

Crown Street, Reading

Air Quality Assessment

On behalf of **Thomas Homes Ltd**

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1 Introduction

1.1 Proposed Development

1.1.1 Thomas Homes Ltd has commissioned Peter Brett Associates LLP (PBA) to undertake an air quality assessment to support a planning application for the redevelopment of land at the junction of Crown Street and Silver Street, Reading. The proposed development site is located within the boundary of Reading Borough Council.

1.1.2 The planning application is for the development of 79 apartments, including affordable housing.

1.2 Scope of Assessment

1.2.1 This report describes existing air quality within the study area, considers the suitability of the site for residential development, and assesses the impact of the construction of the development on air quality in the surrounding area. The main air pollutants of concern related to construction are dust and fine particulate matter (PM₁₀), and for road traffic are nitrogen dioxide (NO₂), PM₁₀ and PM_{2.5}. The development is not likely to generate significant traffic compared to existing and consented uses, and therefore the operational impact of development related traffic has been screened out of this assessment.

1.2.2 The proposed development will not include an energy centre. Therefore, an assessment of the effect of potential energy centre emissions has been scoped out.

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

1.3 Consultation

1.3.1 Consultation has been carried out with the Environmental Health Officer (EHO) at Reading Borough Council (RB), Ross Jarvis (e-mail 27th April 2017), to obtain the latest air quality monitoring for the Council and agree the assessment scope.

2 Legislation and Policy

2.1 The Air Quality Strategy

- 2.1.1 The Air Quality Strategy (2007) (DETR, 2007) establishes the policy framework for ambient air quality management and assessment in the UK. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.
- 2.1.2 Part IV of the Environment Act 1995 (Environment Act, 1995) introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 (Statutory Instrument, 2000) and the Air Quality (Amendment) (England) Regulations 2002 (Statutory Instrument, 2002).
- 2.1.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.
- 2.1.4 The Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16); Defra, 2016), issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM₁₀) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure.

2.2 EU Limit Values

- 2.2.1 The Air Quality Standards Regulations 2010 (Statutory Instrument, 2010) implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO₂. These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO₂ EU Limit Value was 1 January 2010, five years later than the date for the NAQO.
- 2.2.2 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.
- 2.2.3 The Directive limit values are applicable at all locations except:
- Where members of the public do not have access and there is no fixed habitation;
 - On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
 - On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

2.3 Planning Policy

National Policy

- 2.3.1 The National Planning Policy Framework (NPPF) was published in March 2012 (Department for Communities and Local Government, 2012). This sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that;

"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."

- 2.3.2 Paragraph 124, also states that;

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

- 2.3.3 Paragraph 203 goes on to say;

"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."

Planning Practice Guidance

- 2.3.4 Planning Practice Guidance (PPG) (Planning Practice Guidance, 2014) was published in March 2014 to support the National Planning Policy Framework. Paragraph 001, Reference 32-001-20140306 of the PPG provides a summary as to why air quality is a consideration for planning;

"...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....The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date....If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan.....Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive.....Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

- 2.3.5 Paragraph 002, Reference 32-002-20140306, of the PPG concerns the role of Local Plans with regard to air quality;

"....Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider;

- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;*

- *the impact of point sources of air pollution...; and*
- *ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."*

2.3.6 Paragraph 005, Reference 32-005-20140306, of the PPG identifies when air quality could be relevant for a planning decision;

"....When deciding whether air quality is relevant to a planning application, considerations could include whether the development would;

- *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Are;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations; and*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

2.3.7 Paragraph 007, Reference 32-007-20140306, of the PPG provides guidance on how detailed an assessment needs to be;

"Assessments should be proportionate 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."

2.3.8 Paragraph 008, Reference 32-008-20140306, of the PPG provides guidance on how an impact on air quality can be mitigated;

"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact....Examples of mitigation include;

- *the design and layout of development to increase separation distances from sources of air pollution;*
- *using green infrastructure, in particular trees, to absorb dust and other pollutants;*

- *means of ventilation;*
- *promoting infrastructure to promote modes of transport with low impact on air quality;*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."*

2.3.9 Paragraph 009, Reference 32-009-20140306, of the PPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment;

"Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations." If Yes:

"Consider how the proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused."

Local Policy

2.3.1 RBC adopted their Core Strategy in January 2008. Policy CS34 on pollution and water resources states:

"Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development.

Proposals for development that are sensitive to the effects of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution."

Reading Borough Council Air Quality Action Plan

2.3.2 RBC's Air Quality Action Plan (AQAP) sets out measures to reduce emissions and thereby improve air quality in the Borough. One AQMA has been declared in the Borough, which encompasses the town centre and major arterial routes leading into Reading. The AQAP explains that the AQMA goes further than covering areas of known exceedances so that it addresses the possibility of moving hotspots from one area to another.

2.3.3 Direct measures outlined in the AQAP include traffic management and the promotion of alternative vehicle technologies. The AQAP also includes measures specific to the Reading Festival and Home Energy Use. Air quality will also be taken into account during the planning process where developments are located within or adjacent to an AQMA, or where they have the potential to adversely affect air quality.

3 Methodology

3.1 Existing Conditions

- 3.1.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by Reading Borough Council (RBC). Background concentrations for the site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid (Defra, 2016).

3.2 Construction Impacts

- 3.2.1 During demolition and construction the main potential effects are dust annoyance and locally elevated concentrations of PM₁₀. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.
- 3.2.2 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100 m of sources. Intermediate particles (10-30µm) can travel 200-500 m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1 km; however, the impact on the short-term concentrations of PM₁₀ occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 3.2.3 The Institute of Air Quality Management (IAQM) has issued revised guidance on the assessment of dust from demolition and construction (Holman et al, 2014). The IAQM guidance recommends that the risk of dust generation is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.
- 3.2.4 In accordance with the IAQM, the dust emission magnitude is defined as either large, medium or small (**Table 3.1**) taking into account the general activity descriptors on site and professional judgement.
- 3.2.5 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2014 guidance (**Table 3.2**), taking into account professional judgement.

Table 3.1: Criteria for Dust Emission Magnitude

Dust Emission Magnitude	Activity
Large	Demolition >50,000 m ³ building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20 m above ground level
	Earthworks >10,000 m ² site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8 m high bunds formed, >100,000 tonnes material moved

Dust Emission Magnitude	Activity
	Construction >100,000 m ³ building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100 m unpaved roads
Medium	Demolition 20,000 - 50,000 m ³ building demolished, dusty material (e.g. concrete) 10-20 m above ground level
	Earthworks 2,500 - 10,000 m ² site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4 m – 8 m high bunds, 20,000 - 100,000 tonnes material moved
	Construction 25,000 - 100,000 m ³ building volume, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 -100 m unpaved roads
Small	Demolition <20,000 m ³ building demolished, non-dusty material, <10 m above ground level, work in winter
	Earthworks <2,500 m ² site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4 m high bunds, <20,000 tonnes material moved
	Construction <25,000 m ³ , non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50 m unpaved roads

Table 3.2: Area Sensitivity Definitions

Area Sensitivity	People and Property Receptors	Ecological Receptors
High	>100 dwellings, hospitals, schools, care homes within 50 m 10 – 100 dwellings within 20 m Museums, car parks, car showrooms within 50 m	National or Internationally designated site within 20 m with dust sensitive features / species present

Area Sensitivity	People and Property Receptors	Ecological Receptors
	PM ₁₀ concentrations approach or are above the daily mean objective.	
Medium	>100 dwellings, hospitals, schools, care homes within 100 m 10 – 100 dwellings within 50 m Less than 10 dwellings within 20 m Offices/shops/parks within 20 m PM ₁₀ concentrations below the daily mean objective.	National or Internationally designated site within 50 m with dust sensitive features / species present Nationally designated site or particularly important plant species within 20 m
Low	>100 dwellings, hospitals, schools, care homes 100 - 350m away 10 – 100 dwellings within 50 – 350 m Less than 10 dwellings within 20 – 350 m Playing fields, parks, farmland, footpaths, short term car parks, roads, shopping streets PM ₁₀ concentrations well below the daily mean objective.	Nationally designated site or particularly important plant species 20 – 50 m Locally designated site with dust sensitive features within 50 m

- 3.2.6 Based on the dust emission magnitude and the area sensitivity, the risk of dust impacts is then determined (**Table 3.3**), taking into account professional judgement.

Table 3.3: Risk of Dust Impacts

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

- 3.2.7 Based on the risk of dust impacts, appropriate mitigation is selected from the IAQM guidance using professional judgement.

Significance Criteria

- 3.2.8 The construction impact significance criteria are based on the IAQM guidance. The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.
- 3.2.9 With appropriate mitigation in place, the residual effect of construction impacts on air quality is assessed as not significant.

3.3 Road Traffic Impacts

Sensitive Locations

- 3.3.1 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, the proposed residential properties are considered to be sensitive receptors.
- 3.3.2 Four locations on the façade of the proposed development have been chosen as receptors in order to assess the suitability of the site for residential development (Figure 1). Receptors were modelled at a height of 1.5m, 4.5m, 7.5m and 10.5m representing exposure at ground, first, second and third floor levels of the proposed development.
- 3.3.3 Concentrations have also been predicted at three diffusion tube monitors located in close proximity to the site, in order to verify the modelled results (see Appendix C for further details on the verification method).

Impact Predictions

- 3.3.4 Predictions have been carried out using the ADMS-Roads dispersion model (v4.0.1). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of Heavy Duty Vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using 2015 meteorological data from the Heathrow Airport meteorological station, which is considered suitable for this area.
- 3.3.5 Annual Average Daily Traffic (AADT) flows, and the proportions of Heavy Duty Vehicles (HDVs), for roads adjacent to the site were obtained from the Department of Transport website. Traffic speeds were based on local speed restrictions, taking into account congestion and proximity to a junction. Traffic data used in this assessment is summarised in **Appendix D**.
- 3.3.6 Emissions were calculated using the most recently released Emission Factor Toolkit (EFT) v7.0, which utilises NO_x emission factors taken from the European Environment Agency COPERT 4 (v11) emission tool. The traffic data were entered into the EFT, along with speed data to provide combined emission rates for each of the road links entered into the model.

Assessment Criteria

- 3.3.7 The NAQOs for NO₂ and PM₁₀ set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 3.4**.

Table 3.4: NO₂ and PM₁₀ Objectives

Pollutant	Time Period	Objective
Nitrogen dioxide (NO ₂)	1-hour mean	200µg/m ³ not to be exceeded more than 18 times a year
	Annual mean	40µg/m ³
Particulate matter (PM ₁₀)	24-hour mean	50µg/m ³ not to be exceeded more than 35 times a year
	Annual mean	40µg/m ³

- 3.3.8 The objectives for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Analysis of long term monitoring data suggests that if the annual mean NO₂ concentration is less than 60µg/m³ then the one-hour

mean NO₂ objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved (Defra, 2009).

Assumptions and Limitations

- 3.3.9 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 3.3.10 A disparity between national road transport emissions projections and measured annual mean concentrations of nitrogen oxides and NO₂ has been identified in recent years. Whilst projections suggest that both annual mean nitrogen oxides and NO₂ concentrations from road traffic emissions should have fallen significantly over the past 6 – 8 years, at many monitoring sites levels have remained relatively stable, or have shown a slight increase.
- 3.3.11 The complete development modelling has been based on 2015 emission factors, background concentrations, and traffic flows. As the model has been verified against 2015 monitoring data, this is considered to provide an appropriately conservative assessment taking into account the uncertainties regarding future vehicle emission factors.

4 Baseline Conditions

4.1 LAQM

- 4.1.1 RBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. One Air Quality Management Area (AQMA) has been declared in the Borough which covers the central area of Reading, Caversham centre and follows the main radial road and rail routes through the Borough due to exceedances of the annual mean nitrogen dioxide objectives. The site lies adjacent to Crown Street which is part of the AQMA.

4.2 Monitoring

Nitrogen Dioxide

- 4.2.1 RBC operate three automatic monitoring sites, as well as deploying nitrogen dioxide diffusion tubes at a number of locations, prepared and analysed by Gradko (50%TEA in acetone), across the Borough. There are no automatic sites in close proximity to the development site. Data from the closest sites (approximately 380m) are described in **Table 4.1** below.

Table 4.1: Measured NO₂ Concentrations, (2011-2015)

Site ID	Site Type	Annual Mean (µg/m ³)					
		2011	2012	2013	2014	2015	2016
10 – 20 Hieatt Close	Roadside	34	41	41.8	36.4	32.0	32.0
44 Crown Street	Roadside	35	39	46.3	41.3	34.6	37.3
Red Cow PH, Southampton Street	Roadside	37	43	46.6	44.0	35.8	38.2
Objective		40					

2011 - 2015 data provided by Reading Borough Council
Exceedances of the objective in bold;

- 4.2.2 Whilst exceedances of the annual mean nitrogen dioxide objective were measured at the three diffusion tube monitoring stations in 2012 to 2014, concentrations have been below the objective in 2015 and 2016.

PM₁₀

- 4.2.3 There is no PM₁₀ monitoring undertaken in close proximity to the proposed development site.

4.3 Background Concentrations

- 4.3.1 In addition to these measured concentrations, estimated background concentrations for the site have been obtained from the national maps provided by Defra (Defra, 2016) (shown in **Table 4.2**). The background concentrations are all well below the relevant objectives.

Table 4.2: Estimated Annual Mean Background Concentrations

Year	Annual Mean (µg/m ³)			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}
2015	35.6	23.3	17.2	12.5
Objectives	-	40	40	25

5 Impact Assessment

5.1 Construction Impacts

5.1.1 The main potential effects during construction are dust deposition and elevated PM₁₀ concentrations. The following activities have the potential to cause emissions of dust:

- Site preparation including delivery of construction material, erection of fences and barriers;
- Earthworks including digging foundations and landscaping;
- Materials handling such as storage of material in stockpiles and spillage;
- Construction and fabrication of units; and
- Disposal of waste materials off-site.

5.1.2 Typically, the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

5.1.3 Based on the IAQM criteria (**Table 3.1**), the risk of dust emissions is considered to be small. The study area is considered to be of high sensitivity, as there are more than 10 dwellings within 20 m of the site boundary (**Table 3.2**). Appropriate mitigation corresponding to a low risk site is therefore required during the construction phase (**Table 3.3**). With appropriate mitigation in place the construction impacts are described as not significant.

5.2 Road Traffic Impacts

5.2.1 Predicted concentrations of NO₂, PM₁₀ and PM_{2.5} at the four modelled receptor locations are presented in **Table 5.1** below.

Table 5.1: Predicted Concentrations of NO₂ and PM₁₀ at Existing Receptors

Receptor	Annual Mean (µg/m ³)		
	NO ₂	PM ₁₀	PM _{2.5}
Ground Floor			
R1	34.3	19.2	13.7
R2	35.9	19.3	13.8
R3	32.7	18.7	13.4
R4	31.2	18.5	13.3
First Floor			
R1	33.3	19.0	13.6
R2	34.3	19.1	13.6
R3	31.3	18.5	13.2
R4	30.3	18.3	13.2
Second Floor			
R1	32.6	18.9	13.5
R2	32.8	18.9	13.5
R3	30.1	18.3	13.1
R4	29.6	18.2	13.1

Receptor	Annual Mean ($\mu\text{g}/\text{m}^3$)		
	NO ₂	PM ₁₀	PM _{2.5}
Objectives	40		25

- 5.2.3 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations for future residents are below the relevant objectives at all worst case receptor locations. Air quality for future residents will therefore be acceptable.

Uncertainty

- 5.2.4 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 5.2.5 A disparity between the national road transport emission projections and measured annual mean concentrations of nitrogen oxides (NO_x) and NO₂ has been identified in recent years. Whilst projections suggest that both annual mean NO_x and NO₂ concentrations from road traffic emissions should have fallen significantly over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase.
- 5.2.6 The road traffic modelling has been based on 2015 emission factors, background concentrations and future traffic flows which is the year for which the model has been verified. This is considered to provide a conservative assessment to balance against the uncertainties regarding future vehicle emissions.

Impact Significance

- 5.2.7 Overall, considering the conservative nature of the assessment, and the criteria set out in **Section 3.3.13**, the air quality effects on future residents are considered to be not significant as there are no predicted exceedances of the relevant air quality strategy objectives at any of the worst case receptor locations (refer to **Figure 1**).

6 Mitigation

6.1 Construction

- 6.1.1 The following standard low risk mitigation measures from the IAQM 2014 guidance are recommended. These should be included within a Construction Environmental Management Plan and agreed with the Local Authority.

Communication

- Display the name and contact details of persons accountable on the site boundary.
- Display the head or regional office information on the site boundary.

Management

- Develop and implement a dust management plan.
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions.
- Record exceptional incidents and action taken to resolve the situation.
- Carry out regular site inspections to monitor compliance with the dust management plan and record results.
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.
- Avoid site run off of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove potentially dusty materials from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators where possible.
- Only use cutting, grinding and sawing equipment with dust suppression equipment.
- Ensure an adequate supply of water on site for dust suppressant.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate.

- Ensure equipment is readily available on site to clean up spillages of dry materials.
- No on-site bonfires and burning of waste materials on site.

Demolition

- Incorporate 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 water suppression is used during demolition operation.
- Avoid explosive blasting, using appropriate manual and mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.

Trackout

- Use water assisted dust sweepers on the site access and local roads.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials.
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable.
- Install hard surfaced haul routes which are regularly damped down.
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.

6.2 Operation

- 6.2.1 No exceedances of relevant objectives are predicted at the worst case receptor locations assessed. Air quality is considered to be acceptable for the proposed residential use and further mitigation is not considered necessary.

7 Conclusions

- 7.1.1 The air quality impacts associated with the proposed development of Crown Street, Reading have been assessed.
- 7.1.2 One Air Quality Management Area has been declared in the Borough which covers the central area of Reading, Caversham centre and follows the main radial road and rail routes through the Borough. This area has been declared due to exceedances of the annual mean nitrogen dioxide objective.
- 7.1.3 The construction works have the potential to create dust. During construction it is recommended that a package of mitigation measures is put in place to minimise the risk of elevated PM₁₀ concentrations and dust nuisance in the surrounding area. With mitigation in place the construction impacts are judged as not significant.
- 7.1.4 There are no predicted exceedances of the NO₂, PM₁₀ and PM_{2.5} objectives at any of the worst case receptor locations assessed. Air quality across the site is considered to be acceptable for residential use.
- 7.1.5 Overall, it is concluded that there are no air quality constraints to the proposed development.

Appendix A Glossary

Appendix A: Glossary

AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
CDC	Cherwell District Council
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO ₂ in the air
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes Includes Heavy Gross Vehicles and buses
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen oxides, generally considered to be nitric oxide and NO ₂ . Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
PM ₁₀	Small airborne particles less than 10µm in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
TEA	Triethanolamine

Appendix B References

Appendix B: References

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Appendix C Model Verification

Nitrogen Dioxide

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides ($\text{NO}_x = \text{NO} + \text{NO}_2$). The model has been run to predict the 2015 annual mean road- NO_x contribution at three monitoring locations (identified in [Table 4.1](#)).

The model output of road- NO_x has been compared with the 'measured' road- NO_x , which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NO_x from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero ([Figure C.1](#)). This factor was then applied to the modelled road- NO_x concentration for each monitoring site to provide adjusted modelled road- NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road- NO_x concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero ([Figure C.2](#)).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor: 2.7127

Secondary adjustment factor: 1.0205

The results imply that overall, the model was under-predicting the road- NO_x contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

[Figure C.3](#) compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2 , and shows the 1:1 relationship, as well as $\pm 10\%$ and $\pm 25\%$ of the 1:1 line. Bramley Close data point lies within $\pm 10\%$; Oxford Road and Langford Lane lie within the $\pm 25\%$ on the 1:1 line.

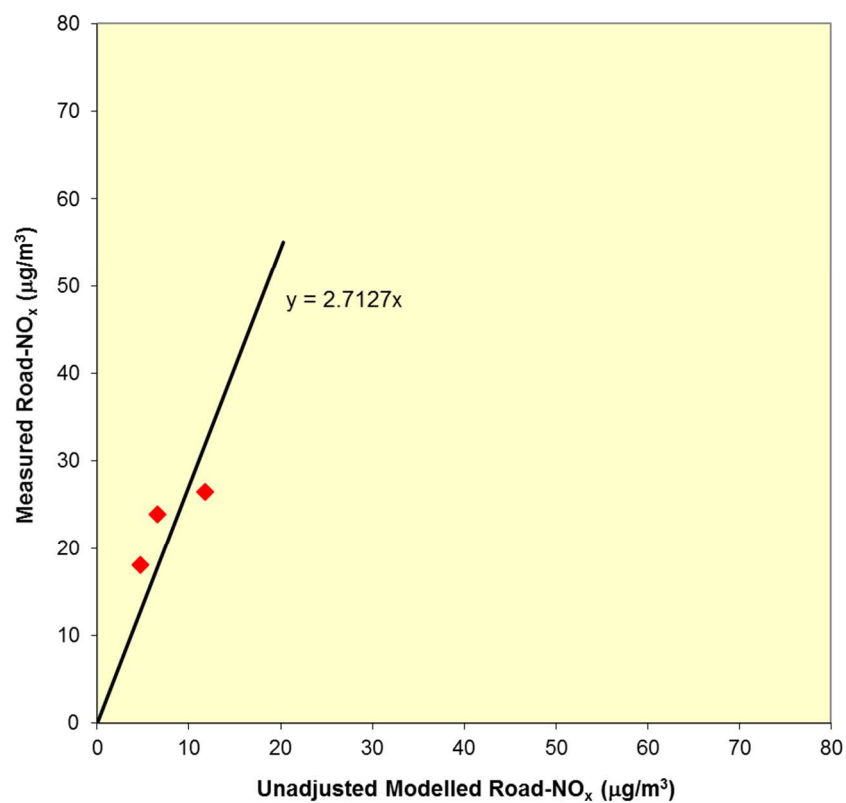


Figure C.1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x Concentrations

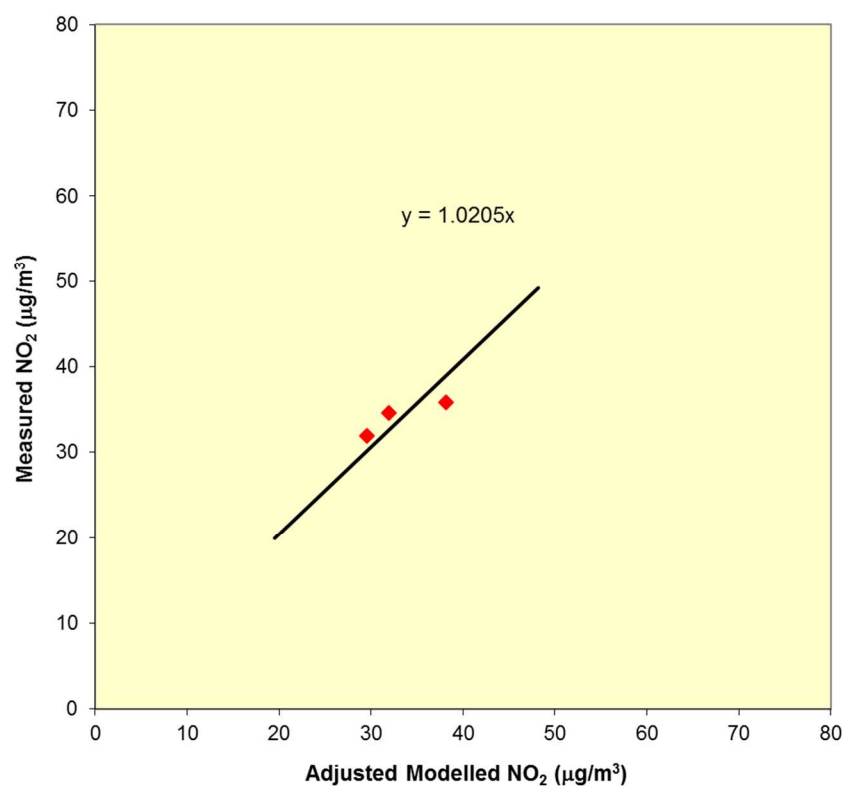


Figure C.2: Comparison of Measured NO₂ with Primary Adjusted Modelled NO₂ Concentrations

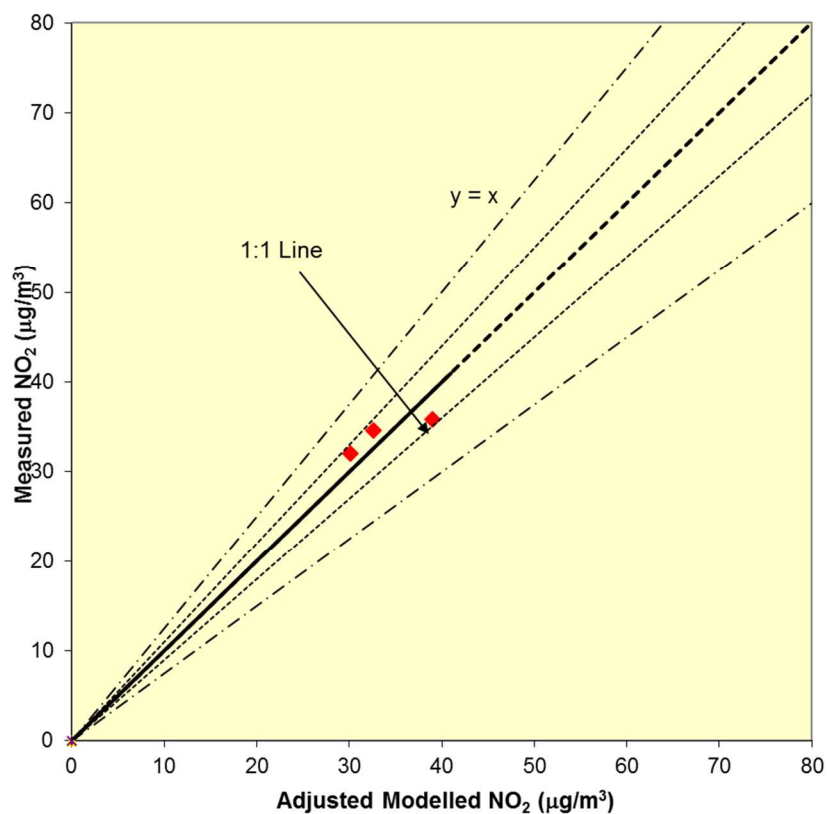


Figure C.3: Comparison of Measured NO₂ with Fully Adjusted Modelled NO₂ Concentrations

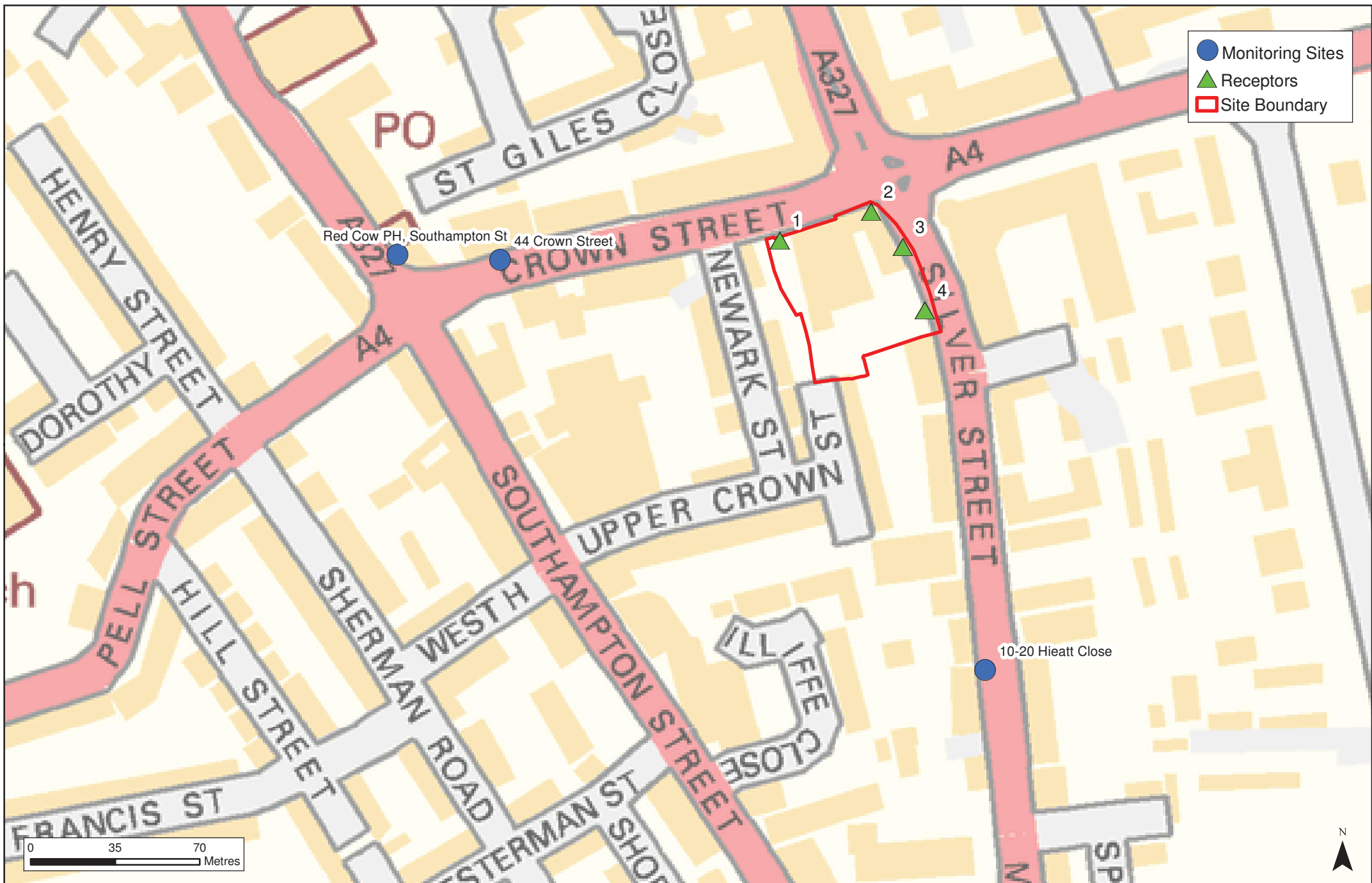
PM₁₀

There is no PM₁₀ monitoring in close proximity to the proposed development site. Therefore, the primary adjustment factor calculated for NO₂ concentrations has been applied to the modelled road-PM₁₀ concentrations.

Appendix D Traffic Data

Location	2015 Baseline	
	AADT	HDV (%)
London Road	12,417	4.8
Silver Street	6,741	3.8
Londo Street	6,463	11.5
Crown Street	10,562	1.4
Pell Street	8,483	3.6
Southampton Street	8,590	4.8
A327	16,766	4.2

Appendix E Figures



Service Layer Credits:		1:2,000 @ A4 05/05/2017 Drawn: FKL Checked: GH	Crown Street, Reading Receptors and Local Monitoring Figure 1 Rev A
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