



Eden Green Environmental



Air Quality Assessment

Site: 40 Church Street, Caversham Reading, RG4 8AU

Client

Dr Lakshmi Kanthan

40 Church Street, Caversham Reading, RG4 8AU

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1. Introduction

1.1 Overview

Dr Lakshmi Kanthan is seeking consent for change of use to residential development of 40 Church Street, Caversham Reading, RG4 8AU (hereafter referred to as the 'proposed development').

Eden Green Environmental (EGE) was instructed by Rahul Taheem (Architectural Consultant) on behalf of Dr Lakshmi Kanthan to produce an Air Quality Assessment to accompany the planning application to Reding Borough Council (RBC) to secure planning consent.

This proposal involves the change of use of the upper floors from commercial A1 to Residential C3 to provide 3 residential flats. The proposal would retain the A1 use at ground floor level and provide an additional single flat at the rear of the property. The proposal will not introduce any new parking spaces.

The potential local air quality effects of the proposed development have been assessed using the latest planning guidance from Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)¹ and the Department for Environment, Food and Rural Affairs (Defra)².

A construction dust risk assessment has been undertaken, to consider the potential risk from dust generating activities during the construction phase of the development. This has been carried out in accordance with the latest IAQM guidance on construction dust³.

1.2 Objective

This report provides an assessment on the following key impacts associated with the constructional and operational phase of the proposed development:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the development on sensitive receptors;
- Changes in traffic related pollutant concentrations associated with the operational phase of the proposed development; and
- Assessing the suitability of the site for the introduction of new residential receptors.

1.3 Site Location

Figure 1.1 shows the proposed site location. The proposed development is within the Reading Air Quality Management Area (AQMA), declared in 2009 as a result of

¹ IAQM (2017): 'Land Use Planning and Development Control: Planning for Air Quality v1.2'

² Defra (2016): 'Local Air Quality Management – Technical Guidance (TG16)'

³ IAQM (2016): 'Guidance on the Assessment of Dust from Demolition and Construction v1.1'.

exceeding NO₂ annual mean objective. There are no nationally designated ecological sites within close proximity to the proposed development.

Further site drawings are presented in Appendix F.

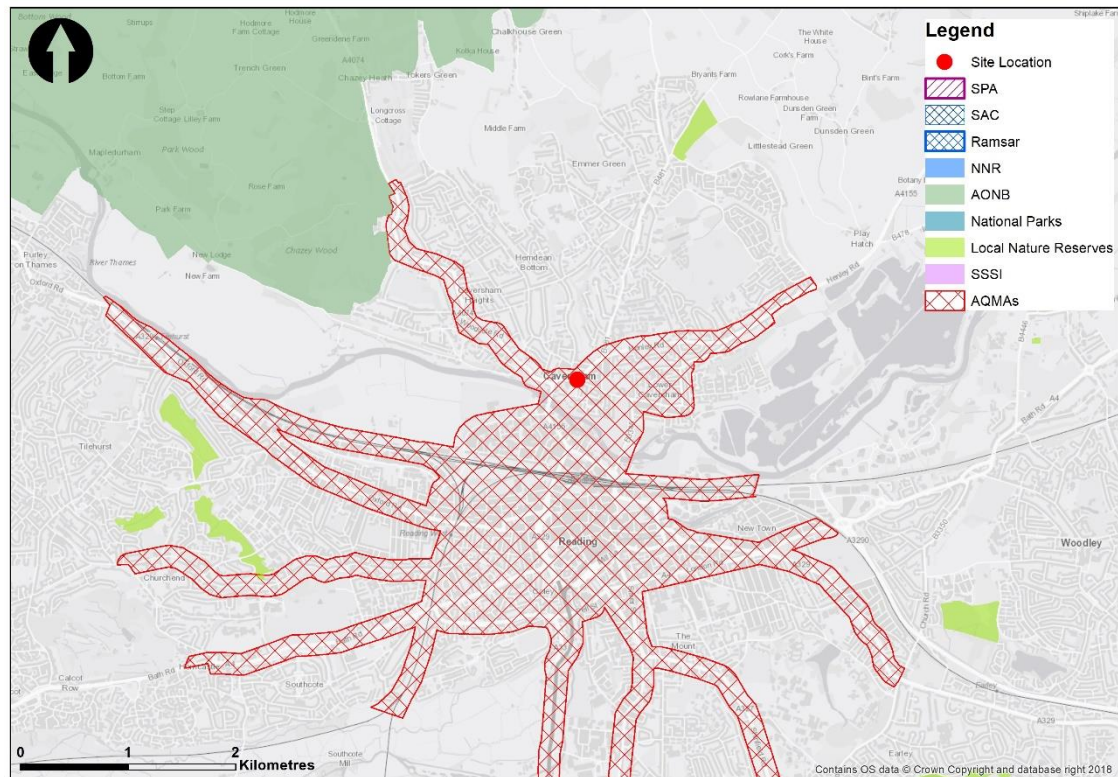


Figure 1.1: Proposed site location

1.4 Key Pollutants

The key pollutants associated with the construction phase of the project will be 'disamenity' or 'nuisance' dust. The key pollutants associated with the operational phase of the proposed development will be road traffic emissions including nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). These pollutants are therefore considered as part of this assessment. Further details of the key pollutants are presented in Appendix A.

2. Legislation and Policy

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 European Union

The EU sets legally binding limit values for outdoor air pollutants to be met by EU countries by a given date. These limit values are based on the World Health Organisation (WHO) guidelines on outdoor air pollutants. These are legally binding and set out to protect human health and the environment by avoiding, preventing or reducing harmful air pollution effects.

The current air quality directive is the Directive 2008/50/EC⁴ on ambient air quality and cleaner air for Europe entered into force in June 2008. This merged most of the existing 'Daughter' Directives⁵ (apart from the fourth Daughter Directive); maintaining existing air quality objectives set out by 'Daughter' Directives for sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and oxides of Nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}), lead (Pb), benzene (C₆H₆), carbon monoxide (CO), ozone (O₃). It also includes related objectives, exposure concentration obligation and exposure reduction targets for PM_{2.5} (fine particles). The 'Daughter' Directives were based upon requirements set out in the first EU Ambient Air Quality Framework Directive 96/92/EEC⁶.

2.2 National Level – England

The UK government has a legal responsibility to meet the EU limit values. Part IV of the 1995 Environment Act⁷ sets guidelines for protecting air quality in the UK and forms the basis of the local air quality management. The Environment Act requires local authorities in the UK to review air quality in their area periodically and designate 'Air Quality Management Area' (AQMA) if improvements are necessary. Where an AQMA is designated, local authorities are also required to produce an 'Air Quality Action Plan' (AQAP) detailing the pollution reduction measures that need to be adopted to achieve the relevant air quality objectives within an AQMA.

As part of the Environment Act, the UK Government was required to publish a National Air Quality Strategy (NAQS) to establish the system of 'local air quality management' (LAQM) for the designation of AQMAs. This led to the introduction of the first Air Quality Strategy (AQS) in 1997⁸ which since has progressed through several revisions until it was replaced by the Air Quality Strategy for England,

⁴ European Union (2008): 'Ambient air quality assessment management', Framework Directive 2004/50/EC.

⁵ European Union. (1999), 'Ambient air quality assessment management', Framework Directive 1999/30/EC;

European Union. (2000), 'Ambient air quality assessment management', Framework Directive 2000/3/EC;

European Union. (2002), 'Ambient air quality assessment management', Framework Directive 2002/3/EC;

European Union. (2004), 'Ambient air quality assessment management', Framework Directive 2004/107/EC.

⁶ European Union. (1996), 'Ambient air quality assessment management', Framework Directive 96/62/EC.

⁷ Parliament of the United Kingdom. (1990), 'Environmental Protection Act', Chapter 43. Queen's Printer of Acts of Parliament.

⁸ Department for Environment Food and Rural Affairs. (1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.

Scotland, Wales and Northern Ireland 2007⁹. Each revision introduced strategies and regulations that considered measures for different pollutants by tightening existing objectives and also by introducing new ones to establish a common framework to protect human health and the environment by achieving ambient air quality improvements.

The 2008 EU ambient air quality directive 2008/50/EC was transposed to England law through the introduction of the Air Quality (Standards) Regulations in 2010¹⁰ which also incorporated the fourth EU Daughter Directive (2004/107/EC) that set target values for certain toxic heavy metals and polycyclic aromatic hydrocarbons, (PAH).

2.2.1 National Planning Policy Framework

The principal national planning policy guidance in respect of the proposed development is the National Planning Policy Framework (NPPF)¹¹. The most recent update of the NPPF was published on 24th July 2018 by the Department for Communities and Local Government (DCLG). The NPPF Section 170 (e) states that:

“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, taking into account relevant information...”

Section 180 states that:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.”

Section 181 states that:

“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

⁹ Department for Environment Food and Rural Affairs. (2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.

¹⁰ Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.

¹¹ National Planning Policy Framework. Accessible at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728643/Revised_NPPF_2018.pdf

in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

Section 183 states that:

“The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

2.2.2 Relevant National Planning Practice Guidance

The DCLG published a number of supporting web based resources of Planning Practice Guidance (PPG)¹² to supplement the NPPF. With respect to air quality PPG provide guidance on when air quality is relevant to a planning application. It states that:

“Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).”

The PPG also states that, when deciding whether air quality is relevant to a planning application, the applicant should consider whether the proposal will:

“Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. Introduce new point sources of air pollution.....,

Expose people to existing sources of air pollutants.....,

Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.....,

- *Affect biodiversity.....”*

2.2.3 Statutory Nuisance

It is recognised that the planning system presents a way of protecting amenity. However, in cases where planning conditions are not applicable to a development/installation, the requirements of the Environmental Protection Act 1990 still apply. Under Part III of the Environmental Protection Act 1990, local authorities have a statutory duty to investigate any complaints of:

- *“any premises in such a state as to be prejudicial to health or a nuisance*
- *smoke emitted from premises so as to be prejudicial to health or a nuisance*

¹² National Planning Practice Guidance web-based resource. Accessible at: <http://planningguidance.planningportal.gov.uk/>

- *fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*
- *any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*
- *any accumulation or deposit which is prejudicial to health or a nuisance”*

Where the local authority establishes any one of these issues constitutes a statutory nuisance and believes it to be unreasonably interfering with the use or enjoyment of someone’s premises and/or is prejudicial to health, an abatement notice will be served on the person responsible for the offence or the owner / occupier. Failure to comply with the notice could lead to a prosecution. However, it is considered as a defence if the best practicable means to prevent or to counteract the effects of the nuisance are employed.

2.2.4 Relevant National Air Quality Standards

A summary of the relevant Air Quality Standards/Objectives (henceforth referred to as ‘AQO’) and the types of receptors that are relevant to this assessment are presented in Table 2.1 and

Table 2.2. The AQO listed in Table 2.1 applies only at locations with relevant exposure where a member of the public could be exposed to a level of pollution concentration for the specific averaging periods for that pollutant as stated in Table 2.2.

Table 2.1: AQO Relevant to the Proposed Development

Pollutant	Air Quality Objectives		Concentration measured as:	Applicable to:
	Concentration	Allowance		
Nitrogen Dioxide (NO₂)	200 µg/m ³	18 per calendar year	1 hour mean	All local authorities
	40 µg/m ³		Annual mean	All local authorities
Particulate Matter (PM₁₀)	50 µg/m ³	35 per calendar year	24 hour mean	All local authorities
	40 µg/m ³		Annual mean	All local authorities
Particulate Matter (PM_{2.5}) Exposure reduction^(a)	25 µg/m ³ ^(a)		Annual	England only

Notes: ^(a) This is a target value set for a 15% reduction in concentrations at urban background aimed to achieve between 2010 and 2020

Source: Department for Environment Food and Rural Affairs (2014): ‘Local Air Quality Management Technical Guidance’ (TG.16).

Table 2.2: Examples of Where the AQO Should Apply

<i>Averaging period</i>	<i>Objectives should apply at</i>	<i>Objectives should not apply at</i>
<i>Annual</i>	<i>All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.</i>	<i>Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.</i>
<i>24 Hour</i>	<i>All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.^(a)</i>	<i>Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.</i>
<i>1 Hour</i>	<i>All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.</i>	<i>Kerbside sites where the public would not be expected to have regular access.</i>

Note: ^(a) “Such locations should represent parts of the garden where relevant public exposure to pollutants is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.”

Source: Department for Environment Food and Rural Affairs (2014): ‘Local Air Quality management Technical Guidance’ (TG.16).

2.3 Local Level – (Reading Borough Council)

The Core Strategy was first adopted in January, 2008¹³. With alteration it was published on 27th January, 2015 which includes number of policies relevant to Air Quality.

In policy CS11 ‘use of employment land for alternative uses’, 5.15 factors which may be taken into account in assessing criteria states that:

“.....effects on neighbouring uses of noise, pollution and air quality, intensity of activity.....”

Policy CS34 Pollution and water resources states that:

“.....The Environmental Protection background paper has highlighted that there are pockets of poor air quality within Reading caused by vehicles emissions.....”

In the indicator section of the same policy, it states that:

“.....Number/ percentage of planning applications dealt with where air quality was a material consideration.....”

¹³ Reading Borough Council (2008): Core Strategy (with alteration adopted 27th January 2015)

3. Methodology

3.1 Overview

This section provides the details of the methodological approach taken to assess the impacts on air quality from the construction and operation of the proposed development; addressing the following key elements:

- Scope of the assessment;
- Dispersion modelling approach;
- Modelled scenarios; and
- Model parameters - such as emission factors, NO_x to NO₂ conversion, estimating background concentrations, meteorology, and criteria used to assess the residential suitability of the proposed development, addressing uncertainties, model assumptions and limitations.

3.2 Scope of the Assessment

The assessment is based on the following scope of work presented in Table 3.1:

Table 3.1: Scope of Work

Scope	Phase	Consideration
Spatial	Construction	Based on the IAQM Guidance, sensitive receptors within 350 m of the proposed development have been considered. For trackout IAQM guidance suggest without site specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. It is considered that the trackout impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.
	Operation	The assessment considers those roads which have potential to significantly change traffic as a result of the proposed development. Impacts on air quality arising from traffic related emissions are considered unnoticeable above background concentrations beyond 200 m from the source¹⁴. Hence, this assessment only considered receptors within 200 m from a road source. Sensitive receptors that are likely to experience greatest change in concentration in terms of traffic related emission as a result of the proposed development are considered within this assessment.

¹⁴ Highways England (2007), Design Manual for Roads and Bridges (DMRB), Volume 11 Section 3 Part 1 Air Quality. Available at: <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/ha20707.pdf>.

Temporal	Construction	The construction phase effects resulting from the proposed development for all key phases of construction have been considered for the duration of the construction period.
	Operational	The operational phase effects resulting from the proposed development have been considered for the earliest possible year of occupation, 2019.

3.3 Construction Phase Assessment

3.3.1 Site Traffic Emissions on Local Roads

The IAQM planning guidance suggests construction road traffic emissions should be assessed using the same methodology and significance criteria used for assessing operational traffic impacts. Therefore, this assessment used the EPUK operational traffic criteria presented in Appendix B to assess the impact of construction road traffic emissions as a result of the proposed development.

It is not anticipated that the development will generate long term construction related traffic movement greater than 100 AADT¹⁵ or 25 daily HDV¹⁶ within the AQMA. Therefore, the impacts of exhaust emissions from construction site traffic are not considered significant and on this basis no further consideration has been given to the effects of construction traffic on ambient air quality.

3.3.2 Construction Site Plant Emissions

The IAQM guidance for construction dust assessments suggests that the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) are unlikely to have a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. In the context of the proposed development site, construction site plant emissions are considered to be negligible when compared to the local road traffic contribution of exhaust emission. Consequently, any impact on the AQO for NO₂ and PM₁₀ arising from construction plant are considered insignificant and have been scoped out of the assessment.

3.3.3 Construction Dust Assessment

A construction dust assessment was carried out to consider impacts from 'disamenity' (or 'nuisance') dust as discussed in Section 1.4, associated with annoyance. The development has potential to generate dust during the construction phase of the project. Although there are no standards (such as AQO) for dust disamenity or annoyance, various 'custom and practice' criteria have become established.

For the purpose of this assessment, the IAQM construction dust risk guidance has been used.

The IAQM guidance provides a methodology (Appendix C) to evaluate potential risk of dust generation for a development and the level of mitigation required. The impact of the development is described using one of the following three categories: 'Low

¹⁵ Annual Average Daily Traffic

¹⁶ Heavy Duty Vehicle

Risk', 'Medium Risk' and 'High Risk'. Based on the risk level, appropriate mitigation measures can be considered to minimise any effects of dust from the construction phase.

3.4 Operational Phase Assessment

3.4.1 Modelled Scenarios

The proposed development will only introduce 4 residential flats. Based on the IAQM planning guidance (Appendix B), the proposed development is unlikely to exceed the 100 AADT threshold for daily traffic generation. Therefore, a detailed consideration for operational traffic emissions as a result of the proposed development can be scoped out.

However, an assessment for residential suitability to investigate the existing air quality impact on the proposed new sensitive receptors has been carried out.

Based on above the following scenarios have been considered:

- 2016 Base Year and
- 2019 Earliest Year of Occupation.

The model verification has been carried out using 2016 base year traffic data. Further details of the model verification process are presented in Appendix D.

According to the guidance provided by Defra in their Air Quality Strategy, vehicle emissions are expected to decrease in future years as a result of advancement in abatement technologies. It is also expected that more stringent emission limits will be imposed upon manufacturers. Hence, the 2019 operational year scenario was considered to be the worst case and therefore no future year scenario was considered in this assessment.

3.4.2 Dispersion Model Used

The assessment on identifying the impact of current traffic related emissions sources in the area of the proposed development has been carried out using the latest version of 'ADMS-Roads' Dispersion Modelling PC based software (version 4.1.1.0) developed by Cambridge Environmental Research Consultants (CERC). This model is commonly used in planning application and regulatory assessment of traffic related emissions.

3.4.3 Road Traffic Data

Key facts for the traffic data used are:

- Traffic flow data are based on the DfT Traffic counts¹⁷;
- Speed at junctions has been reduced as advised in Defra Technical Guidance (TG16) for a robust assessment; and

¹⁷ Available at - <https://www.dft.gov.uk/traffic-counts/cp.php?la=Ealing>

- The Trip End Model Presentation Program (TEMPRo), DfT's traffic forecasting software was used to obtain annual factors to calculate the 2019 future year assessment scenario.

Table 3.2 shows the traffic data for the proposed development and Figure 3.1 shows the extent of the ADMS-Roads dispersion modelling network.

Table 3.2: Relevant traffic data for the proposed development

Link Name	Base year (2016)			Opening year (2019)		
	AADT (per hour)	HDV %	Speed (kph)	AADT (per hour)	HDV %	Speed (kph)
A4155 Church St	1161	3%	20 (a)	1218	3%	20 (a)

Note: (a) Conservative assumption

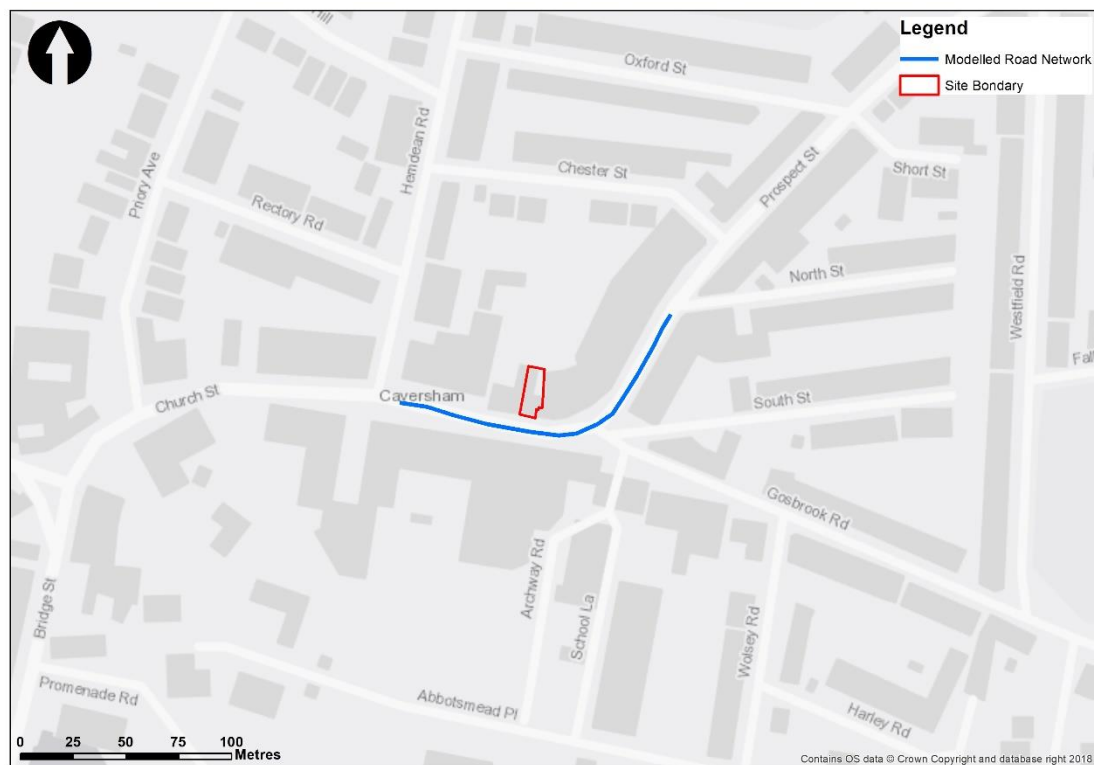


Figure 3.1: Modelled Road Network

3.4.4 Meteorological Data

The key meteorological parameters for dispersion modelling are wind speed and wind direction. There are other meteorological parameters which also need to be taken into account such as cloud cover, surface temperature, precipitation rate and relative temperature.

For dispersion modelling purposes, data are required on an hourly resolution and local sites cannot always provide reliable data for all the meteorological parameters on an hourly basis.

Based on above, the most representative meteorological monitoring station identified is the Heathrow Airport meteorological monitoring site which is located approximately 31 km east from the proposed development site.

In order to undertake a worst-case meteorological assessment, the dispersion modelling has been carried out with meteorological data from the period 2015 to 2017. Data are presented on a receptor by receptor basis for the maximum annual mean concentrations predicted across the modelled years. Figure 3.2 below presents the windrose for each modelling year:

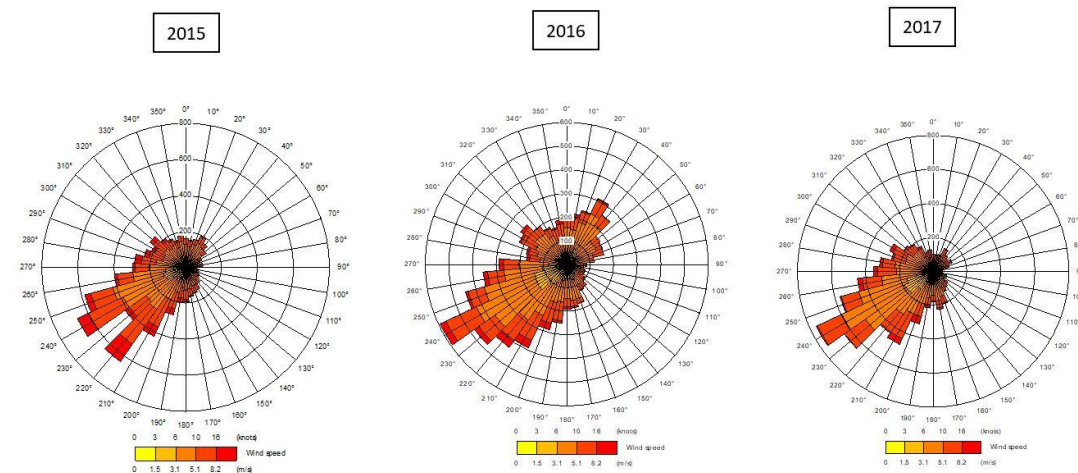


Figure 3.2: Windrose for Heathrow Airport Meteorological Station 2015-2017

3.4.5 Assessment of Background Concentrations

This assessment considers road traffic emission sources in detail and as part of the predictive process all non-road traffic related emission sources in the Defra data set were assigned appropriate 'background' concentrations at the modelled receptors. Further details regarding the assignment of background pollution concentration are presented in Section 4.3.

3.4.6 Emission Factors

For the purpose of this assessment, the latest Defra Emission Factor Toolkit (EFT 8.0.1, December 2017) has been used for the earliest opening year. The EFT Version 8.0.1 has been developed for the UK by the National Atmospheric Emissions Inventory (NAEI) and Transport for London (TfL). The EFT is based on data collected from a number of sources including the European Environment Agency (EEA) COPERT (Computer Programme to calculate Emissions from Road Transport) emission calculator.

3.4.7 NO_x to NO₂ Conversion Method

This assessment uses the latest NO_x to NO₂ conversion factor toolkit for the operational phase of this development (Version 6.1 released October 2017), provided by Defra as a Microsoft Excel based calculation tool which is available from Defra's

web-based air quality resource centre¹⁸. This method is considered to be the most appropriate technique of determining NO₂ concentrations from road NO_x contributions.

3.4.8 Estimating Hourly and Daily Mean Concentrations

The latest Local Air Quality Management (LAQM) Technical Guidance TG (16) has been used for predicting 1 hourly and 24-hourly pollutant concentrations.

The guidance suggests that the short term hourly NO₂ AQO of 200 µg/m³ (not to be exceeded more than 18 times per year) is not likely to exceed at any roadside locations if the annual mean concentration is below 60 µg/m³. Based on this guidance, the hourly mean NO₂ AQO is only considered when the annual mean NO₂ concentrations are over 60 µg/m³.

In accordance with the guidance, the short term 24 hourly PM₁₀ mean concentration can be calculated using the following equation as presented below:

$$\begin{aligned} & \text{Number of 24 hour mean exceedences} \\ & = 18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right) \end{aligned}$$

3.4.9 Relevant Sensitive Receptors

Table 3.3 and Figure 3.3 below present the locations of sensitive receptors considered within this assessment to assess residential suitability. the selected receptor locations are considered worst case location as they are the closest building façades of residential properties to the modelled road network.

Table 3.3: Relevant sensitive receptors identified for this assessment

Receptor Name	Receptor Number	National Grid Reference ^(a)		Height (m)	AQO Applicable
		X	Y		
Proposed Development Ground Floor Flat	R1	471405.	174797	1.5	Short and long term
Proposed Development 1 st Floor Flats	R2	471403	174788	3.8	Short and long term

Note: ^(a) British National Grid

¹⁸ Department for Environmental Food and Rural Affairs. Accessible at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>



Figure 3.3: Modelled Receptors

3.4.10 Criteria Used to Assess Significance

For the purpose of this assessment, residential suitability has been assessed by comparing the modelled data against the relevant AQO as presented within Section 2.2.4.

Model Uncertainties, assumptions and limitations

The assessment has been carried out based on the following assumptions:

- The earliest possible year of occupation is 2019;
- The mitigation measures proposed in Section 6 will be implemented in order to mitigate construction related dust nuisance;
- Emissions from vehicles are expected to decrease in the future as mentioned in Section 3.4.1. Hence, the 2019 operational year scenario was considered to be the worst case and therefore no further future year scenario was considered in this assessment;
- No assessment of any potential onsite energy plants has been carried out as it is assumed that Principle of Good Practice as stated in the IAQM guidance will be used when selecting the appropriate energy plant for the required design;
- For the construction dust risk assessment, it has been assumed that all construction activities will be carried out for the duration of the construction period in order to assess a worst-case scenario; and

- Dispersion modelling has associated uncertainties related to emission data, meteorological data and model algorithms. In order to address these uncertainties a model verification has been carried out by comparing the modelled concentrations with the monitored concentrations as described within the verification methodology presented in Appendix D.

4. Baseline Conditions

4.1 Overview

The following section sets out the baseline conditions in relation to air quality for the proposed development. Baseline air quality information is available from a number of sources including local and national monitoring data reports and websites. For the purposes of this assessment, data has been obtained from RBC most recent published Annual Review and Assessment Report¹⁹ and the Defra air quality resource website²⁰.

4.2 Existing Baseline Conditions

RBC currently have one AQMA and the proposed development is located within the Reading AQMA which is declared in 2009 for exceedance of the NO₂ annual mean objective.

RBC is currently undertaking automatic (continuous) monitoring of NO₂ and PM₁₀ at 4 monitoring location and PM_{2.5} monitoring at one location. RBC also undertaking non-automatic diffusion tubes (passive) monitoring of NO₂ at 62 sites within Reading.

There is no suitable automatic monitoring station within close proximity to the proposed development. However, there is a non-automatic (diffusion tube) monitor within 2m distance of the proposed development as shows in Figure 4.1. Therefore, this monitor is considered representative for the proposed development. The monitoring results presented within the ASR shows that the DT55 monitor has consistently breached the NO₂ annual mean objective within the last 5 years and the latest available year data for 2016 recorded 42 µg/m³. It should be noted that diffusion tube data are considered to be indicative and therefore a detailed dispersion modelling exercise has been carried out for this assessment to determine potential concentration at the proposed residential flats.

¹⁹ Reading Borough Council (2017): Air Quality Annual Status Report (ASR) for the year 2017

²⁰ Department for Environmental Food and Rural Affairs. Accessible at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>.



Figure 4.1: Nearest local air quality monitoring sites

4.3 Defra Background Pollution Concentrations

Defra provides background pollution concentration estimates to assist local authorities undertake their 'Review and Assessment' work. This data is available to download from Defra air quality resource website for NO_x, NO₂, PM₁₀ and PM_{2.5} for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2015 background data and the future year projections are available for 2015 to 2030. The background dataset provides breakdown of pollution concentrations by different sources (both road and non-road sources).

Table 4.1: Defra projected background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} for chosen assessment receptors

Receptor No	Receptor Name	NO _x	NO ₂	PM ₁₀	PM _{2.5}
R1 and R2	Proposed Development	32.03	21.52	14.90	9.62

Note: Data presented within the table are derived from the following ordinance survey grid squares: 471500, 174500.

5. Potential Impacts

5.1 Construction Phase

The construction phase of the proposed development is yet to be decided. For the purpose of this assessment the earliest construction year is assumed to be 2019. The impacts from earthworks, construction and track-out have been considered. No external demolition work will be involved and therefore not been considered any further. Due to the temporary nature of the construction activities, it is unlikely there will be a significant amount of HGV movements involved. In order to assess the worst-case scenario, it has been assumed that all activities will be carried out for the duration of the construction period. Figure 5.1 shows the construction dust assessment study area based on the recommended distances by IAQM.

Magnitude and sensitivity descriptors that have been applied to assess the overall impact of the construction phase are presented in Appendix C.

Table 5.1 presents the potential dust emission magnitude based on project specific construction activities and is based on the criteria presented in Table C 1 within Appendix C. The nearest SSSI site is over 50m distance from the proposed development site boundary. Therefore, ecological effects during the construction phase of the development can be scoped out based on the IAQM guidance.

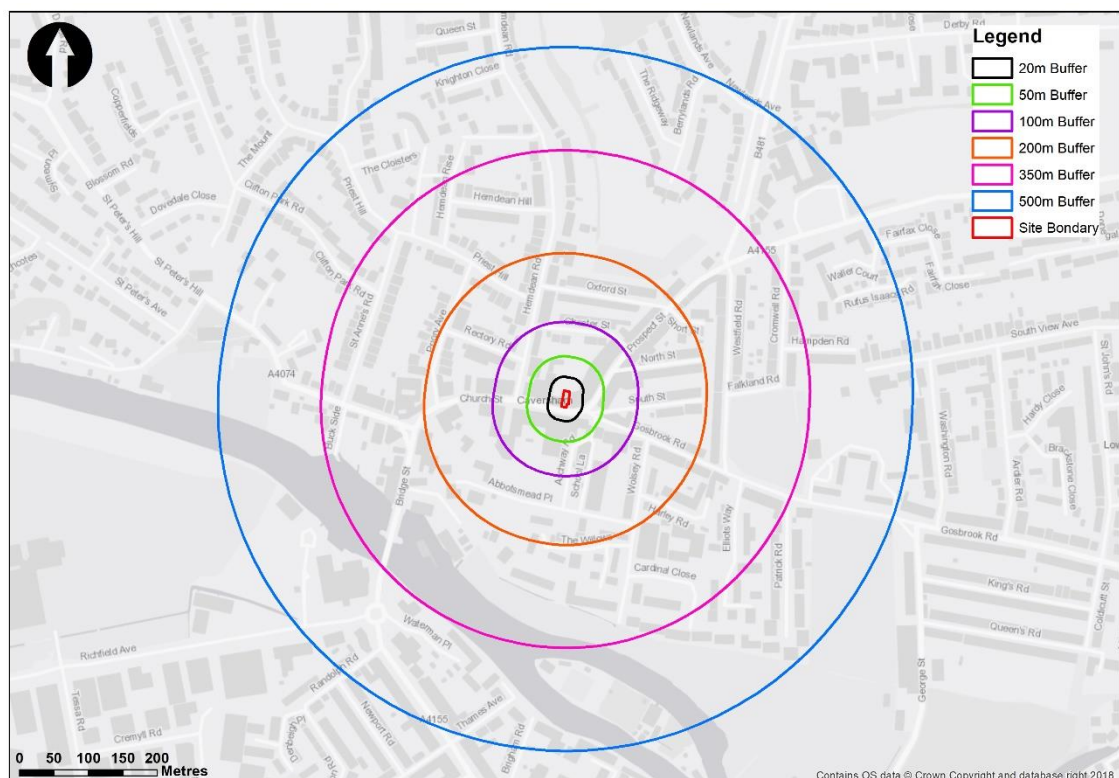


Figure 5.1: Construction assessment buffers

Table 5.1: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	NA
Earthworks	Small
Construction	Small
Track Out	Small

Table 5.2 presents the sensitivity of receptors to effects caused by construction activities and is based on the criteria presented in Table C 2 within Appendix C.

Table 5.2: Sensitivity of Study Area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low

The overall risk of receptors to dust soiling effects and PM₁₀ effects are presented in Table 5.3. Risk is based on the criteria presented in Table C 3 to Table C 6 within Appendix C.

Table 5.3: Summary of the Risk of Construction Effects

Sensitivity of Area	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	NA	Low Risk	Low Risk	Low Risk
Human Health	NA	Negligible	Negligible	Negligible

Based on the above, the largest risk associated with all construction activities are considered to be 'Low Risk' with regards to dust soiling and 'Negligible Risk' with regards to human health. Based on the outcome of the construction dust assessment, mitigation measures appropriate for the proposed development have been presented in Section 6 Overall, the impacts from disamenity dust and PM₁₀ from the construction phase of the proposed development are considered to be not significant.

5.2 Operational Impacts

The proposed development will introduce 4 residential flats. Therefore, based on the IAQM planning guidance (Appendix B), the operational impacts from the proposed development are considered to be negligible. Thus, the impacts from operational phase of the development is considered not significant.

5.3 Residential Suitability

It should be noted that pollution concentration reduces with increasing height. Therefore, concentrations at the first floor level would be less than ground floor level. However, the proposed ground floor residential flat is located at the rear of the building as the commercial space is occupying the front of the ground floor that is adjacent to the Church Street as shown in figures in Appendix F. Therefore, the concentration is likely to be less with the distance from the roadside. The existing commercial floor space already have planning permission to operate, therefore, this assessment has considered residential flats only.

Table 5.4 to Table 5.6 present forecast NO₂, PM₁₀ and PM_{2.5} pollutant concentrations respectively for all residential receptor points as discussed in section 3.4.9.

Table 5.4 shows the forecast annual mean NO₂ concentrations are below the annual mean AQO at all modelled receptor location.

According to Defra LAQM.TG (16) guidance, exceedance of the one-hour NO₂ mean objective is generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. The annual mean NO₂ concentration at all modelled receptors is comfortably lower than 60 µg/m³ and therefore it is unlikely that the one-hour mean will be exceeded at all modelled receptor locations.

Table 5.5 and Table 5.6 show that both PM₁₀ and PM_{2.5} predicted annual mean concentrations for all residential receptor locations are comfortably below the relevant AQO.

Defra also provides guidance on calculating the number of exceedances, as a 24-hour mean PM₁₀ concentration, of 50 µg/m³. At all modelled receptors the number of exceedances is considerably below the limit of 35 times within one calendar year.

Table 5.4: Annual Mean NO₂ Predicted Pollutant Concentrations (µg/m³) (2019)

Receptor Number	Receptor Name	NO ₂ Average Concentration (µg/m ³)	Relevant AQO (µg/m ³)
R1	First Floor	35.30	40
R2	Proposed Development	37.15	40

Table 5.5: Annual Mean PM₁₀ Predicted Pollutant Concentrations (µg/m³) (2019)

Receptor Number	Receptor Name	PM ₁₀ Average Concentration (µg/m ³)	Relevant AQO (µg/m ³)
R1	Proposed Development	15.46	40
R2	Proposed Development	15.54	40

Table 5.6: Annual Mean PM_{2.5} Predicted Pollutant Concentrations (µg/m³) (2019)

Receptor Number	Receptor Name	PM _{2.5} Average Concentration (µg/m ³)	Relevant AQO (µg/m ³)
R1	Proposed Development	10.57	25
R2	Proposed Development	10.71	25

6. Proposed Mitigation Measures

6.1 Construction Phase Mitigation Measures

Mitigation measures have been set out in Appendix E in accordance with mitigation measures set out in the IAQM guidance for construction dust to reduce the potential impacts presented in Section 5.

The risks of construction activities in relation to dust soiling were deemed 'Low Risk' and all risks to human health were deemed 'Negligible Risk'. Therefore, mitigation measures proposed in Appendix E are appropriate to mitigate 'Low Risk' effects.

6.2 Operational Phase Mitigation Measures

The IAQM planning guidance states that new developments should be designed to minimise public exposure and that a presence of an AQMA should not halt the development but ensure that the planning system minimises any impacts as far as possible.

The proposed development is located within an existing AQMA, as illustrated in Figure 1.1. Based on the results presented within Section 5, the proposed development is not considered to need operational mitigation measures.

Based on the IAQM guidance, it is also recommended that all gas-fired boilers to meet a minimum standard of <40 mgNO_x/kWh.

7. Conclusion

This report provides an assessment of the following potential key impacts associated with the construction and operational phases of the proposed development at 40 Church Street, Caversham Reading, RG4 8AU:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the development on sensitive receptors;
- Changes in traffic related pollutant concentrations associated with the operational phase of the proposed development; and
- Assessing the suitability of the site for the introduction of new residential receptors.

A qualitative assessment of construction dust effects has been undertaken for the proposed scheme. The construction phase is predicted to have a 'Low Risk' of nuisance and/or loss of amenity impacts due to dust nuisance. However, the risk of dust nuisance can be mitigated by implementing the proposed mitigation measures listed in Appendix E and therefore impact of construction dust is not considered significant.

Due to the proposed small number of residential flats the operational impact on the local air quality from transport-related emissions is considered to be negligible.

Based on the modelled results presented above, which indicate that predicted concentrations of NO₂, PM₁₀ and PM_{2.5} would be below the respective Air Quality Objectives, and with the implementation of mitigation measures recommended in Section 6, the proposed development is deemed suitable for residential use.

It can therefore be concluded that the proposed development is not considered to conflict with any national, regional, or local planning policy.

Appendix A: Key Pollutants

A1. Nitrogen Dioxide (NO₂)

Nitrogen dioxide (NO₂) and nitric oxide (NO) are collectively referred as oxides of nitrogen (NO_x). During fuel combustion, atmospheric nitrogen combines with oxygen to form nitric oxide (NO), which is not considered harmful. Through, a chemical reaction with ozone (O₃), however NO can further combine with oxygen to create NO₂ which is harmful to human health and vegetation. The foremost sources of NO₂ in the UK are from combustion sources produced mainly by road traffic and power generation.

A2. Particulate Matter

Particulate matter is a term which refers to a mixture of solid particles and liquid droplets found in the air. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others can be so small that they can only be detected using an electron microscope. Fine dust, essentially particles up to 10 micron (µm), is commonly referred to as PM₁₀.

PM₁₀ is known to arise from a number of sources such as construction sites, road traffic movement, industrial and agricultural activities. Very fine particles (PM_{2.5} – PM_{0.1}) are known to be associated with pollutants such as oxides of nitrogen (NO_x) and sulphur dioxide (SO₂) emitted from power plants, industrial installation and road transport sources. PM_{2.5} is generally associated with combustion and traffic sources and is more likely to be associated with the operational phase of the proposed development.

A3. ‘Disamenity’ Dust

‘Dust’ is generally regarded as particulate matter up to 75 µm (micron) diameter and in an environmental context can be considered in two categories, according to size: coarser dust (essentially particles greater than 10 µm) and fine particulate matter (PM₁₀ and PM_{2.5}) as set out above.

Coarser dust (essentially particles greater than 10 µm) is generally regarded as ‘disamenity dust’ and can be associated with annoyance, although there are no official standards (such as AQO) for dust annoyance. Disamenity dust is more readily described than defined as it relates to the visual impact of short-lived dust clouds and the long-term soiling of surfaces.

Although it is a widespread environmental phenomenon, dust is also generated through many human activities including industrial and materials handling sites, construction and demolition sites and roads. Dust is generally produced by mechanical action on materials and is carried by moving air when there is sufficient energy in the airstream. More energy is required for dust to become airborne than for it to remain suspended.

Appendix B: Operational Impact Assessment Methodology

The EPUK & IAQM guidance refers to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] for a definition of a 'major' development when scoping assessments required for the planning process. Based on the guidance, a 'major' development is such development where:

- The number of dwellings is 10 or above;
- The residential development is carried out of a site of more than 0.5ha where the number of dwellings is unknown;
- The provision of more than 1,000 m² commercial floorspace; or,
- Development carried out on land of 1ha or more.

It is recommended that consideration should be given to reduce impacts from any 'major' developments by considering:

- The impact of existing sources in the local area on the proposed development; and
- The impacts of the proposed development on the local area.

The assessment process involves two stages where:

Stage 1 scope out the need for an air quality assessment and **Stage 2** provide guidance of determining the level of assessment required for a project.

Table B 1 below sets out the Stage 1 criteria to determine the need to assess impacts arising from small developments and Table B 2 provides more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area.

Table B 1: Stage 1 Criteria to proceed to Stage 2

Criteria to Proceed to Stage 2	
A	If any of the following apply: ● or more residential units of a site area of more than 0.5ha ● More than 1,000m² of floor space for all other uses or a site area greater than 1ha
B	Coupled with any of the following: ● The development has more than 10 parking spaces ● The development will have a centralised energy facility or other centralised combustion process

Table B 2: Indicative Criteria for Requiring an Air Quality Assessment

The development will	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors.	Typically, any combustion plant where the single or combined NO _x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion.
NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

Appendix C: Construction Dust Assessment Criteria

IAQM guidance framework on assessing the risk of dust proposes the construction phase should be split into phases dependent on their potential impacts, determining the risk for each individually. Therefore, this assessment has determined the risk of the four construction categories put forward by the IAQM guidance:

- Demolition;
- Earthworks;
- Construction; and
- Track out (transport of dust and dirt onto the public road network).

The IAQM guidance framework states that the risk of dust impacts from the four categories can be defined as 'negligible', 'low risk', 'medium risk' or 'high risk' depending upon the scale and nature of the construction activity and the sensitivity and proximity of receptors to the construction site boundary. This categorisation is used to put forward appropriate mitigation measures, reducing the level of effects from the dust impacts so they are not significant.

The assessment of dust impacts using the IAQM guidance considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to significant increase in exposure to PM₁₀.

Step 1 of the assessment is set out to screen for the requirement for a more detailed assessment for the proposed development. The screening criteria states:

A 'human receptor' within:

- 350 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

An 'ecological receptor' within:

- 50 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

Where there are no receptors and the level of risk is deemed 'negligible', there is no need for further assessment.

Step 2A of the assessment enables the overall dust emission magnitude (small, medium or large) from each dust source (demolition, earthworks, construction and trackout) to be identified in relation with the criteria outlined in Table C 1.

Table C 1: Dust emission magnitude

Source	Large	Medium	Small
Demolition	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level.	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities <10 – 20 m above ground level.	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Earthworks	Total site area >10,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes.	Total site area 2,500 m ² – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes.	Total site area <2,500 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction	Total building volume >100,000 m ³ , on site concrete batching or sandblasting.	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Track out	>50 HDV (>3.5t) outward movements ^a in any one day ^b , potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	10-50 HDV (>3.5t) outward movements ^a in any one day ^b , moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.	<10 HDV (>3.5t) outward movements ^a in any one day ^b , surface material with low potential for dust release, unpaved road length <50 m.

Notes: ^a Vehicle movement is a one-way journey. i.e. from A to B, and excludes the return journey.

^b HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.

Step 2B allows for the sensitivity of the area (high, medium or low) to be assessed and takes into account a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the existing local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Receptor sensitivity has been based on the highest of any criteria being met thus, the assessment is considered as robust. The sensitivity of the area is further determined for dust soiling, human health and ecosystem effects by considering the criteria presented in Table C 2.

Table C 2: Magnitude of Receptor Sensitivity

Source	High	Medium	Low
Sensitivities of people to dust soiling effects	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks^b and car showrooms.	• Users would expect^a to enjoy a reasonable level of amenity, but would not reasonably expect^a to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected^a to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.	• The enjoyment of amenity would not reasonably be expected^a; or • Property would not reasonably be expected^a to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks^b and roads.

Sensitivities of people to health effects of PM₁₀	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).^c • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations where the people exposed are workers^d, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM₁₀, as protection is covered by Health and Safety at Work legislation.	• Locations where human exposure is transient.^e • Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of receptors to ecological effects	• Locations with an international or national designation and the designated features may be affected by dust soiling; or • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	• Locations with a local designation where the features may be affected by dust deposition. • Indicative example is a local Nature Reserve with dust sensitive features.

containing concrete
(alkali) buildings.

Notes: ^a People's expectations will vary depending on the existing dust deposition in the area, see Section 4.2.

^b Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

^c This follows Defra guidance as set out in LAQM.TG (09).

^d Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM₁₀. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

^e There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

^f Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

The final step, step 2C allows for the risk of impacts to be defined. The dust emission magnitude derived in step 2A is combined with the sensitivity of the area defined in step 2B to determine the risk of effects on:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to an increase in exposure to PM₁₀.

The criteria for each of the dust sources are presented in Table C 3, Table C 4, Table C 5 and Table C 6.

Table C 3: Demolition

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

Table C 4: Earthworks

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

Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table C 5: Construction

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

Table C 6: Track out

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

Appendix D: Model Verification

The model verification process includes checks which are carried out to determine the performance of a dispersion model and ensure monitoring results are not biased due to any model uncertainties. Uncertainties are associated with multiple modelling inputs including:

- traffic flows,
- speeds and vehicle splits;
- emissions estimates;
- background concentrations;
- meteorological data; and
- surface roughness, length and terrain.

Model verification is mainly undertaken by comparing modelled results with monitoring data. Uncertainties and differences in data can be identified and resolved by model refinement or adjustment of the model output using a verification factor. The verification factor can be calculated in accordance with the LAQM TG (16) guidance. Model verification was only carried out for nitrogen dioxide (NO₂) as no suitable background concentrations for PM₁₀ and PM_{2.5} were found for the modelled road network.

D1. Methodology

Based on the LAQM TG (16) guidance produced by Defra, verification of NO₂ concentrations has been carried out using data collected at diffusion tube monitoring sites near the proposed development. Table D.1 presents the monitoring data used within the model verification for NO₂.

Table D.1: Relevant NO₂ Monitoring Data Used for Model Verification

Site name	Monitor type	2016 NO ₂ Annual Mean (µg/m ³)
V1 (DT55)	Continuous monitoring	42

Table D.2 presents the Defra background concentrations used within the model. Road contributions were not removed from background concentrations to ensure a worst-case scenario.

Table D.2: Relevant Background Concentrations Used for Model Verification

Verification Site Name	2016 NO _x Background Annual Mean (µg/m ³)	2016 NO ₂ Background Annual Mean (µg/m ³)
V1 (DT55)	36.24	12.13

C2. Verification Results

Table D 3 presents the monitored and modelled annual mean NO₂ concentrations along with the percentage difference after verification method was applied. An adjustment factor was then derived by comparing the modelled road NO_x contribution against the monitored road NO_x contribution.

Table D 3: Comparison of monitored and modelled road NO₂ contribution

Site name	Monitored NO ₂ (µg/m ³)	Modelled NO ₂ (µg/m ³)	Difference in percentage
V1 (DT55)	42	27.22	-35.2

Based on the methodology presented above, an adjustment factor of 2.13 was estimated and applied to all road NO_x contributions to take account for systematic bias.

Appendix E: Mitigation Measures for Construction Impacts

Mitigation measures set out are from IAQM guidance for construction dust and are appropriate for the mitigation of 'Low Risk' effects as proposed below:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Develop a Dust Management Plan.
- Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
- Display the head or regional office contact information.
- Record and respond to all dust and air quality pollutant emissions complaints.
- Make a complaints log available to the local authority when asked.
- Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
- Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
- Plan site layout: machinery and dust causing activities should be located away from receptors.
- Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
- Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
- Agree monitoring locations with the Local Authority.
- Where possible, commence baseline monitoring at least three months before phase begins.
- Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.
- 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 possible.
- Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes 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 appropriate).

- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- 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 mitigation (using recycled water where possible).
- Use enclosed chutes, conveyors and covered skips.
- Minimise 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.
- Reuse and recycle waste to reduce dust from waste materials.
- Avoid bonfires and burning of waste materials.
- 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 operations.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.
- Avoid scabbling (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.
- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Appendix F: Site Drawings

OS MAP (OS)

40 Church Street, Reading, RG4

Notes

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Site Location Plan, 1:1250 (A4)



FOR TOWN PLANNING ONLY

DWG NO: P001A

June 2018

Neighbouring property

Existing structure

Rahul Taheem

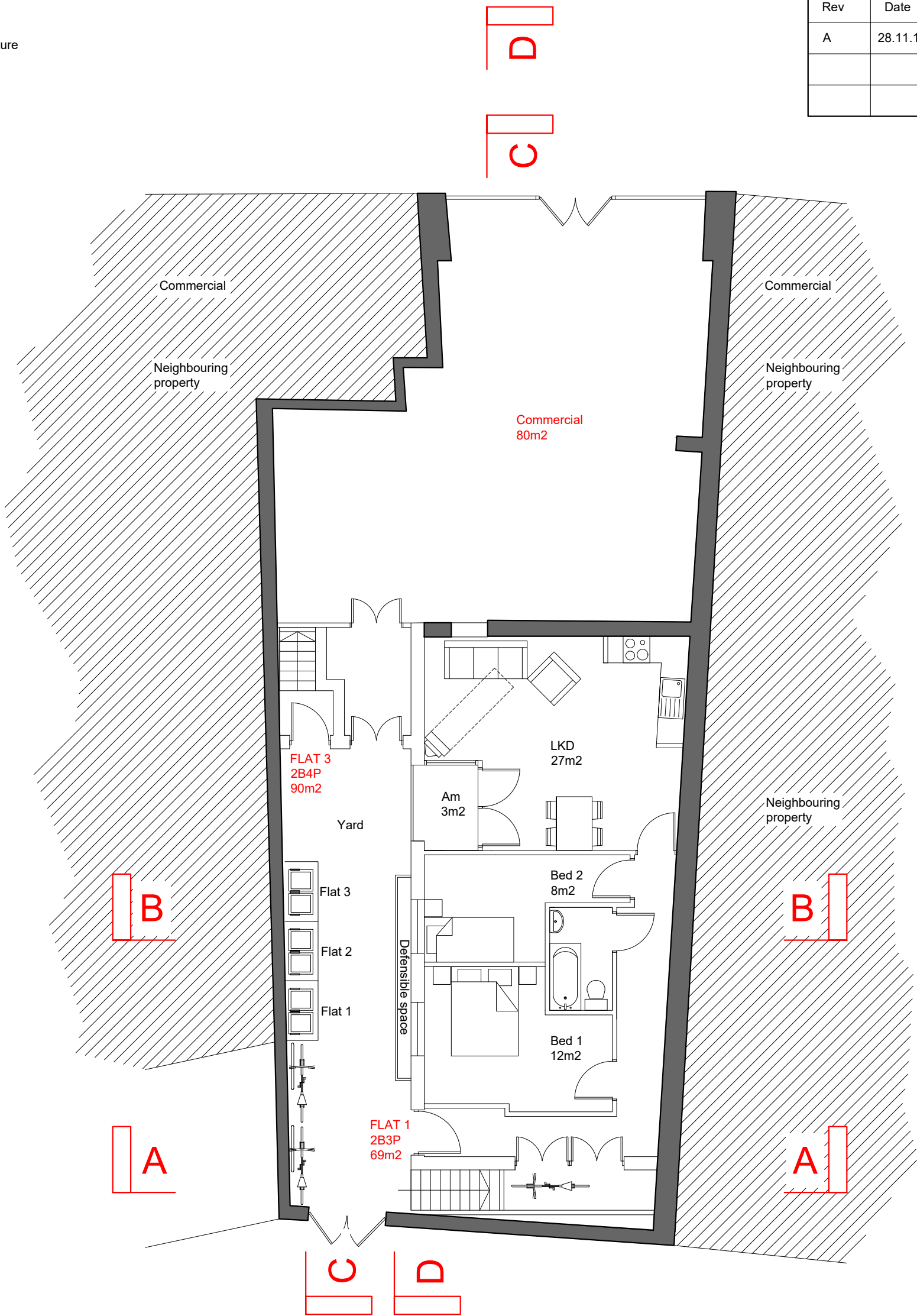
RTAC

© 2017

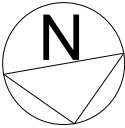
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Notes

Rev	Date	Comments
A	28.11.18	Mods



Ground floor proposed

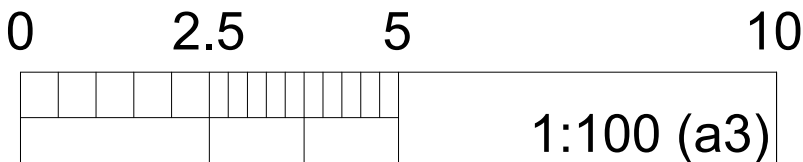


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40 Church Street Reading RG4 8AU

Metres



Neighbouring property

Existing structure

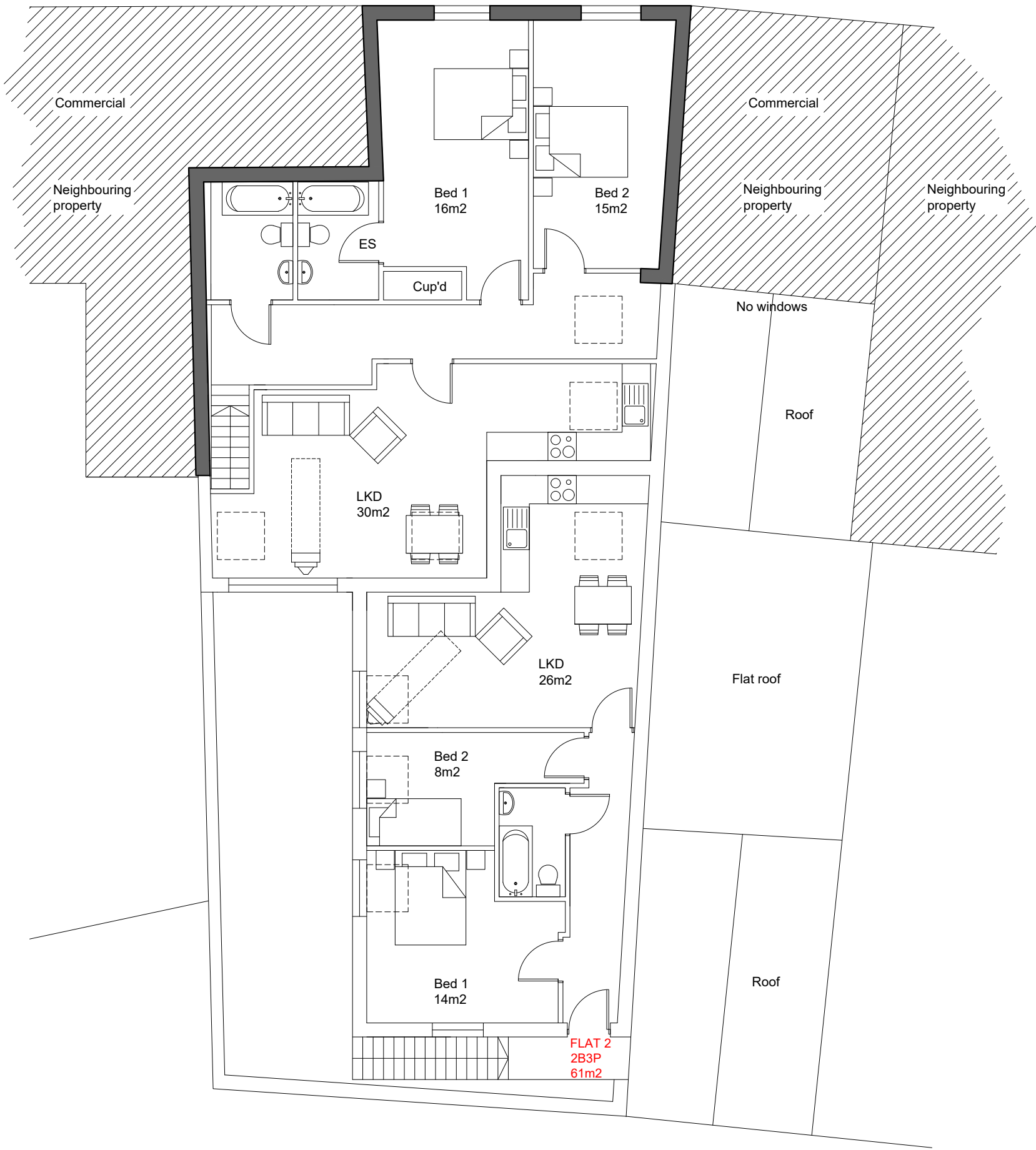
RTAC

© 2017

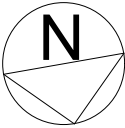
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Notes

Rev	Date	Comments
A	28.11.18	Mods



First floor proposed



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June 2018

RTAC
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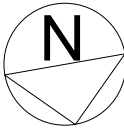
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Notes

Rev

Date

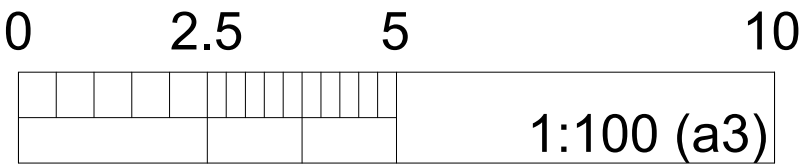
Comments



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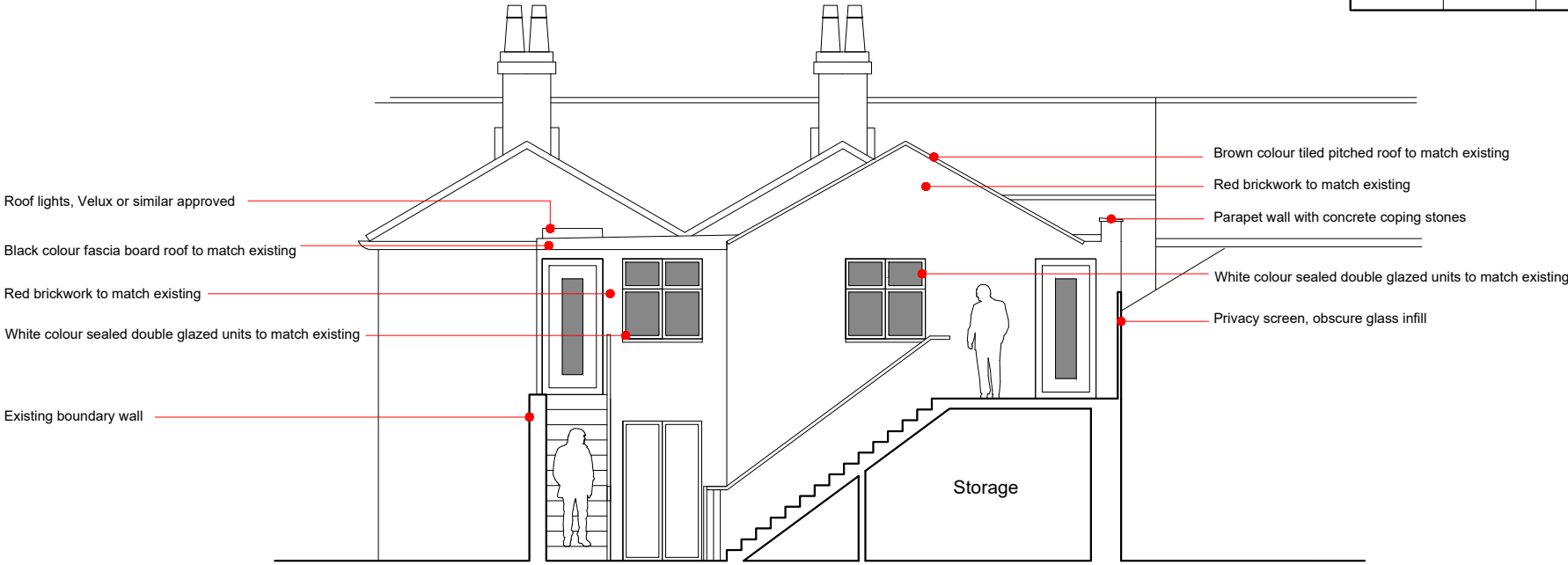
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Metres

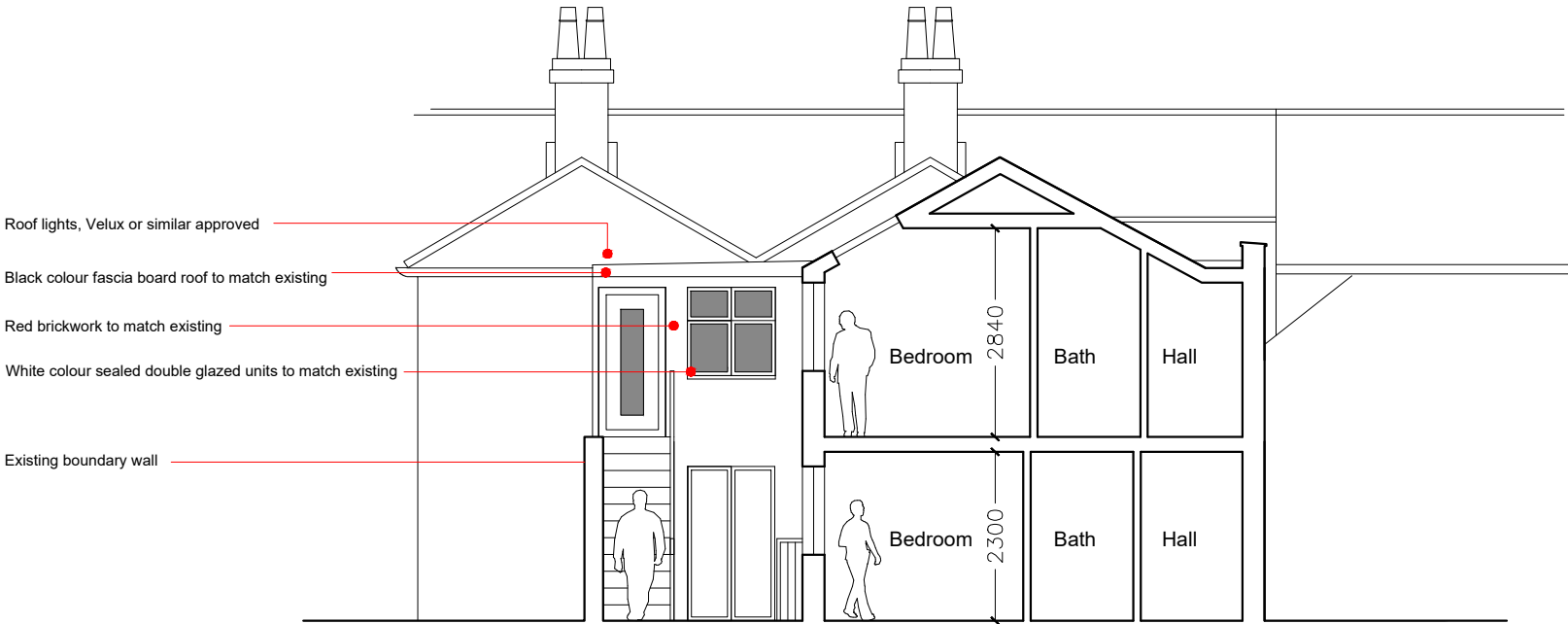


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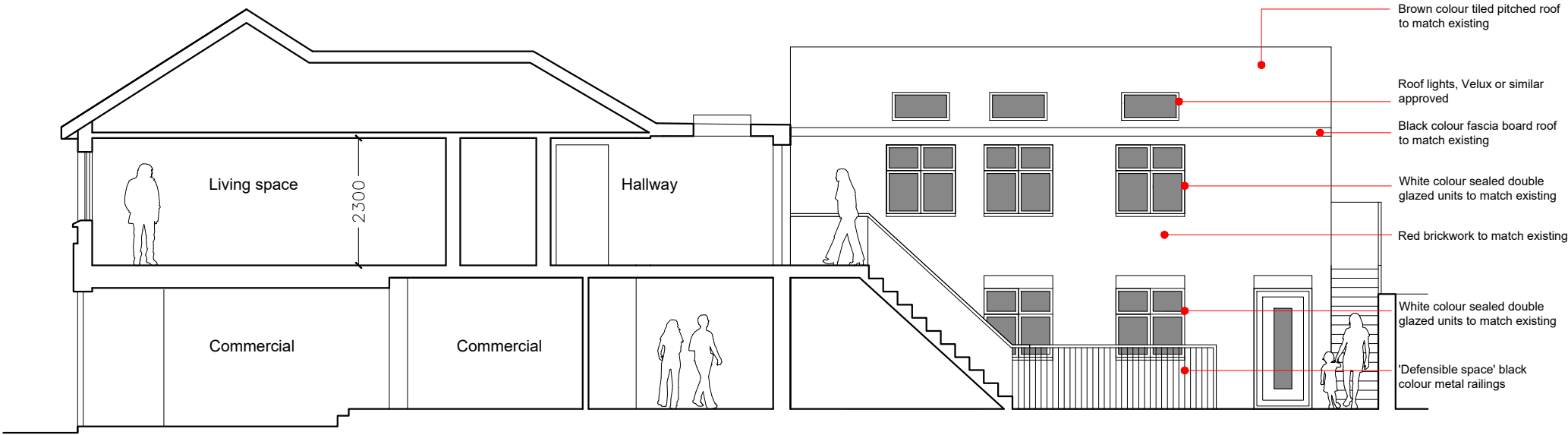
Rev	Date	Comments



Section AA proposed



Section BB proposed



Section CC proposed

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FOR TOWN PLANNING ONLY

DWG NO: P005

June 2018

Rahul Taheem



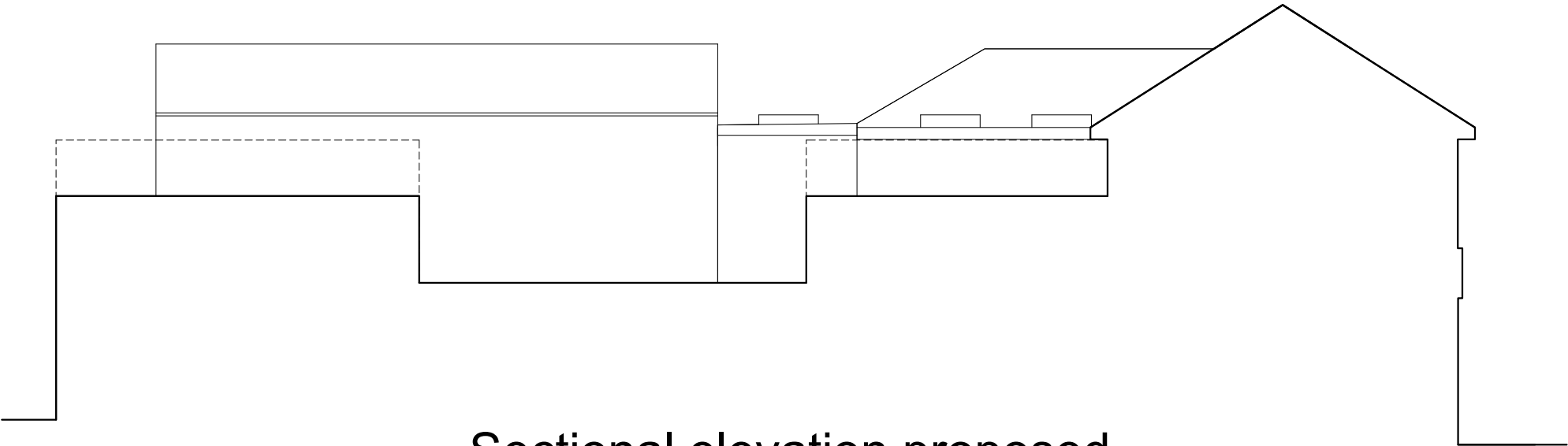
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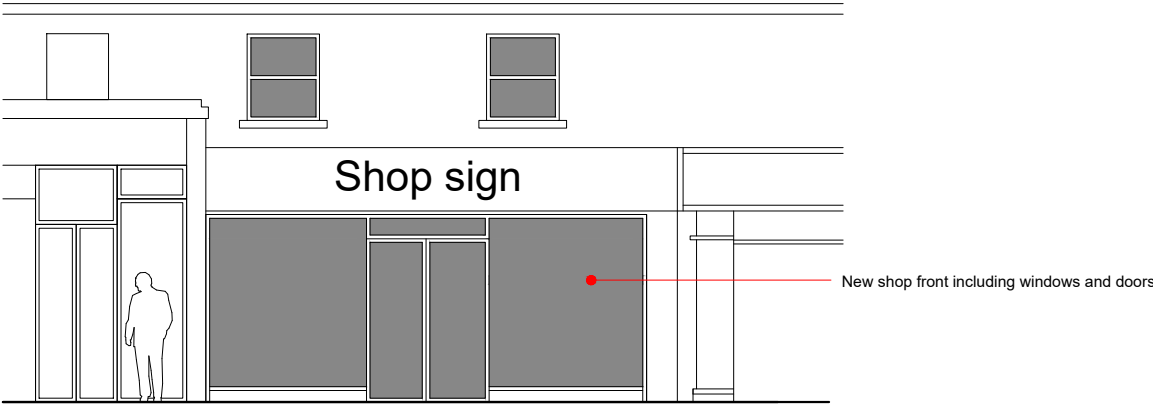
Rev	Date	Comments
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Section DD proposed



Sectional elevation proposed



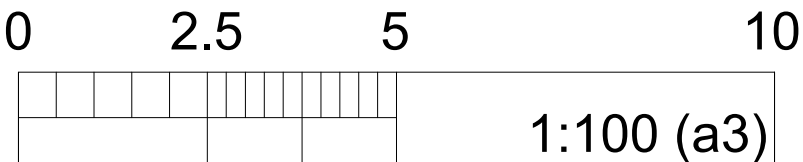
Front elevation proposed

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40 Church Street Reading RG4 8AU

Metres

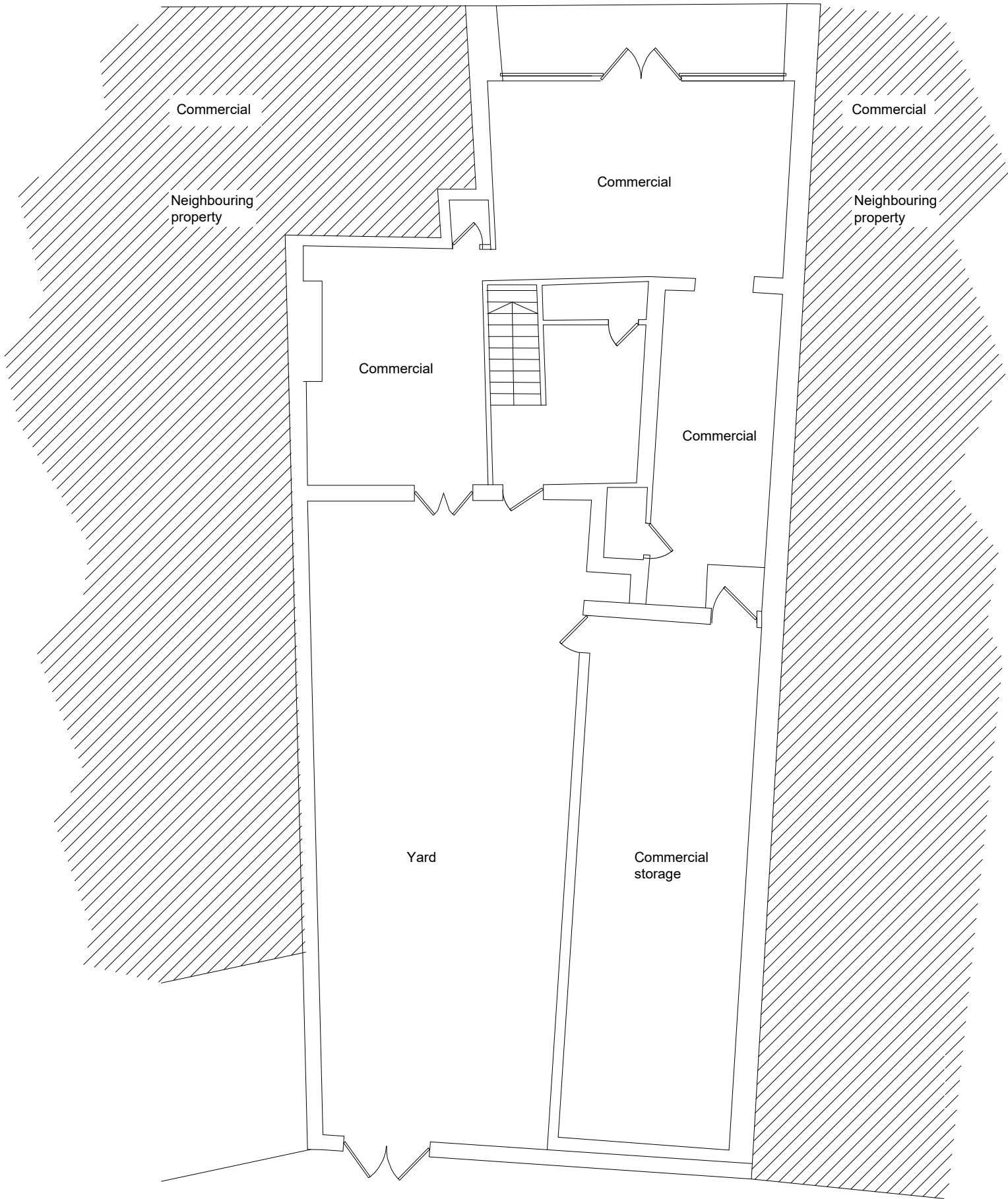


FOR TOWN PLANNING ONLY

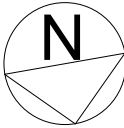
DWG NO: S001

June 2018

Note: Survey by others



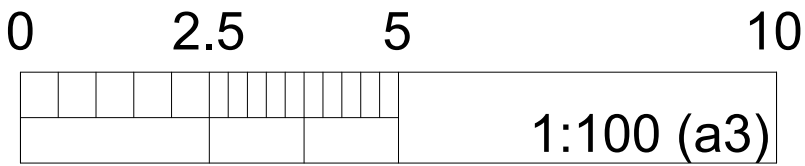
Ground floor existing



Notes
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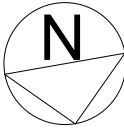
40 Church Street Reading RG4 8AU

Metres





First floor existing



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