

# Air Quality Assessment for the proposed development at Drake Way, Reading



Report to Diageo Pension Trust Ltd  
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**Aether** 

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# 1. Introduction

Aether has been commissioned by Wrenbridge Land Ltd on behalf of Diageo Pension Trust Ltd to undertake an air quality screening assessment for the proposed extension of the BMW car dealership at Drake Way in Reading.

The development will consist of a used car display on 2,145m<sup>2</sup> of land currently unoccupied. The proposed development would place an additional 74 parking spaces on site for the display of vehicles for sale.

The expected completion date of the proposed development is 2019.

The assessment utilises the Design Manual for Roads and Bridges (DMRB)<sup>1</sup>, a screening tool designed to assess the impact of traffic emissions at sensitive receptor locations. This approach has been undertaken to provide an indication of likely pollution levels.

## 1.1 The Location of the Development

The proposed development is located on Drake Way, Reading RG2 0GH (Figure 1).

Figure 1: Location of the development site



<sup>1</sup> Highways Agency's Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1 Air Quality, May 2007

## 1.2 Assessment Criteria

A summary of the air quality objectives relevant to the development, as set out in the UK Air Quality Strategy<sup>2</sup>, is presented in Table 1 below.

**Table 1: UK Air Quality Objectives for NO<sub>2</sub> and PM<sub>10</sub>**

| Pollutant                              | Concentration         | Measured as                                                                                |
|----------------------------------------|-----------------------|--------------------------------------------------------------------------------------------|
| Nitrogen Dioxide (NO <sub>2</sub> )    | 40 µg/m <sup>3</sup>  | Annual mean                                                                                |
|                                        | 200 µg/m <sup>3</sup> | Hourly mean not to be exceeded more than 18 times per year (99.8 <sup>th</sup> percentile) |
| Particulate Matter (PM <sub>10</sub> ) | 40 µg/m <sup>3</sup>  | Annual mean                                                                                |
|                                        | 50 µg/m <sup>3</sup>  | 24 hour mean not to be exceeded more than 35 times a year (90.4 <sup>th</sup> percentile)  |

The oxides of nitrogen (NO<sub>x</sub>) comprise principally of nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>). NO<sub>2</sub> is a reddish brown gas (at sufficiently high concentrations) and occurs as a result of the oxidation of NO, which in turn originates from the combination of atmospheric nitrogen and oxygen during combustion processes. NO<sub>2</sub> can also form in the atmosphere due to a chemical reaction between NO and ozone (O<sub>3</sub>). Health based standards for NO<sub>x</sub> generally relate to NO<sub>2</sub>, where acute and long-term exposure may adversely affect the respiratory system.

Particulate matter is a term used to describe all suspended solid matter, sometimes referred to as Total Suspended Particulate matter (TSP). Sources of particles in the air include road transport, power stations, quarrying, mining and agriculture. Chemical processes in the atmosphere can also lead to the formation of particles. Particulate matter with an aerodynamic diameter of less than 10 µm is the subject of health concerns because of its ability to penetrate deep within the lungs and is known in its abbreviated form as PM<sub>10</sub>.

Further information on the health effects of air pollution can be found in the reports produced by the Committee on the Medical Effects of Air Pollutants<sup>3</sup>.

As defined by the regulations, the air quality objectives for the protection of human health are applicable:

- Outside of buildings or other natural or man-made structures above or below ground; and
- Where members of the public are regularly present.

Using these definitions, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building façades of residential properties, schools and

<sup>2</sup> The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

<sup>3</sup> <https://www.gov.uk/government/collections/comeap-reports>

hospitals and will not apply at the building façades of offices or other places of work, where members of the public do not have regular access. The 24 hour objective will apply at all locations where the annual mean objective would apply together with hotels. Therefore, in this assessment the hourly objective will apply at all levels of the development. The annual and daily mean objectives are not applicable due to the commercial nature of the development.

## 1.3 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP).

Reading Borough Council declared an AQMA<sup>4</sup> for the annual mean nitrogen dioxide objective, for an area covering Reading town centre, the main road routes into Reading and along railway lines where they pass through built up areas. The proposed development lies adjacent to the AQMA.

An AQAP was produced in 2009, with an update provided in 2016<sup>5</sup>; this outlines the measures that the Council are taking to improve air quality.

## 1.4 The DMRB Screening Method

Following a discussion with Reading Borough Council<sup>6</sup>, a screening assessment has been undertaken. This is because the development is small, generating little traffic or emissions and given the location outside of an AQMA, no air quality constraints have been identified.

The Highways Agency's Design Manual for Roads and Bridges (DMRB), a screening tool that can be used to predict concentrations of pollutants in the vicinity of roads, has been used. The methodology has been used for many years in support of planning applications for new residential/commercial developments and road building projects.

The DMRB model is only able to provide an estimate of ground level pollutant concentrations.

The screening method predicts annual average ground level concentrations at sensitive receptors by applying average roadside emission dispersion curves and correcting for vehicle type and speed. The screening method incorporated the latest vehicle classifications at the time of publication; however these have now been superseded and the DMRB model is expected to be updated shortly.

The most recent version of the DMRB (1.03c) was issued in July 2007 and requires the following information to assess the impact at sensitive receptor locations:

- Annual average daily traffic (AADT) flows;

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<sup>4</sup> [http://old.reading.gov.uk/media/1229/Air-Quality-Management-Area/pdf/Air\\_Quality\\_Management\\_Area.pdf](http://old.reading.gov.uk/media/1229/Air-Quality-Management-Area/pdf/Air_Quality_Management_Area.pdf)

<sup>5</sup> <http://www.reading.gov.uk/airquality>

<sup>6</sup> Email communication with Ross Jarvis at Reading Borough Council on the 2nd November 2017.

- Annual average speed;
- Distance from road link to sensitive receptor; and
- Fleet composition (percentage of heavy duty vehicles).

Three scenarios have been modelled:

- The baseline (2016 – the latest year for which monitoring data is available)
- 2019 (the expected year of completion) without the impact of the development on local traffic levels.
- 2019 with the impact of predicted generated traffic from the development.

Due to the uncertainty surrounding the emission outputs from the DMRB model, a worst-case scenario in 2019 has been modelled. It has been assumed that there will be no improvements in the traffic fleet or background concentrations since 2016.

## 2. Methodology

### 2.1 Local Pollutant Concentrations

It is good practice to include up-to-date local background pollutant concentrations in the assessment model, and also to verify modelled outputs against local monitoring data where available. This section provides an overview of the local data available for use in the assessment.

#### **Local monitoring data**

Reading Borough Council operates 3 automatic monitoring sites which measure nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>). In addition, these 3 automatic monitors are complemented by another monitor, operated as part of the Automatic Rural and Urban Network (AURN). However, these monitors are all located more than 3 km from the proposed development. Many local authorities use diffusion tubes to further improve the spatial coverage across their administrative area; these passively measure NO<sub>2</sub> concentrations via laboratory analysis. Unfortunately, there are no diffusion tube sites located in close proximity to the proposed development site. There are two sites that are located within two km and these are shown in [Table 2](#).

Monitoring results have been taken from the Council's latest Annual Status Report (ASR)<sup>7</sup>.

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<sup>7</sup> [http://www.reading.gov.uk/media/6388/Air-Quality-Annual-Status-Report/pdf/Reading\\_2017\\_Annual\\_Status\\_Report.pdf](http://www.reading.gov.uk/media/6388/Air-Quality-Annual-Status-Report/pdf/Reading_2017_Annual_Status_Report.pdf)

**Table 2: Monitoring sites within 2 km of the proposed development at Drake Way, Reading.**

| Site Name            | Site Type | Pollutant(s)    | Grid Reference | Distance to Kerb (m) | Approx. Distance to development site (m) |
|----------------------|-----------|-----------------|----------------|----------------------|------------------------------------------|
| 495 Basingstoke Road | R         | NO <sub>2</sub> | 471709, 170043 | 3                    | 710                                      |
| 102 Whitley Street   | R         | NO <sub>2</sub> | 472002, 172158 | 6.5                  | 1,820                                    |

Note: R = roadside.

Basingstoke Road is a B road that runs approximately parallel to the A33 as it goes past Drake Way. It is anticipated that air pollutant concentrations would be higher at a similar distance from the A33 than at the Basingstoke Road site due to increased traffic flows on the A33.

Whitley Street is a nearby A road (A327), located to the north east of Drake Way. Traffic flows on the A327 were less than half of that on the A33 in 2016 and therefore at a similar distance from the kerb, it is expected that air pollutant concentrations would be higher adjacent to the A33.

The diffusion tubes were analysed by Gradko International Ltd, who participate in the Proficiency scheme<sup>8</sup>. Whilst diffusion tubes provide an indicative estimate of pollutant concentrations, they tend to under or over read. The data is therefore corrected using a bias adjustment factor. There are two types of bias adjustment factor – local and national. The local factor is derived from co-locating diffusion tubes (usually in triplicate) with automatic monitors, whereas the national factor is obtained from the average bias from all local authorities using the same laboratory. Reading Borough Council has applied a national bias adjustment factor (1.03) to their 2016 diffusion tube results.

Monitoring results are presented in Table 3. The data shows that no exceedances of the annual mean NO<sub>2</sub> objective were recorded at diffusion tubes sites within 2 km of the development site between 2012 and 2016. Diffusion tubes do not provide information on hourly exceedances, but research<sup>9</sup> identified a relationship between the annual and 1 hour mean objective, such that exceedances of the latter were considered unlikely where the annual mean was below 60 µg/m<sup>3</sup>. Therefore, no exceedances of the 1 hour mean objective are predicted.

**Table 3: Monitoring results 2012-2016**

| Objective                                        | Site Name            | 2012 | 2013 | 2014 | 2015 | 2016 |
|--------------------------------------------------|----------------------|------|------|------|------|------|
| Annual mean NO <sub>2</sub> (µg/m <sup>3</sup> ) | 495 Basingstoke Road | 33   | 32   | 34   | 31   | 33   |
|                                                  | 102 Whitley Street   | 32   | 36   | 36   | 32   | 29   |

<sup>8</sup> This is a national QA/ QC scheme.

<sup>9</sup> As described in Box 5.2 of LAQM Technical Guidance (TG16).

### Background mapped data

Background pollutant concentration maps are available from the Defra LAQM website<sup>10</sup> and data has been extracted for Reading for this assessment. These 2015 baseline, 1 kilometre grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites.

The estimated mapped background NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub> concentrations around the development site are 26.2 µg/m<sup>3</sup>, 18.3 µg/m<sup>3</sup> and 13.6 µg/m<sup>3</sup> respectively in 2016 (the baseline year used in the assessment). The background maps also provide projections to future years. For 2019 (the predicted year of completion), the concentrations obtained for the same pollutants are 23.3 µg/m<sup>3</sup>, 16.6 µg/m<sup>3</sup> and 13.3 µg/m<sup>3</sup> respectively.

Due to the lack of a nearby urban background monitoring site, the 2016 mapped background concentrations have been used in this assessment. To provide a conservative estimate, the projected improvements in background air quality by 2019 have not been used in the assessment.

## 2.2 Traffic data

Average annual daily traffic (AADT) count data for 2016 (the selected baseline year) has been obtained for the A33 from Department for Transport (DfT) Traffic Counts<sup>11</sup>, which provides data for major roads. For the minor roads, estimates are based upon traffic count data at Manor Farm Road, approximately 500 m away from the development, from DfT data for minor roads<sup>12</sup>. All roads within 200 metres of the modelled receptors have been included in the assessment. AADT data has also been obtained for the A327 from DfT Traffic Counts for use in model verification. The values are shown in Appendix B.

For the purpose of this assessment, the RTF<sup>13</sup> model has been utilised to project traffic growth. It has been assumed that traffic on local roads will increase by 3.9 % between 2016 and 2019.

The Transport Assessment<sup>14</sup> concludes that the development will result in a maximum of 30.6 additional daily vehicular trips. This is divided between additional customer trips to the site (8.6 trips per day) and additional staff trips (22 trips per day) as a result of the development. The resulting estimated increase in daily car trips has been taken into account in the assessment for roads with direct access to the site with development in 2019. Results (Section 3 of this report) therefore refer to concentrations modelled in 2019 both without and with the proposed development.

An average speed of 25.3 kph has been assumed on the modelled 'A' roads (A33 and A327), which is the average traffic speed for A roads in Reading in 2016<sup>15</sup>. In the absence of any other data being available, we have assumed average speeds on local minor roads based on the speed limit.

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<sup>10</sup> <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>

<sup>11</sup> <http://www.dft.gov.uk/traffic-counts>

<sup>12</sup> <https://data.gov.uk/dataset/gb-road-traffic-counts/resource/35fa861c-e08e-46f6-94f3-542241d92bde>

<sup>13</sup> <http://laqm.defra.gov.uk/documents/RTF-Automated-Traffic-Growth-Calculator-v3-1.xls>

<sup>14</sup> Land at Drake Way, Reading. Transport Statement. February 2018. Transport Planning Associates

<sup>15</sup> <https://www.gov.uk/government/statistical-data-sets/average-speed-and-delay-on-local-a-roads-cgn05>

## 2.3 Model Input Data

The DMRB model requires distances to sensitive receptors from the centre of each of the road links. These have been measured using the Architect's plans and are presented in [Table 4](#) below along with a summary of the other DMRB input parameters for each road link.

Three sensitive receptor locations have been selected for the assessment at the development site:

- A – Rear of the development site, closest point to the A33.
- B – Centre point of the development site, representing the drop off in emissions from the A33.
- C – Front entrance to the development site, closest point to Drake Way.

In addition, the impact on a nearby hospital and residential location has been assessed. These are:

- D – The front entrance to Circle Hospital, opposite the development site, located on Drake Way.
- E – The front entrance to a residential development, located on Drake Way.

These sites have been chosen to reflect the extremities of the site and their proximity to road traffic sources. These are shown in [Figure 2](#) below.

**Figure 2: The locations of the receptors used in the modelling**



**Table 4: DMRB input parameters**

| Receptor                  | Road link                | Distance to link centre (m) | 2016 AADT | 2019 With Development AADT | 2019 Without Development AADT | Average speed (kph) | % HDV |
|---------------------------|--------------------------|-----------------------------|-----------|----------------------------|-------------------------------|---------------------|-------|
| <b>A</b>                  | A33                      | 80                          | 44,124    | 45,889                     | 45,858                        | 25.3                | 4.3   |
|                           | Minor roads              | 95                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
|                           | Minor roads              | 100                         | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
| <b>B</b>                  | A33                      | 130                         | 44,124    | 45,889                     | 45,858                        | 25.3                | 4.3   |
|                           | Minor roads              | 48                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
|                           | Minor roads              | 80                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
| <b>C</b>                  | A33                      | 169                         | 44,124    | 45,889                     | 45,858                        | 25.3                | 4.3   |
|                           | Minor roads              | 10                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
|                           | Minor roads              | 60                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
| <b>D</b>                  | Minor roads              | 10                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
|                           | Minor roads              | 75                          | 2,480     | 2,608                      | 2,577                         | 48.3                | 4.5   |
|                           | A33                      | 190                         | 44,124    | 45,889                     | 45,858                        | 25.3                | 4.3   |
| <b>E</b>                  | Minor roads              | 10                          | 2,480     | 2,608                      | 2,577                         | 48.30               | 4.5   |
|                           | Minor roads              | 160                         | 2,480     | 2,608                      | 2,577                         | 48.30               | 4.5   |
|                           | A33                      | 167                         | 44,124    | 45,889                     | 45,858                        | 25.30               | 4.3   |
| <b>Verification</b>       |                          |                             |           |                            |                               |                     |       |
| <b>102 Whitley Street</b> | Minor roads              | 10                          | 2,480     | -                          | -                             | 48.3                | 4.5   |
|                           | A327                     | 55                          | 19,547    | -                          | -                             | 25.3                | 3.3   |
|                           | Minor roads              | 63                          | 2,480     | -                          | -                             | 48.3                | 4.5   |
|                           | Christchurch Road (A327) | 60                          | 16,307    | -                          | -                             | 25.3                | 3.0   |
|                           | Minor roads              | 62                          | 2,480     | -                          | -                             | 48.3                | 4.5   |

## 2.4 Conversion of NO<sub>x</sub> to NO<sub>2</sub>

Recent evidence shows that the proportion of primary NO<sub>2</sub> in vehicle exhaust has increased<sup>16</sup>. This means that the relationship between NO<sub>x</sub> and NO<sub>2</sub> at the roadside has changed from that currently used in the DMRB model. A NO<sub>x</sub> to NO<sub>2</sub> calculator (Published in October 2017)<sup>17</sup> has therefore been developed and has been used in conjunction with the DMRB model to obtain a more accurate picture of NO<sub>2</sub> concentrations.

<sup>16</sup> <http://uk-air.defra.gov.uk/assets/documents/reports/aqeg/primary-no-trends.pdf>

<sup>17</sup> <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc>

## 2.5 Model Verification

Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of predicted versus measured concentrations. Where there is a disparity, the first step is to check the input data and the model parameters in order to minimise the errors. If required, the second step will be to determine an appropriate adjustment factor that can be applied. In the case of NO<sub>2</sub>, the model should be verified for NO<sub>x</sub> as the initial step and should be carried out separately for the background contribution and the source (i.e. road traffic). Once the NO<sub>x</sub> has been verified and adjusted as necessary, a final check should be made against the measured NO<sub>2</sub> concentration.

For this project, modelled annual mean road-NO<sub>x</sub> estimates have been verified against the concentrations measured at the Whitley Street diffusion tube site<sup>18</sup> (see Appendix A for model verification results). Ideally three verification sites would have been used, but only this site was deemed suitable. The Basingstoke Road site was not used in the analysis, due to no traffic data being available for this location. It is worth noting that the Whitley Street site is located more than 1,800 metres from the development site and therefore there will be uncertainty in the modelled results.

The adjustment factor determined for annual mean NO<sub>2</sub> concentrations was also applied to the modelled annual mean PM<sub>10</sub> concentrations. This was done as no PM<sub>10</sub> monitoring data that is representative of the development site is available and this approach was considered more appropriate than not applying any adjustment<sup>19</sup>.

## 3. Results

### 3.1 Results of the Dispersion Modelling

Table 5 below presents the estimated pollutant concentrations in 2019 without and with the predicted impact of the development on generated traffic. Given the inherent uncertainties in the modelling, background pollutant concentrations and vehicle fleet emission factors have been maintained at 2016 levels to provide a conservative estimate.

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<sup>18</sup> There is uncertainty associated with this verification site as the coordinates provided point to 126 Whitley Street, not 102 Whitley Street.

<sup>19</sup> This is in accordance with Paragraph 7.528 of LAQM TG(16), which states that in the absence of any PM<sub>10</sub> data for verification, it may be appropriate to apply the road NO<sub>x</sub> adjustment to the modelled road PM<sub>10</sub>.

**Table 5: Estimated annual mean nitrogen dioxide concentrations in 2019 without and with the impact of the development on generated traffic ( $\mu\text{g}/\text{m}^3$ ) at ground level.**

| Receptor | Annual mean NO <sub>2</sub> concentration ( $\text{mg}/\text{m}^3$ ) |                  | Annual mean PM <sub>10</sub> concentration ( $\text{mg}/\text{m}^3$ ) |                  | NO <sub>2</sub> Change | PM <sub>10</sub> change |
|----------|----------------------------------------------------------------------|------------------|-----------------------------------------------------------------------|------------------|------------------------|-------------------------|
|          | Without development                                                  | With development | Without development                                                   | With development |                        |                         |
| <b>A</b> | 22.7                                                                 | 22.7             | 14.9                                                                  | 14.9             | <0.1                   | <0.1                    |
| <b>B</b> | 20.5                                                                 | 20.5             | 14.2                                                                  | 14.2             | <0.1                   | <0.1                    |
| <b>C</b> | 21.4                                                                 | 21.4             | 14.4                                                                  | 14.4             | <0.1                   | <0.1                    |
| <b>D</b> | 21.0                                                                 | 21.0             | 14.3                                                                  | 14.2             | <0.1                   | <0.1                    |
| <b>E</b> | 20.9                                                                 | 21.0             | 14.3                                                                  | 14.2             | <0.1                   | <0.1                    |

In the 'without development' scenario, the annual average NO<sub>2</sub> concentration is predicted to be below the annual mean objective of 40  $\mu\text{g}/\text{m}^3$  at all receptors (by more than 43 %). The concentrations are highest at receptor A, as this location is closest to the A33, the most relevant pollution source. The concentrations obtained are reasonable when compared to the data collected at the both monitoring sites. Measured concentrations at the monitoring sites are higher than at the development site; this is due to the monitoring sites being located much closer to the adjacent roads (<10m cf. >80m) and them being located closer to a higher number of roads than the development, for which only three roads are within 200m.

DMRB is not able to produce a short-term statistic for NO<sub>2</sub>. However, the guidance states that authorities may assume that exceedances of the 1 hour objective are only likely to occur where annual mean concentrations are 60 $\mu\text{g}/\text{m}^3$  or above. Therefore, it is considered that this objective will not be exceeded at any of the receptors modelled.

In the with development scenario, NO<sub>2</sub> concentrations are expected to increase by less than 0.1  $\mu\text{g}/\text{m}^3$ , but will still be below objective levels. This increase is as a result of the predicted impact of the development on generated traffic levels. This is however a conservative estimate as vehicle emissions are expected to improve in the future as a result of tighter regulations.

In the 'without development' scenario, DMRB predicts total annual average PM<sub>10</sub> concentration at all of the ground floor receptors modelled to be under 40  $\mu\text{g}/\text{m}^3$  (by more than 62 %), therefore below the long-term air quality objective for the protection of human health. In addition, no exceedances of the daily mean are expected.

In the with development scenario, annual mean concentrations are expected to increase by less than 0.1  $\mu\text{g}/\text{m}^3$  as a result of the predicted impact of the development on generated traffic levels. No exceedances of the annual or daily mean objective are predicted.

## 3.2 Significance

Professional judgement is an important part of the assessment of significance. However, there are various documents available that attempt to qualitatively or quantitatively provide ways of assessing the significance of a development on air quality. The most commonly applied is Environmental Protection UK's Air Quality Guidance Document<sup>20</sup> which outlines how impacts may be assessed quantitatively. The assessment is made up of two steps – firstly to assess the magnitude of change in concentration (e.g. between with and without development) relative to the objective level, and secondly the percentage above / below the objective based upon the total modelled concentration at a given location or receptor. By combining these two values, you can obtain the impact descriptor. This method is presented in Table 6 below.

**Table 6: Significance of change description**

| Long term average concentration at receptor in assessment year | % Change in concentration relative to Air Quality Assessment Level (AQAL) |             |             |             |
|----------------------------------------------------------------|---------------------------------------------------------------------------|-------------|-------------|-------------|
|                                                                | 1                                                                         | 2-5         | 6-10        | >10         |
| 75% or less of AQAL                                            | Negligible                                                                | Negligible  | Slight      | Moderate    |
| 76-94% of AQAL                                                 | Negligible                                                                | Slight      | Moderate    | Moderate    |
| 95-102% of AQAL                                                | Slight                                                                    | Moderate    | Moderate    | Substantial |
| 103-109% of AQAL                                               | Moderate                                                                  | Moderate    | Substantial | Substantial |
| 110% or more of AQAL                                           | Moderate                                                                  | Substantial | Substantial | Substantial |

In addition to the criteria provided above, the Guidance document states that the table is intended to be used by rounding the change in percentage pollutant concentrations to whole numbers. Changes of 0% i.e. less than 0.5% are described as negligible.

In applying these criteria, it can be concluded that the impact of the development on local annual mean NO<sub>2</sub> concentrations is likely to be 'negligible', as the change in concentration due to the development is <0.1 % of the Air Quality Assessment Level (AQAL) at all locations and the long term average concentration in the assessment year is less than 75% of the Air Quality Assessment Level (AQAL),

However, this is a fairly simplistic conclusion and other factors may also need to be considered in order to make transparent conclusions. Specific factors to consider may include:

1. Number of properties affected by the slight, moderate or major impacts and a judgement of the overall balance.
2. Where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant.
3. The magnitude of the changes and descriptions of the impacts at the receptors
4. Whether or not an exceedance of an objective or limit value is predicted to arise in the study area where none existed before or an exceedance area is substantially increased.
5. Whether or not the study area exceeds an objective or limit value and this exceedance is removed or the exceedance area is reduced.

<sup>20</sup> <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

6. Uncertainty, including the extent to which worst case assumptions have been made.
7. The extent to which an objective or limit value is exceeded, for example an annual mean of  $41 \mu\text{g}/\text{m}^3$  should attract less significance than an annual mean of  $51 \mu\text{g}/\text{m}^3$ .

In this case, none of the above criteria are of significance, suggesting that there will be no concerns in terms of exposure to harmful pollutant concentrations across the study area.

### 3.3 Mitigation Measures

No specific mitigation is required as predicted  $\text{NO}_2$  and  $\text{PM}_{10}$  concentrations are below the objectives at all locations and the impact of the development is negligible. Going forward, improvements in the traffic fleet are expected (particularly with the introduction of Euro 6/VI vehicles) and therefore it is likely that the  $\text{NO}_2$  and  $\text{PM}_{10}$  concentrations will generally decrease, particularly at roadside locations.

However, the developer is encouraged to consider further mitigation measures in order to minimise the use of private vehicles by staff. Such measures include: providing secure and covered cycle storage, promoting car share schemes, installing electric charging points and implementing appropriate travel and building management plans.

## 4. Summary and Conclusions

An air quality assessment has been undertaken for the proposed extension of the BMW car dealership at Drake Way in Reading. The proposed development would place an additional 74 parking spaces on site for the display of vehicles for sale.

A conservative approach has been taken, in that no improvement in the pollutant background concentrations or road transport emission factors has been assumed between the base year (2016) and the expected year of completion (2019). With expected improvements to the traffic fleet, improvements in pollutant concentrations may however materialise.

A quantitative screening assessment has been carried out using the DMRB method to determine the impact of emissions from road traffic on sensitive receptors.

Predicted concentrations have been compared with the air quality objectives. The results of the assessment indicate that both nitrogen dioxide and particulate matter concentrations are substantially below objective levels in both the without and with development scenarios and that the difference between the two is negligible. Therefore, no specific mitigation is required to reduce exposure to air pollution. Instead other measures such as providing secure and covered cycle storage and electric vehicle charging points, should be considered to reduce the emissions arising from the development.

## Appendix A – Model Verification

Verification of the DMRB model has been undertaken for nitrogen dioxide using the diffusion tube results for 102 Whitley Street. The model was run to predict the annual mean road-NO<sub>x</sub> concentration during 2016 at this location. The model output of road-NO<sub>x</sub> was then compared with the 'measured' road-NO<sub>x</sub>. Measured road-NO<sub>x</sub> for the monitoring sites was calculated using the NO<sub>x</sub> to NO<sub>2</sub> calculator<sup>21</sup>.

A primary adjustment factor was determined to convert between the 'measured' road contribution and the model derived road contribution. This factor was then applied to the modelled road-NO<sub>x</sub> concentration for each receptor to provide adjusted modelled road-NO<sub>x</sub> concentrations. Total NO<sub>2</sub> concentrations were then determined by combining the adjusted modelled road-NO<sub>2</sub> concentrations with the 2016 mapped background NO<sub>2</sub> concentration. The results imply that the model was very slightly under-estimating road-NO<sub>x</sub> as an adjustment factor of 1.01 was required.

**Figure A.1: Comparison of Measured road-NO<sub>x</sub> to unadjusted modelled road-NO<sub>x</sub> concentrations**

| Receptor           | Measured road-NO <sub>x</sub> | Unadjusted modelled road-NO <sub>x</sub> | Adjustment factor |
|--------------------|-------------------------------|------------------------------------------|-------------------|
| 102 Whitley Street | 21.1                          | 20.8                                     | 1.01              |

### RMSE

The root mean square error (RMSE) is used to define the average error or uncertainty of the model. The following RMSE value has been calculated:  
NO<sub>2</sub>: 0.23

If the RMSE values are higher than ±25 % of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. In this case the model is being assessed against the annual mean objective, which is 40 µg/m<sup>3</sup> for NO<sub>2</sub>. An RMSE value of less than 10 µg/m<sup>3</sup> is obtained and therefore the model behaviour is acceptable.

<sup>21</sup> <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc>

## Appendix B – Traffic Data

**Table B.1: Traffic data for 2016 (and prediction for 2019 without development)**

| Development/<br>verification site | Road links                    | Annual Average<br>Daily Traffic<br>(AADT) | % Heavy<br>Duty<br>Vehicles<br>(HDV) | Speed<br>(kph) |
|-----------------------------------|-------------------------------|-------------------------------------------|--------------------------------------|----------------|
| Development sites                 | A33                           | 44,124 (45,858)                           | 4.3                                  | 25.3           |
|                                   | Minor roads (Manor Farm Road) | 2,480 (2,577)                             | 4.5                                  | 48.3           |
| Verification sites                | A327                          | 19,547 (19,547)                           | 3.3                                  | 25.3           |
|                                   | Christchurch Road (A327)      | 16,307 (16,307)                           | 3.0                                  | 25.3           |

Note: With development results in an average daily traffic increase of 30.6 vehicles on all roads that have direct access to the site.



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