a Chartered Environmentalist as well as a Fellow of the Institute of Quality Management, Institution of Environmental Sciences and Chartered Institute of Water and Environmental Management.

Chris Rush (Hoare Lea), BSc (Hons), MSc, PG Dip Acoustics, CEnv, MIOA, MIEMA, MIEnvSc, AMIAQM

Chris is an Associate Air Quality Consultant with Hoare Lea. He is a Chartered Environmentalist, a Member of the Institute of Acoustics, a Full Member of the Institute of Environmental Management and Assessment, a Member of the Institution of Environmental Sciences and an Associate Member of the Institute of Air Quality Management.

He has a diverse portfolio of experience and has worked on a range of projects from initial site feasibility, through planning and development to construction and operation. Chris's expertise covers planning, noise and air quality, specifically in relation to residential developments, industrial fixed installations such as waste management centres and transportation environmental impact on developments including air traffic.

Gina Gissing (Hoare Lea), BSc (Hons), StudentIEMA

Gina is a Graduate Air Quality Consultant with Hoare Lea. She has recently successfully completed a BSc (Hons) in Environmental Management and Sustainability from Manchester Metropolitan University and is a Student Member of the Institute of Environmental Management and Assessment (IEMA).

As part of her academic work, Gina has been involved in the assessment process for various factors relating to human health, which has involved developing an understanding of the legislative framework in which these sit. She has also researched the nitrogen-fixing capabilities of mosses to assist the recovery of bogs and mires damaged through atmospheric deposition within her project.

Mohamed Jama (Hoare Lea), BEng (Hons)

Mohamed is a Graduate Air Quality Consultant with Hoare Lea. He is a Chemical Engineering Graduate from the University of Nottingham.

Mohamed's final year project involved designing a plant for the Andrussow production of Hydrogen Cyanide whereby he provided input on devising ventilation systems for waste gas removal. He has gained experience from his involvement in design projects throughout university. His interests lie in sustainability and Air Pollution Control.

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