

Air Quality Monitoring Report 2022

Brandhall Village

Sandwell Metropolitan Borough Council

Project number: 60653817

April 2022

Revision History

| Revision | Revision date | Details | Authorized | Name | Position |
|----------|---------------|-------------|------------|------|----------|
| 01 | April 2022 | First Draft | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Distribution List

| # Hard Copies | PDF Required | Association / Company Name |
|---------------|--------------|----------------------------|
| | | |
| | | |
| | | |
| | | |

Prepared for:

Sandwell Metropolitan Borough Council

Prepared by:

AECOM Limited
12 Regan Way
Chetwynd Business Park
Nottingham NG9 6RZ
United Kingdom

aecom.com

© 2022 AECOM Limited. All Rights Reserved.

This document has been prepared by AECOM Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

| | | |
|----|--------------------------------------|----|
| 1. | Introduction | 5 |
| 2. | Monitoring Results Summary | 6 |
| 3. | Conclusions..... | 9 |
| | Appendix A Monitoring Locations..... | 10 |

Figures

| | |
|--|----|
| Figure 1: Diffusion Tube Monitoring Locations..... | 10 |
|--|----|

Tables

| | |
|--|---|
| Table 2.1: AECOM NO ₂ Diffusion Tube Monitoring Locations | 6 |
| Table 2.2: Raw NO ₂ Diffusion Tube Monitoring Results..... | 6 |
| Table 2.3: Bias Adjusted & Annualised Mean NO ₂ Concentrations | 8 |
| Table 2.4: Annual mean and period mean data at each reference monitor site | 8 |
| Table 2.5: Defra Mapped 2021 Background NO ₂ concentration for 1km grid squares around Brandhall Village..... | 9 |
| Table 2.6: SMBC diffusion tube monitoring around Brandhall Village | 9 |

1. Introduction

- 1.1 AECOM has carried out site-specific air quality monitoring for Brandhall Village project on behalf of Sandwell Metropolitan Borough Council (SMBC). The site exists entirely within the borough-wide air quality management area (AQMA) which SMBC declared in 2005 for exceedance of the annual mean air quality strategy (AQS) objective value for nitrogen dioxide (NO₂).
- 1.2 AECOM conducted three months of monitoring for NO₂ between May and August 2021. The purpose of the NO₂ monitoring survey is two-fold. Firstly, to identify the baseline air quality conditions to determine if concentrations are above the NO₂ annual mean AQS objective of 40 µg/m³ and would therefore pose a notable constraint to the proposed development. Secondly, for use in model verification as part of a subsequent air quality assessment for the development required as part of any future planning application.
- 1.3 The monitoring programme involved the use of passive NO₂ diffusion tubes with monthly site visits. Data was collected at 10 sites, two on the land parcel at locations 30m and 70m from the M5, seven on nearby roads which are likely to be affected by traffic associated with the development and a remaining site which is representative of the local background pollutant climate.
- 1.4 The NO₂ diffusion tubes were exposed for a period of approximately one calendar month and then re-sealed. Additional NO₂ diffusion tubes were used as control blanks (travel blanks) during the survey but these were not exposed to the air. Following exposure, the NO₂ diffusion tubes were sent to the laboratory for analysis along with the control NO₂ diffusion tubes.
- 1.5 Air quality monitoring sites are normally located on accessible and suitable structures such as street furniture, whilst the annual mean NO₂ AQS objective applies to locations representative of relevant long-term exposure, such as residential properties. The selected monitoring sites have been chosen to be as representative as possible of long-term exposure locations and professional judgement has been utilised to determine the indicative risk of exceedance of the air quality objectives.
- 1.6 This monitoring report provides the NO₂ measurement data for May to August 2021. As data was collected for 3 months, it has been adjusted to provide an indication of baseline air quality in the study area that is representative of current air quality conditions over a 12 month period, to align with the annual objective. The results of this adjustment are presented in Section 2 of this report.
- 1.7 When the air quality monitoring for this development was commenced, the initial masterplan for the site included the provision of dwellings, a school, a public park, local amenities, pedestrian and cycle links and wildlife areas. Following public consultation four new options are now being considered:
 - Option 1 - A 'no development' option which effectively assumes no development will take place and the site is turned into public open space.
 - Option 2 – Which is as per Option 1 with the addition of a primary school to the north west corner.
 - Option 3 – Which is as per Option 2 with the addition of 2 new housing parcels (R1 and R2) providing circa 180 homes.
 - Option 4 – Which is as per Option 2 with the addition of 4 new housing parcels (R1, R2, R3 and R4) providing circa 360 homes.
- 1.8 While the air quality monitoring survey was set up for the initial masterplan, the data obtained can be utilised to assist with the identification of potential air quality impacts or constraints for any of the above options.

2. Monitoring Results Summary

2.1 As set out above, measurement data was collected at 10 locations on and around the development area. Details of each monitoring site are presented in Table 2.1. Figure 1 in Appendix A illustrates the location of each monitoring site on a map.

Table 2.1: AECOM NO₂ Diffusion Tube Monitoring Locations

| Site ID | Description | X, Y (m) | Type | Distance from Road (m) | Height (m) |
|---------|--------------------|----------------|------------|------------------------|------------|
| DT1 | Brandhall Site | 398914, 286183 | On site | 30 | 1.5 |
| DT2 | Brandhall Site | 398954, 286199 | On site | 70 | 1.5 |
| DT3 | Grafton Road | 398855, 286367 | Roadside | 1.7 | 2.3 |
| DT4 | Wolverhampton Road | 399704, 286390 | Roadside | 1.7 | 2.4 |
| DT5 | Hurst Green Road | 398880, 285922 | Roadside | 2.4 | 2.3 |
| DT6 | Tame Road | 399360, 285865 | Roadside | 1.1 | 2.2 |
| DT7 | Queensway | 399620, 286190 | Roadside | 2.2 | 2.0 |
| DT8 | Chester Rise | 399997, 285931 | Background | - | 2.2 |
| DT9 | Wolverhampton Road | 400739, 285605 | Roadside | 2.6 | 2.2 |
| DT10 | Hagley Road West | 400707, 285172 | Roadside | 3.2 | 2.4 |

2.2 The raw monitoring results for the period May to August 2021 are presented in Table 2.2.

Table 2.2: Raw NO₂ Diffusion Tube Monitoring Results

| Site ID | NO ₂ Concentration (µg/m ³) | | | |
|---------|--|----------|----------|-------------|
| | Period 1 | Period 2 | Period 3 | Period Mean |
| DT1 | 25.3 | 28.3 | 25.5 | 26.4 |
| DT2 | 17.4 | Missing | 19.3 | 18.3 |
| DT3 | 27.1 | 26.0 | 25.4 | 26.2 |
| DT4 | 23.9 | 23.9 | 20.0 | 22.6 |
| DT5 | 25.2 | 26.3 | 21.6 | 24.3 |
| DT6 | Missing | 26.3 | 19.4 | 22.8 |
| DT7 | 16.6 | 15.0 | 14.9 | 15.5 |
| DT8 | 12.8 | Missing | 12.1 | 12.5 |
| DT9 | 36.4 | 34.3 | 35.8 | 35.5 |
| DT10 | 21.1 | 26.9 | 21.3 | 23.1 |

Note: values have been subject to rounding. Missing data refers to stolen or damaged tubes.

- 2.3 Diffusion tubes are affected by several sources of interference which can cause substantial under or overestimation upon comparison with a reference quality chemiluminescent analyser. This under or overestimation is often referred to as “bias”. Any bias is problematic when diffusion tube results are to be compared with air quality objectives, and therefore quantification of this “bias” is required such that an appropriate bias adjustment factor can be applied to the annual mean.
- 2.4 A database of bias adjustment factors¹ determined from local authority co-location studies has been collated by the Department for Environment, Food and Rural Affairs (Defra) and provides combined bias adjustment factors which have been calculated for each laboratory, year and preparation method combination where data are available. This database is updated periodically. The laboratory selected to supply and analyse the diffusion tubes used in this survey was Staffordshire Highways Laboratory, and a preparation method of 20% Triethanolamine (TEA) in water was utilised. A bias adjustment factor 0.93 was applied to the period mean concentrations.
- 2.5 As the survey took place over three months, an annualisation factor needs to be applied to the period mean to ensure that it is representative of an annual mean concentration. The need to apply an annualisation factor is due to the seasonal variation that is observed with ambient NO₂ concentrations in the UK, whereby concentrations are consistently lower in the summer months relative to the winter at any given site. To account for this, the approach described by Defra’s Technical Guidance document² is followed, where data from 2-4 background reference monitoring sites are used to obtain and ratio of annual mean to relevant period mean concentrations. The average of these annual mean to period mean (A_m/P_m) factors is then applied to the period mean concentration at each monitoring site. Data from three Automatic Urban and Rural Network (AURN) sites (Birmingham Acocks Green, Walsall Woodlands and Coventry Allesley) for the year 2019 were obtained. This year was selected as it represents the most recent full year of data which was not affected by national lockdowns.
- 2.6 Additional technical guidance from Defra includes using a projection factor to account for the predicted decrease in roadside NO₂ concentrations with ongoing improvements to vehicle fleets and other factors. This process has not been applied to this dataset as the data are not being used for modelling at this stage. The data are suitable to represent the pollutant climate for the year in which the data were collected.
- 2.7 The raw period mean, annualised and bias adjusted mean NO₂ concentrations are presented in Table 2.3. It is shown that a relatively large A_m/P_m factor is used for each site. This is because the survey took place in summer months, where NO₂ concentrations are expected to be lower than the remaining months of the calendar year. It is also noted that there are three different A_m/P_m factors used in the table, this is because there are effectively three different measurement periods due to missing data at DT2, DT6 and DT8. Table 2.4 shows the data set for each reference monitor site. The first row in this table is relevant for the monitoring sites where no data are missing (DT1, DT3, DT4, DT5, DT7, DT9 and DT10), the second row is relevant for monitoring sites where Period 2 data are missing (DT2 and DT8) and the third row in Table 2.4 is relevant for monitoring sites where Period 1 data are missing (DT6).

¹ Defra (2022) National Bias Adjustment Factors [Online] Available: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/national-bias/> [Accessed 06/04/2022].

² Defra (2021) LAQM Technical Guidance (TG16) [Online] Available: <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf> [Accessed 06/04/2022].

Table 2.3: Bias Adjusted & Annualised Mean NO₂ Concentrations

| Site ID | NO ₂ Concentration (µg/m ³) | | | | Bias Factor | A _m /P _m | Annualised Mean (µg/m ³) |
|---------|--|----------|----------|-------------|-------------|--------------------------------|--------------------------------------|
| | Period 1 | Period 2 | Period 3 | Period Mean | | | |
| DT1 | 25.3 | 28.3 | 25.5 | 26.4 | 0.93 | 1.61 | 39.5 |
| DT2 | 17.4 | Missing | 19.3 | 18.3 | 0.93 | 1.60 | 27.3 |
| DT3 | 27.1 | 26.0 | 25.4 | 26.2 | 0.93 | 1.61 | 39.2 |
| DT4 | 23.9 | 23.9 | 20.0 | 22.6 | 0.93 | 1.61 | 33.9 |
| DT5 | 25.2 | 26.3 | 21.6 | 24.3 | 0.93 | 1.61 | 36.5 |
| DT6 | Missing | 26.3 | 19.4 | 22.8 | 0.93 | 1.71 | 36.3 |
| DT7 | 16.6 | 15.0 | 14.9 | 15.5 | 0.93 | 1.61 | 23.2 |
| DT8 | 12.8 | Missing | 12.1 | 12.5 | 0.93 | 1.60 | 18.6 |
| DT9 | 36.4 | 34.3 | 35.8 | 35.5 | 0.93 | 1.61 | 53.2 |
| DT10 | 21.1 | 26.9 | 21.3 | 23.1 | 0.93 | 1.61 | 34.6 |

Note: values have been subject to rounding.

Table 2.4: Annual mean and period mean data at each reference monitor site

| Data Present | | | Walsall Woodlands | | | Birmingham Acocks Green | | | Coventry Allesley | | |
|--------------|----------|----------|-------------------------------------|-------------------------------------|--------------------------------|-------------------------------------|-------------------------------------|--------------------------------|-------------------------------------|-------------------------------------|--------------------------------|
| Period 1 | Period 2 | Period 3 | A _m (µg/m ³) | P _m (µg/m ³) | A _m /P _m | A _m (µg/m ³) | P _m (µg/m ³) | A _m /P _m | A _m (µg/m ³) | P _m (µg/m ³) | A _m /P _m |
| ✓ | ✓ | ✓ | 16.13 | 10.00 | 1.61 | 18.14 | 11.06 | 1.64 | 20.44 | 12.92 | 1.58 |
| ✓ | ✗ | ✓ | 16.13 | 10.41 | 1.55 | 18.14 | 10.90 | 1.66 | 20.44 | 12.84 | 1.59 |
| ✗ | ✓ | ✓ | 16.13 | 8.62 | 1.87 | 18.14 | 11.20 | 1.62 | 20.44 | 12.54 | 1.63 |

Note: data presented to 2d.p to demonstrate calculations

- 2.8 Data presented in Table 2.3 show that one measurement location (DT9) has an annualised mean concentrations of nitrogen dioxide above the air quality objective of 40 µg/m³. A further four locations are close to the objective (within 10%), DT1, DT3, DT5 and DT6.
- 2.9 The location exceeding the objective value (DT9) is on Wolverhampton Road. Some development related traffic would be likely to use Wolverhampton Road when heading out into the wider area. It is therefore probable that changes in traffic to this route as a result of the development would affect NO₂ concentrations at this location.
- 2.10 The measurement location within the Brandhall site at the closest edge of the site to the M5 (DT1), approximately 30m, has an annualised NO₂ concentration of 39.5 µg/m³. The site which is approximately 70m from the M5 (DT2) has an annualised NO₂ concentration of 27.3 µg/m³.
- 2.11 The location selected to represent the background pollutant climate of the local area (DT8) is shown to have an annualised concentration of 18.6 µg/m³. This is the lowest concentration of any site in the survey, as would be expected, due to the relatively large distance to any major roads.

- 2.12 The Defra modelled background concentrations for NO₂ in 2021 for the area surrounding the development are shown in Table 2.5. A range of 15.6 – 19.1 µg/m³ is obtained. The annualised concentration at the background site in the AECOM monitoring survey (DT8) falls within this range.

Table 2.5: Defra Mapped 2021 Background NO₂ concentration for 1km grid squares around Brandhall Village

| Location | X OS Grid | Y OS Grid | Annual mean NO ₂ concentration (µg/m ³) |
|----------|-----------|-----------|--|
| Dudley | 394500 | 289500 | 19.1 |
| Dudley | 398500 | 285500 | 15.6 |
| Sandwell | 399500 | 286500 | 16.0 |
| Sandwell | 399500 | 285500 | 18.0 |

- 2.13 Diffusion tube data obtained from the most recent SMBC Air Quality Annual Status Report³ is presented in Table 2.6. The sites presented here are the closest to the development, located approximately 1.5 km north west of the development. The NO₂ concentrations presented are of a similar range to those obtained by the AECOM monitoring survey, but also show a general trend in decreasing NO₂ concentrations in the local area.

Table 2.6: SMBC diffusion tube monitoring around Brandhall Village

| Site ID | X OS Grid | Y OS Grid | Site Type | Annual mean NO ₂ concentration (µg/m ³) | | | | |
|---------|-----------|-----------|-----------|--|------|------|------|------|
| | | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| UA | 398146 | 287639 | Roadside | 32.7 | 34.3 | 31.2 | 31.7 | 29.8 |
| UB | 398214 | 287726 | Roadside | 34.0 | 35.8 | 33.4 | 33.9 | 33.3 |
| UC | 398170 | 287746 | Kerbside | 34.4 | 36.9 | 35.6 | 36.1 | 32.4 |

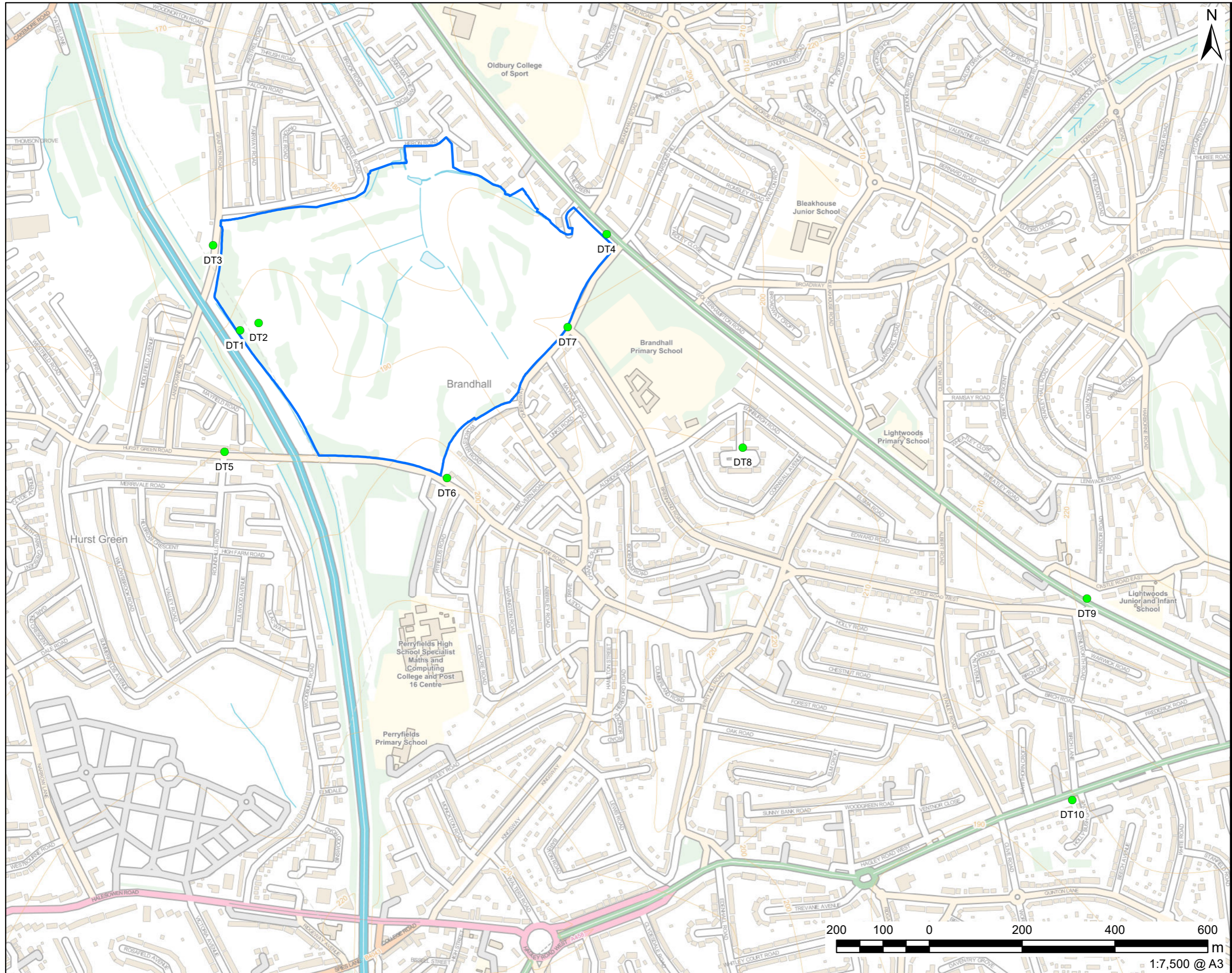
3. Conclusions

- 3.1 The NO₂ concentrations obtained as part of this survey are close to or exceeding the objective value in a number of locations and they are consistent with what would be expected for an urban area which is within an AQMA.
- 3.2 Long-term monitoring data from SMBC, presented in Table 2.6 shows that there is a general trend whereby concentrations of NO₂ are decreasing at a local level. It would be expected that sites around the development would experience a similar trend. It is likely that by the time a development is operational, NO₂ concentrations would have improved at the sites surveyed. Notwithstanding, it is recommended, that a detailed air quality assessment is conducted for any option where development takes place to ensure the site is suitable for its intended use and to establish whether the development may lead to likely significant effects in the wider area.
- 3.3 With consideration to the survey results for the two on site locations (DT1 and DT2), it is recommended that a suitable buffer from the M5 to any proposed sensitive location (e.g. residential property) is retained to protect health for any development bought forward.

³ https://www.sandwell.gov.uk/downloads/file/31492/air_quality_annual_status_report_2020 [Accessed 06/04/2022].

Appendix A Monitoring Locations

Figure 1: Diffusion Tube Monitoring Locations



This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and disclaims any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

