



2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995
Local Air Quality Management, as amended by the
Environment Act 2021

Date: June, 2023

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Executive Summary: Air Quality in Our Area

The 2023 Annual Status Report (ASR) is designed to provide the public with information relating to local air quality in Brentwood, to fulfil Brentwood Borough Council's statutory duty to review and assess air quality within its area, and to determine whether or not the air quality objectives are likely to be achieved.

In 2022, Brentwood Borough Council measured **no** exceedances of the Air Quality Objectives.

Air Quality in Brentwood

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas^{1,2}.

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

The Borough of Brentwood is situated in the southwest of Essex and is a pleasant, busy town situated within the Metropolitan Green Belt. Apart from its urban heart, the Borough of Brentwood has about 3,000 acres (about 1,215 hectares) of woodland, yet it is only 18 miles from Central London.

The main source of air pollution in Brentwood is road traffic emissions for major roads, notably the M25, A12, A127, A128, A1023 and A129.

Brentwood Borough Council has three Air Quality Management Areas (AQMA) which are detailed in Table 2.1. These were declared due to exceedances of Nitrogen Dioxide (NO₂).

No exceedances at relevant exposure have been measured in these AQMAs and Brentwood Borough Council proposes to revoke these declarations.

¹ Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

² Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Air quality appraisal: damage cost guidance, January 2023

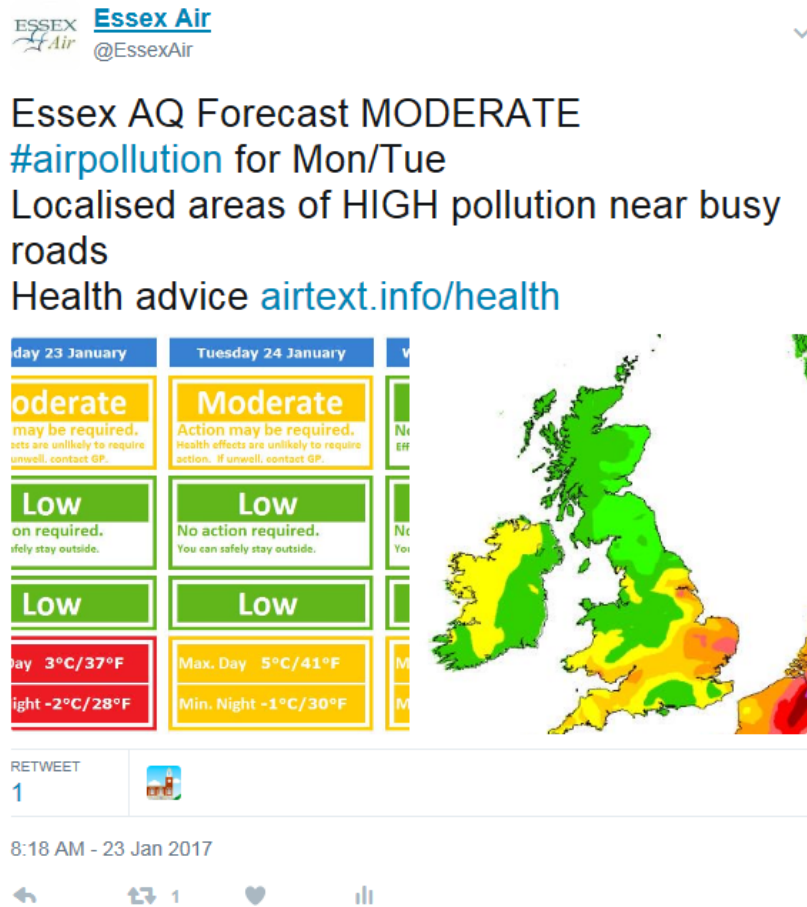
⁴ Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

Local Engagement and How to get Involved

Brentwood Borough Council is a member of the Essex Air Quality consortium. The Essex Air website operated by the consortium is being updated and will be available in the second half of 2023.

The [@EssexAir](#) twitter feed provides localised weekly air pollution forecasts.

Figure i.1 - Essex Air Twitter Air Quality Notifications



Links to Defra recommended actions and health advice are provided when air pollution is likely to be moderate or higher. This will enable those with heart or lung conditions, or other breathing problems to make informed judgements about their levels of activity or exposure.

The Essex Air twitter also promotes the [DVSA service](#) for reporting smoky lorries or buses. Particulate matter is usually not visible but when poorly maintained diesel engines can produce visible particles, appearing as smoke. Fine particles have an adverse effect on human health, particularly among those with respiratory and cardiovascular problem.

Conclusions and Priorities

Brentwood Borough Council have concluded that:

- No air quality exceedances have been identified in 2021.
- There are no new developments that will have an impact on air quality.
- Brentwood Borough Council proposes to revoke:
 - AQMA 2 - Parts of Brook Street, Brentwood and the A12.
 - AQMA 4 - Parts of Warescot Road, Hurstwood Avenue and Ongar Road, Brentwood and the A12.
 - AQMA7 - Parts of Ongar Road, Ingrave Road, High Street and Shenfield Road, Brentwood in proximity to Wilsons Corner (the junction of the A128 and A1203).
- With the revocation of the AQMAs, it will be necessary for Brentwood Borough Council to consider developing a Local Air Quality Strategy in accordance with the Local Air Quality Management (LAQM) Technical Guidance (TG22)

Local Responsibilities and Commitment

This ASR was prepared on behalf of Brentwood Borough Council's Environmental Health & Licensing Service.

This ASR has been approved by:

David Carter – Environmental Health Manager, Brentwood Borough Council.

This ASR has been sent to the Director of Public Health at Essex County Council.

If you have any comments on this ASR please send them to David Carter at:

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1 Local Air Quality Management

This report provides an overview of air quality in Brentwood during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Brentwood Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

A summary of the AQMAs declared by Brentwood Borough Council can be found in Table 2.1 below. The table presents a description of the AQMA that is currently designated within Brentwood. A map of air quality monitoring locations and of the AQMA can be found in Appendix D.

The air quality objective pertinent to the current AQMA designations is nitrogen dioxide (NO₂) annual mean.

This Annual Status Report identifies that pollutant concentrations are well below the Air Quality Objectives (at relevant exposure) and that it is appropriate to revoke the remaining AQMAs.

Table 2.1 – Declared Air Quality Management Areas

| AQMA Name | Date of Declaration | Pollutants and Air Quality Objectives | One Line Description | Is air quality in the AQMA influenced by roads controlled by Highways England? | Level of Exceedance: Declaration (µg/m ³) | Level of Exceedance: Current Year (µg/m ³) | Number of Years Compliant with Air Quality Objective | Name and Date of AQAP Publication | Web Link to AQAP |
|---------------------|---------------------|---------------------------------------|---|--|---|--|--|--|---|
| Brentwood AQMA No.2 | Declared 10/01/2005 | NO2 Annual Mean | Parts of Brook Street, Brentwood and the A12. | Yes | 53.4 | No exceedance | 3 | Brentwood Borough Council Air Quality Action Plan 2008 | https://uk-air.defra.gov.uk/assets/documents/no2ten/Local_zone29_Brentwood_AQActionplan_1.pdf |
| Brentwood AQMA No.4 | Declared 10/01/2005 | NO2 Annual Mean | Parts of Warescot Road, Hurstwood Avenue and Ongar Road, Brentwood and the A12. | Yes | 76 | No exceedance | 9 | Brentwood Borough Council Air Quality Action Plan 2008 | https://uk-air.defra.gov.uk/assets/documents/no2ten/Local_zone29_Brentwood_AQActionplan_1.pdf |
| Brentwood AQMA No.7 | Declared 10/01/2005 | NO2 Annual Mean | Parts of Ongar Road, Ingrave Road, High Street and Shenfield Road, Brentwood in proximity to Wilsons Corner (the junction of the A128 and A1203). | No | 56.9 | No exceedance | 6 | Brentwood Borough Council Air Quality Action Plan 2008 | https://uk-air.defra.gov.uk/assets/documents/no2ten/Local_zone29_Brentwood_AQActionplan_1.pdf |

Brentwood Borough Council confirms the information on UK-Air regarding their AQMA(s) is up to date

Brentwood Borough Council confirm that the current AQAP has been submitted to Defra

Progress and Impact of Measures to address Air Quality in Brentwood Borough Council

Defra's appraisal of last year's ASR concluded that report was well structured, detailed, and provides the information specified in the Technical Guidance.

Brentwood Borough Council have a number of ongoing measures to improve air quality in Brentwood. These are detailed in Table 2.2 below.

Table 2.2 – Progress on Measures to Improve Air Quality

| Measure No. | Measure | Category | Classification | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | Organisations Involved | Funding Source | Defra AQ Grant Funding | Funding Status | Estimated Cost of Measure | Measure Status | Reduction in Pollutant / Emission from Measure | Key Performance Indicator | Progress to Date | Comments / Barriers to Implementation |
|-------------|---------------------|---|--|---------------------------------|------------------------------------|--|---------------------------|------------------------|----------------|---------------------------|----------------|--|---------------------------|------------------|---------------------------------------|
| 1 | Essex Carshare | Alternatives to private vehicle use | Car & lift sharing schemes | 2014 | Ongoing | Essex County Council | Essex County Council | No | Funded | < £10k | Implementation | Not quantified | N/A | Ongoing | |
| 2 | Travel Budi | Alternatives to private vehicle use | Car & lift sharing schemes | 2007 | Ongoing | Brentwood Borough Council | Brentwood Borough Council | No | Funded | < £10k | Implementation | Not quantified | N/A | Ongoing | |
| 3 | Member of Essex Air | Policy Guidance and Development Control | Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality | N/A | Ongoing | County Council / District & Borough Councils | N/A | No | Funded | < £10k | Implementation | Not quantified | N/A | Ongoing | |

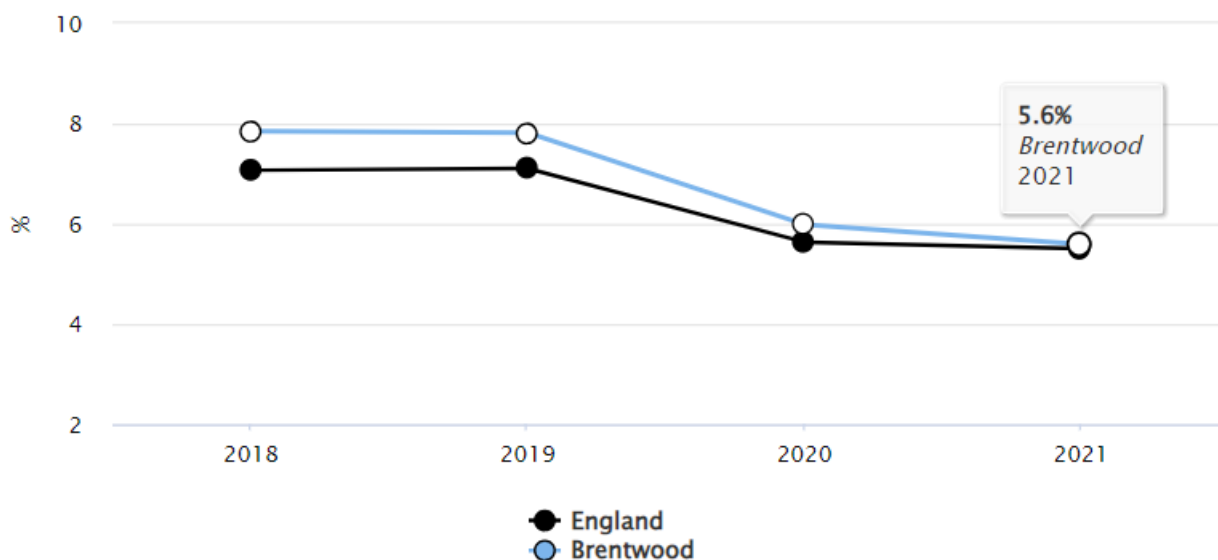
PM_{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), local authorities are expected to work towards reducing emissions and/or concentrations of PM_{2.5} (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Brentwood Borough Council does not monitor PM_{2.5} concentrations however notes the Defra background mapping resource which for PM_{2.5} in 2022 models a maximum annual mean concentration of 10.9µg/m³ in the Local Authority area.

The Public Health Outcomes Framework indicator D01 – Fraction of mortality attributable to particulate (PM_{2.5}) air pollution which for 2021 gave a value of 5.6% which is below the average for England and significantly down from 7.8% in 2018.

Figure 2.1 – Public Health Framework Indicator D01 Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution



Brentwood Borough Council is taking the following measures to address PM_{2.5}:

- Regular inspections of permitted industry where combustion and non-combustion processes could lead to anthropogenic emissions of PM_{2.5}

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

This section sets out the monitoring undertaken within 2022 by Brentwood Borough Council and how it compares with the relevant air quality objectives. Monitoring results are presented for a five-year period between 2018 and 2022.

In 2022, Brentwood Borough Council measured **no** exceedances of the Air Quality Objectives.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Brentwood Borough Council does not undertake automatic continuous monitoring.

3.1.2 Non-Automatic Monitoring Sites

Brentwood Borough Council undertook non-automatic (i.e. passive) monitoring of NO₂ at 33 sites during 2022 using diffusion tubes. Table A.1 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

Individual Pollutants

3.1.3 Nitrogen Dioxide (NO₂)

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

Table A.1 in Appendix A provides the details of the diffusion tube monitoring sites. Table A.2 compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Evidence for Revoking the AQMAs 2, 4 & 7

Pollutant concentrations may vary significantly from one year to the next, due to the influence of meteorological conditions, and it is important for the Council to avoid cycling between declaring, revoking and declaring again, due simply to these variations.

Therefore, before revoking an AQMA on the basis of measured pollutant concentrations, we need to be reasonably certain that any future exceedances that might occur in more adverse meteorological conditions are unlikely.

The Defra LAQM TG.22 technical guidance document defines that revocation of an AQMA should be considered following three consecutive years of compliance with the relevant objective as evidenced through monitoring.

As the NO₂ monitoring in the AQMAs 2, 4 & 7 is completed using diffusion tubes, it is necessary to account for the inherent uncertainty associated with the monitoring method and it is recommended that revocation of an AQMA should only be considered following three consecutive years of annual mean NO₂ concentrations being lower than 36µg/m³ (i.e. within 10% of the annual mean NO₂ objective).

Table 3.1 below identifies that measured concentrations in all of the AQMAs have been below the NO₂ annual mean Air Quality Objectives and below the 36µg/m³ borderline threshold for three years.

These measurements provide Brentwood Borough Council reasonable certainty that future exceedances are unlikely to re-occur and in accordance with the technical guidance is sufficient evidence to revoke AQMAs 2, 4 & 7.

Table 3.1 – Progress on Measures to Improve Air Quality

| AQMA | Maximum Measured Concentration in 2022 | Last Measured Exceedance | Number of Years complying with the Air Quality Objectives | Number of Years below 36 µg/m ³ Borderline Threshold (at relevant exposure) |
|--------|--|--------------------------|---|--|
| AQMA 2 | 30.0µg/m ³ | 2019 | 3 | 3 |
| AQMA 4 | 24.8µg/m ³ | 2013 | 9 | 5 |
| AQMA 7 | 25.9µg/m ³ | 2016 | 6 | 4 |

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites

| Diffusion Tube ID | Site Name | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) ⁽¹⁾ | Distance to kerb of nearest road (m) ⁽²⁾ | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|-------------------|---|------------------|-------------------------|--------------------------|----------------------|----------------------|--|---|---|-----------------|
| BRW 5 | Telegraph pole at end of Brook Street | Roadside | 556887 | 192412 | NO2 | AQMA BRW2 | 16.3 | 1.3 | No | 2.5 |
| BRW 6 | Freeway Cottage, 63 Brook Street | Roadside | 557014 | 192493 | NO2 | AQMA BRW2 | 0.9 | 1.3 | No | 2.5 |
| BRW 7 | 13 Nags Head Lane - on fence trellis | Roadside | 557118 | 191978 | NO2 | | 5.0 | 15.6 | No | 2.5 |
| BRW 8 | 3 High Street - front facade | Roadside | 559691 | 193912 | NO2 | AQMA BRW8 | 9.4 | 9.8 | No | 2.5 |
| BRW 9 | Caffe Uno, High Street - front facade | Roadside | 559643 | 193889 | NO2 | AQMA BRW8 | 0.9 | 8.1 | No | 2.5 |
| BRW 10 | 5/7 Ongar Road - lamp-post | Roadside | 559699 | 193948 | NO2 | AQMA BRW8 | 0.7 | 3.2 | No | 2.5 |
| BRW 11 | 36 Ongar Road - front facade | Roadside | 559604 | 194035 | NO2 | AQMA BRW8 | 0.0 | 5.7 | No | 2.5 |
| BRW 12 | Corner of Kings Road/Hart Street/High Street | Roadside | 559187 | 193658 | NO2 | | 5.3 | 2.1 | No | 2.5 |
| BRW 14 | 145 High Street - front facade | Roadside | 559148 | 193660 | NO2 | | 0.0 | 2.6 | No | 2.5 |
| BRW 15 | 4 Westbury Road - downpipe on corner of house | Roadside | 559085 | 193601 | NO2 | | 2.0 | 6.9 | No | 2.5 |
| BRW 16 | 24 Wingrave Crescent - rear boundary fence | Urban Background | 557379 | 192900 | NO2 | | 8.3 | 25.1 | No | 2.5 |
| BRW 17 | 51 Spital Lane - side garden | Roadside | 557632 | 193151 | NO2 | | 3.8 | 9.3 | No | 2.5 |
| BRW 18 | 46 Selwood Road - rear garden tree stump | Urban Background | 557826 | 193333 | NO2 | | 6.0 | 20.0 | No | 2.5 |
| BRW 19 | 61 Warescot Road - front facade | Roadside | 558769 | 194873 | NO2 | AQMA BRW4 | 0.0 | 10.4 | No | 2.5 |
| BRW 20 | 76 Warescot Road - lamp-post | Kerbside | 558818 | 194913 | NO2 | AQMA BRW4 | 7.0 | 0.2 | No | 2.5 |
| BRW 21 | 316 Ongar Road - side gatepost | Roadside | 558681 | 194799 | NO2 | AQMA BRW4 | 9.9 | 8.2 | No | 2.5 |
| BRW 22 | 339 Ongar Road - front facade | Roadside | 558683 | 194894 | NO2 | AQMA BRW4 | 0.0 | 7.1 | No | 2.5 |
| BRW 23 | 12 Hurstwood Avenue - front facade | Roadside | 558742 | 194928 | NO2 | AQMA BRW4 | 0.0 | 8.2 | No | 2.5 |
| BRW 24 | Highwood Close - lamp-post | Roadside | 558624 | 194695 | NO2 | | 18.8 | 1.0 | No | 2.5 |
| BRW 25 | 65 Greenshaw - lamp-post | Roadside | 558482 | 194547 | NO2 | | 5.5 | 21.4 | No | 2.5 |
| BRW 26 | 289 Chelmsford Road - telegraph pole | Roadside | 562278 | 196649 | NO2 | | 15.2 | 2.1 | No | 2.5 |

| Diffusion Tube ID | Site Name | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) ⁽¹⁾ | Distance to kerb of nearest road (m) ⁽²⁾ | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|-------------------|--|------------------|-------------------------|--------------------------|----------------------|----------------------|--|---|---|-----------------|
| BRW 28 | Ingatestone Junior School, The Furlongs - playground pergola | Urban Background | 564446 | 199509 | NO2 | | 11.0 | 37.0 | No | 2.5 |
| BRW 29 | 1 Trimble Close - lamp-post | Roadside | 564617 | 199849 | NO2 | | 8.9 | 11.0 | No | 2.5 |
| BRW 30 | 8 Trimble Close - rear facade | Roadside | 564654 | 199898 | NO2 | | 0.0 | 9.5 | No | 2.5 |
| BRW 31 | New Road, Ingatestone - telegraph pole | Roadside | 565186 | 200071 | NO2 | | 19.2 | 18.7 | No | 2.5 |
| BRW 32 | The Poplars, Brook Street | Urban Background | 556964 | 192288 | NO2 | AQMA BRW2 | 0.0 | 45.0 | No | 2.5 |
| BRW 33 | 108 Doddinghurst Road - front facade | Urban Background | 559139 | 195012 | NO2 | | 1.6 | 16.3 | No | 2.5 |
| BRW 34 | La Clarentet, Talbrook - carport | Roadside | 557719 | 193226 | NO2 | | 2.2 | 2.7 | No | 2.5 |
| BRW 36 | Lincolns Lane - background | Rural | 556603 | 194628 | NO2 | | N/A | 0.6 | No | 2.5 |
| BRW 38 | 58 Roman Road | Roadside | 563659 | 198314 | NO2 | | 9.6 | 26.3 | No | 2.5 |
| BRW 39 | Thorndon Avenue/A127 | Roadside | 562412 | 189153 | NO2 | | 21.3 | 2.2 | No | 2.5 |
| BRW 40 | 131 High St - lamp-post | Kerbside | 559191 | 193681 | NO2 | | 3.0 | 1.0 | No | 2.5 |
| BRW 41 | 88 High St - lamp-post | Kerbside | 559292 | 193710 | NO2 | | 3.0 | 1.0 | No | 2.5 |
| BRW 5 | Telegraph pole at end of Brook Street | Roadside | 556887 | 192412 | NO2 | AQMA BRW2 | 16.3 | 1.3 | No | 2.5 |
| BRW 6 | Freeway Cottage, 63 Brook Street | Roadside | 557014 | 192493 | NO2 | AQMA BRW2 | 0.9 | 1.3 | No | 2.5 |
| BRW 7 | 13 Nags Head Lane - on fence trellis | Roadside | 557118 | 191978 | NO2 | | 5.0 | 15.6 | No | 2.5 |

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

| Diffusion Tube ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type | Valid Data Capture for Monitoring Period (%) ⁽¹⁾ | Valid Data Capture 2022 (%) ⁽²⁾ | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------|-------------------------|--------------------------|------------------|---|--|------|-------------|------|------|------|
| BRW 5 | 556887 | 192412 | Roadside | 100.0 | 100.0 | 39.6 | 42.1 | 31.1 | 31.5 | 30.0 |
| BRW 6 | 557014 | 192493 | Roadside | 100.0 | 100.0 | 34.2 | 32.6 | 25.6 | 24.1 | 24.2 |
| BRW 7 | 557118 | 191978 | Roadside | 100.0 | 100.0 | 25.1 | 23.8 | 19.5 | 19.3 | 17.2 |
| BRW 8 | 559691 | 193912 | Roadside | 100.0 | 100.0 | 33.9 | 35.1 | 26.3 | 27.4 | 25.9 |
| BRW 9 | 559643 | 193889 | Roadside | 100.0 | 100.0 | 31.9 | 31.0 | 22.3 | 26.4 | 24.1 |
| BRW 10 | 559699 | 193948 | Roadside | 100.0 | 100.0 | 36.4 | 33.6 | 24.6 | 27.9 | 25.4 |
| BRW 11 | 559604 | 194035 | Roadside | 100.0 | 100.0 | 31.1 | 30.5 | 24.6 | 24.5 | 23.3 |
| BRW 12 | 559187 | 193658 | Roadside | 100.0 | 100.0 | 26.9 | 26.2 | 20.7 | 22.3 | 20.9 |
| BRW 14 | 559148 | 193660 | Roadside | 100.0 | 100.0 | 31.9 | 29.6 | 23.7 | 25.4 | 22.2 |
| BRW 15 | 559085 | 193601 | Roadside | 100.0 | 100.0 | 20.5 | 19.7 | 15.6 | 16.7 | 15.2 |
| BRW 16 | 557379 | 192900 | Urban Background | 92.3 | 92.3 | 28.1 | 27.3 | 21.3 | 21.7 | 19.9 |
| BRW 17 | 557632 | 193151 | Roadside | 100.0 | 100.0 | 26.0 | 26.6 | 20.5 | 19.9 | 18.9 |
| BRW 18 | 557826 | 193333 | Urban Background | 92.3 | 92.3 | 23.4 | 22.5 | 18.5 | 17.6 | 17.2 |
| BRW 19 | 558769 | 194873 | Roadside | 100.0 | 100.0 | 26.8 | 26.7 | 21.1 | 21.2 | 19.0 |
| BRW 20 | 558818 | 194913 | Kerbside | 100.0 | 100.0 | 32.3 | 31.9 | 26.2 | 27.5 | 24.3 |
| BRW 21 | 558681 | 194799 | Roadside | 100.0 | 100.0 | 23.7 | 23.7 | 19.8 | 16.8 | 20.5 |
| BRW 22 | 558683 | 194894 | Roadside | 100.0 | 100.0 | 30.3 | 30.0 | 23.5 | 23.1 | 22.4 |
| BRW 23 | 558742 | 194928 | Roadside | 100.0 | 100.0 | 33.3 | 33.5 | 25.5 | 25.9 | 24.8 |
| BRW 24 | 558624 | 194695 | Roadside | 100.0 | 100.0 | 23.8 | 24.6 | 19.4 | 19.1 | 17.9 |
| BRW 25 | 558482 | 194547 | Roadside | 100.0 | 100.0 | 28.5 | 26.7 | 26.3 | 21.8 | 22.1 |
| BRW 26 | 562278 | 196649 | Roadside | 100.0 | 100.0 | 26.4 | 26.7 | 20.9 | 21.3 | 19.1 |
| BRW 28 | 564446 | 199509 | Urban Background | 100.0 | 100.0 | 28.3 | 28.4 | 22.4 | 23.1 | 20.4 |
| BRW 29 | 564617 | 199849 | Roadside | 100.0 | 100.0 | 24.6 | 24.5 | 19.6 | 18.6 | 18.0 |
| BRW 30 | 564654 | 199898 | Roadside | 100.0 | 100.0 | 26.4 | 26.9 | 21.0 | 20.6 | 20.2 |
| BRW 31 | 565186 | 200071 | Roadside | 100.0 | 100.0 | 28.3 | 25.9 | 19.5 | 20.8 | 19.2 |
| BRW 32 | 556964 | 192288 | Urban Background | 100.0 | 100.0 | 29.7 | 28.5 | 23.6 | 22.0 | 20.8 |

| Diffusion Tube ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type | Valid Data Capture for Monitoring Period (%) ⁽¹⁾ | Valid Data Capture 2022 (%) ⁽²⁾ | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------|-------------------------|--------------------------|------------------|---|--|------|------|------|------|------|
| BRW 33 | 559139 | 195012 | Urban Background | 100.0 | 100.0 | 22.1 | 22.6 | 17.9 | 17.8 | 16.5 |
| BRW 34 | 557719 | 193226 | Roadside | 100.0 | 100.0 | 22.9 | 23.4 | 19.5 | 19.2 | 16.2 |
| BRW 36 | 556603 | 194628 | Rural | 100.0 | 100.0 | 15.9 | 16.0 | 12.4 | 11.9 | 11.4 |
| BRW 38 | 563659 | 198314 | Roadside | 92.3 | 92.3 | 18.5 | 19.1 | 21.8 | 13.8 | 15.7 |
| BRW 39 | 562412 | 189153 | Roadside | 100.0 | 100.0 | 27.1 | 25.7 | 20.8 | 20.4 | 18.7 |
| BRW 40 | 559191 | 193681 | Kerbside | 100.0 | 100.0 | 39.1 | 36.9 | 32.0 | 30.9 | 28.3 |
| BRW 41 | 559292 | 193710 | Kerbside | 100.0 | 100.0 | 39.2 | 38.4 | 30.8 | 31.7 | 28.7 |

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

Diffusion tube data has been bias adjusted

Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction

Notes:

The annual mean concentrations are presented as $\mu\text{g}/\text{m}^3$.

Exceedances of the NO₂ annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO₂ annual means exceeding $60\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

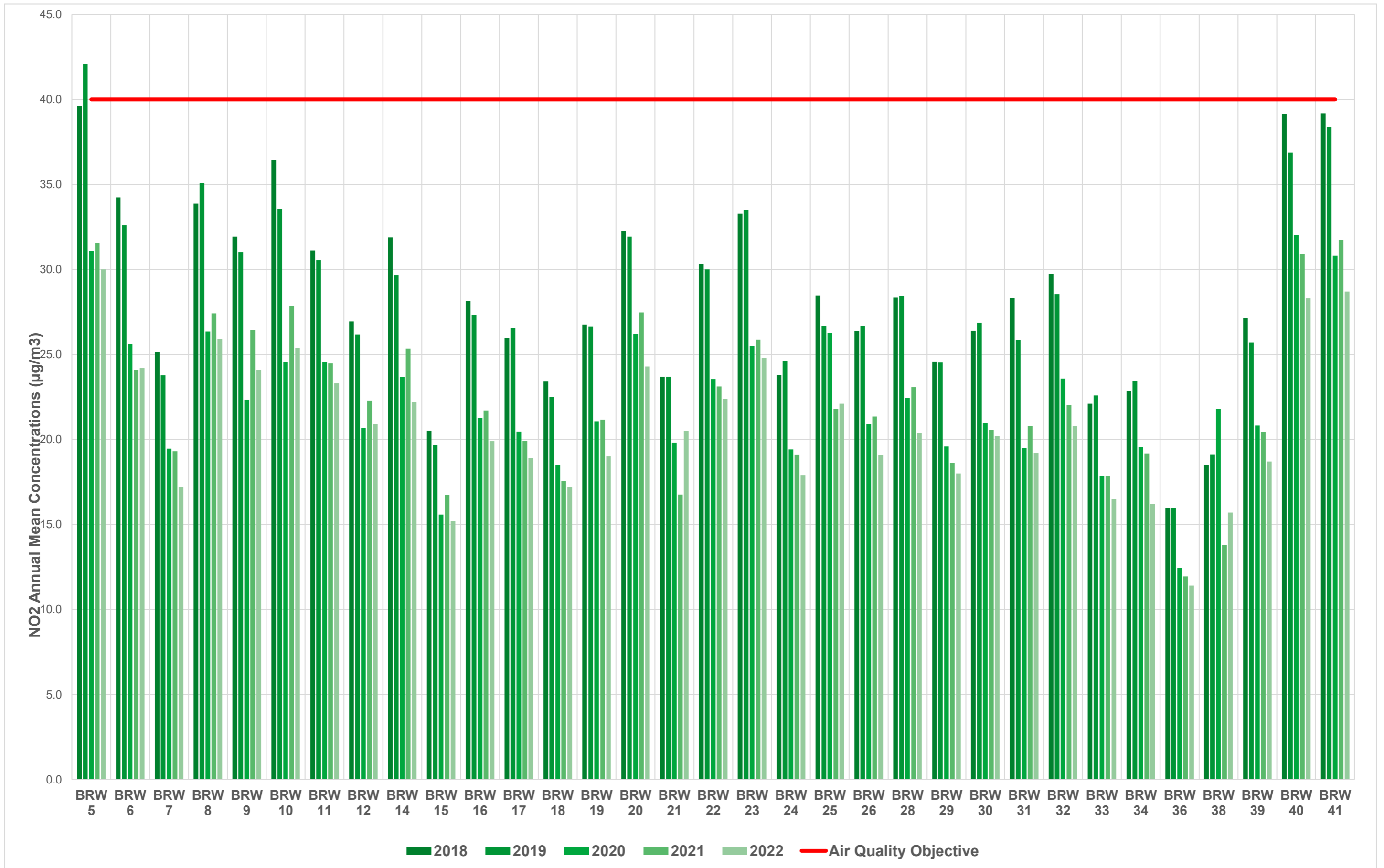
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO₂ 2022 Diffusion Tube Results (µg/m³)

| DT ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted (0.76) |
|--------|-------------------------|--------------------------|------|------|------|------|------|------|---------|---------|------|------|---------|------|-----------------------|--|
| BRW 5 | 556887 | 192412 | 54.9 | 40.4 | 38.6 | 33.5 | 38.4 | 39.0 | 34.0 | 34.0 | 37.5 | 41.3 | 46.7 | 35.0 | 39.4 | 30.0 |
| BRW 6 | 557014 | 192493 | 40.4 | 35.4 | 36.1 | 26.2 | 29.6 | 28.5 | 26.2 | 27.7 | 27.3 | 31.6 | 38.4 | 33.9 | 31.8 | 24.2 |
| BRW 7 | 557118 | 191978 | 24.3 | 32.1 | 19.5 | 15.1 | 24.7 | 23.1 | 18.6 | 15.5 | 19.9 | 24.3 | 30.2 | 25.1 | 22.7 | 17.2 |
| BRW 8 | 559691 | 193912 | 50.9 | 37.3 | 39.2 | 31.0 | 33.9 | 28.5 | 29.3 | 30.8 | 32.9 | 28.3 | 33.1 | 34.6 | 34.1 | 25.9 |
| BRW 9 | 559643 | 193889 | 48.4 | 34.6 | 35.4 | 31.9 | 29.3 | 27.7 | 26.0 | 27.5 | 31.6 | 24.7 | 30.4 | 32.7 | 31.7 | 24.1 |
| BRW 10 | 559699 | 193948 | 50.3 | 4.4 | 44.9 | 36.3 | 33.1 | 27.2 | 30.8 | 36.3 | 35.6 | 33.3 | 36.9 | 31.9 | 33.4 | 25.4 |
| BRW 11 | 559604 | 194035 | 48.8 | 33.9 | 31.7 | 23.7 | 29.5 | 28.7 | 27.7 | 25.4 | 25.6 | 27.2 | 33.9 | 31.7 | 30.6 | 23.3 |
| BRW 12 | 559187 | 193658 | 43.0 | 28.3 | 35.8 | 23.0 | 23.0 | 18.7 | 19.3 | 20.5 | 23.5 | 27.5 | 35.6 | 32.3 | 27.5 | 20.9 |
| BRW 14 | 559148 | 193660 | 40.2 | 29.5 | 34.2 | 27.9 | 27.3 | 22.0 | 23.0 | 25.8 | 31.2 | 27.3 | 31.0 | 31.2 | 29.2 | 22.2 |
| BRW 15 | 559085 | 193601 | 34.6 | 21.8 | 23.9 | 17.6 | 14.7 | 12.4 | 13.2 | 16.4 | 17.0 | 17.0 | 23.7 | 27.3 | 20.0 | 15.2 |
| BRW 16 | 557379 | 192900 | 36.3 | 30.6 | 24.5 | 24.3 | 22.2 | 24.1 | 21.0 | 22.2 | 24.7 | 27.2 | Damaged | 31.2 | 26.2 | 19.9 |
| BRW 17 | 557632 | 193151 | 39.2 | 27.9 | 25.1 | 21.4 | 24.5 | 21.2 | 18.6 | 19.9 | 24.1 | 21.8 | 26.8 | 28.3 | 24.9 | 18.9 |
| BRW 18 | 557826 | 193333 | 34.0 | 24.7 | 23.5 | 21.6 | 19.9 | 17.6 | 16.6 | Missing | 20.3 | 20.8 | 25.4 | 25.1 | 22.7 | 17.2 |
| BRW 19 | 558769 | 194873 | 36.9 | 26.8 | 23.1 | 22.8 | 22.4 | 18.9 | 18.2 | 25.2 | 22.0 | 24.7 | 29.1 | 29.5 | 25.0 | 19.0 |
| BRW 20 | 558818 | 194913 | 44.8 | 31.9 | 39.4 | 39.8 | 26.8 | 22.8 | 26.0 | 37.1 | 29.5 | 27.3 | 33.3 | 24.7 | 31.9 | 24.3 |
| BRW 21 | 558681 | 194799 | 35.8 | 29.8 | 28.7 | 24.9 | 26.6 | 25.4 | 23.1 | 24.5 | 23.0 | 23.3 | 25.4 | 32.5 | 26.9 | 20.5 |
| BRW 22 | 558683 | 194894 | 35.8 | 33.5 | 35.0 | 21.8 | 25.2 | 24.7 | 23.3 | 22.2 | 24.5 | 34.2 | 39.8 | 33.5 | 29.5 | 22.4 |
| BRW 23 | 558742 | 194928 | 49.3 | 36.7 | 37.5 | 23.5 | 30.8 | 28.5 | 27.5 | 27.5 | 28.9 | 34.2 | 40.0 | 27.7 | 32.7 | 24.8 |
| BRW 24 | 558624 | 194695 | 40.4 | 26.8 | 28.7 | 19.5 | 19.5 | 16.4 | 15.3 | 17.4 | 17.8 | 23.5 | 27.5 | 29.5 | 23.5 | 17.9 |
| BRW 25 | 558482 | 194547 | 47.8 | 34.0 | 29.3 | 24.5 | 25.4 | 21.6 | 19.3 | 21.6 | 27.5 | 28.7 | 34.2 | 34.6 | 29.1 | 22.1 |
| BRW 26 | 562278 | 196649 | 38.1 | 31.2 | 21.0 | 23.1 | 23.9 | 19.3 | 16.3 | 23.7 | 26.0 | 23.9 | 30.0 | 25.1 | 25.1 | 19.1 |
| BRW 28 | 564446 | 199509 | 44.6 | 34.2 | 23.5 | 23.5 | 28.3 | 22.6 | 21.0 | 22.8 | 21.8 | 22.6 | 30.0 | 27.9 | 26.9 | 20.4 |
| BRW 29 | 564617 | 199849 | 36.9 | 28.5 | 26.6 | 20.7 | 20.3 | 18.9 | 16.6 | 19.1 | 18.9 | 23.1 | 28.1 | 26.0 | 23.7 | 18.0 |
| BRW 30 | 564654 | 199898 | 37.9 | 28.7 | 31.2 | 25.6 | 27.2 | 21.0 | 20.5 | 23.7 | 24.7 | 24.7 | 25.1 | 28.7 | 26.6 | 20.2 |
| BRW 31 | 565186 | 200071 | 33.3 | 19.7 | 29.5 | 29.3 | 24.7 | 18.7 | 21.0 | 30.8 | 27.5 | 20.3 | 23.9 | 24.7 | 25.3 | 19.2 |
| BRW 32 | 556964 | 192288 | 42.5 | 35.6 | 24.3 | 19.9 | 27.2 | 27.0 | 22.4 | 21.2 | 28.5 | 31.2 | 34.4 | 15.1 | 27.4 | 20.8 |
| BRW 33 | 559139 | 195012 | 33.3 | 26.6 | 23.0 | 17.4 | 19.1 | 15.5 | 14.0 | 16.3 | 21.0 | 20.3 | 26.0 | 28.9 | 21.8 | 16.5 |
| BRW 34 | 557719 | 193226 | 37.1 | 20.8 | 25.1 | 21.8 | 19.7 | 18.7 | 16.3 | 18.4 | 21.8 | 21.6 | 25.2 | 9.6 | 21.3 | 16.2 |
| BRW 36 | 556603 | 194628 | 28.1 | 20.1 | 17.4 | 8.6 | 7.7 | 9.9 | 9.4 | 10.9 | 12.2 | 15.5 | 20.3 | 19.7 | 15.0 | 11.4 |
| BRW 38 | 563659 | 198314 | 22.6 | 18.0 | 26.4 | 14.3 | 16.3 | 13.8 | Missing | 18.7 | 17.4 | 23.1 | 29.1 | 27.7 | 20.7 | 15.7 |
| BRW 39 | 562412 | 189153 | 31.6 | 30.6 | 30.8 | 26.0 | 24.5 | 19.1 | 20.3 | 23.5 | 20.3 | 20.1 | 27.0 | 21.8 | 24.6 | 18.7 |
| BRW 40 | 559191 | 193681 | 59.1 | 40.7 | 39.4 | 29.8 | 35.0 | 31.4 | 31.2 | 30.2 | 35.0 | 35.8 | 41.3 | 38.4 | 37.3 | 28.3 |
| BRW 41 | 559292 | 193710 | 53.9 | 43.0 | 43.4 | 31.2 | 39.2 | 36.7 | 33.3 | 31.0 | 31.7 | 40.2 | 41.7 | 27.7 | 37.8 | 28.7 |

☒ All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

☒ National bias adjustment factor used

☒ Where applicable, data has been distance corrected for relevant exposure in the final column

☒ Brentwood Borough Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

New or Changed Sources Identified Within Brentwood Borough Council During 2022

Brentwood Borough Council has not identified any new sources relating to air quality within the reporting year of 2022.

Additional Air Quality Works Undertaken by Brentwood During 2022

Brentwood Borough Council has not completed any additional air quality works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

- Brentwood Borough Council undertook monitoring at 33 sites in 2022.
- Brentwood Borough Council adheres with the Diffusion Tube Monitoring Calendar.
- The diffusion tubes were supplied by Socotec (UKAS Testing Laboratory number 1015) with a preparation method of 50% triethanolamine (TEA) in Acetone.
- The AIR NO₂ proficiency testing scheme found that the laboratory achieved the following percentage of results determined as satisfactory for 2022:

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Brentwood Borough Council have applied a national bias adjustment factor of 0.76 to the 2022 monitoring data to maintain consistency with other Councils in Essex.

A summary of bias adjustment factors used by Brentwood Borough Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

| Monitoring Year | Local or National | Diffusion Tube | If National, Version of National Spreadsheet | Adjustment Factor |
|-----------------|-------------------|-------------------------------|--|-------------------|
| 2022 | National | Socotec 50% TEA in Acetone | 03/23 | 0.76 |
| 2021 | National | Socotec 50% TEA in Acetone | 03/22 | 0.78 |
| 2020 | National | Socotec 50% TEA in Acetone | 03/21 | 0.77 |
| 2019 | National | Socotec 50% TEA in Acetone | 03/20 | 0.75 |
| 2018 | National | ESG Didcot 50% TEA in Acetone | 03/19 | 0.76 |

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website.

No diffusion tube NO₂ monitoring locations within Brentwood required distance correction during 2022.

Figure D.2 – Map of Non-Automatic Monitoring Sites: BRW4 AQMA & A12/Warescot Road/Hurstwood Avenue/Ongar Road

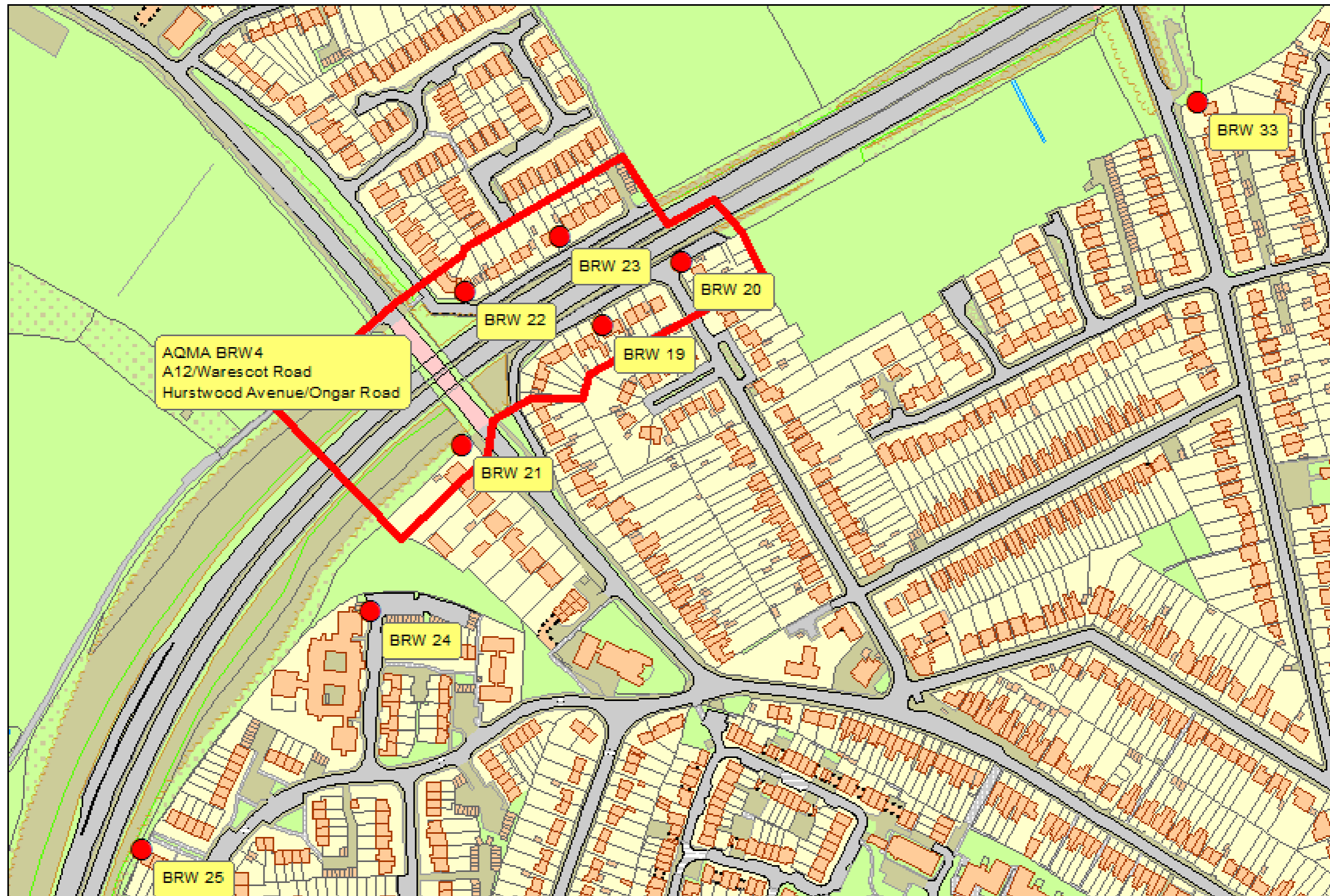


Figure D.3 – Map of Non-Automatic Monitoring Sites: BRW7 AQMA & Brentwood Town Centre

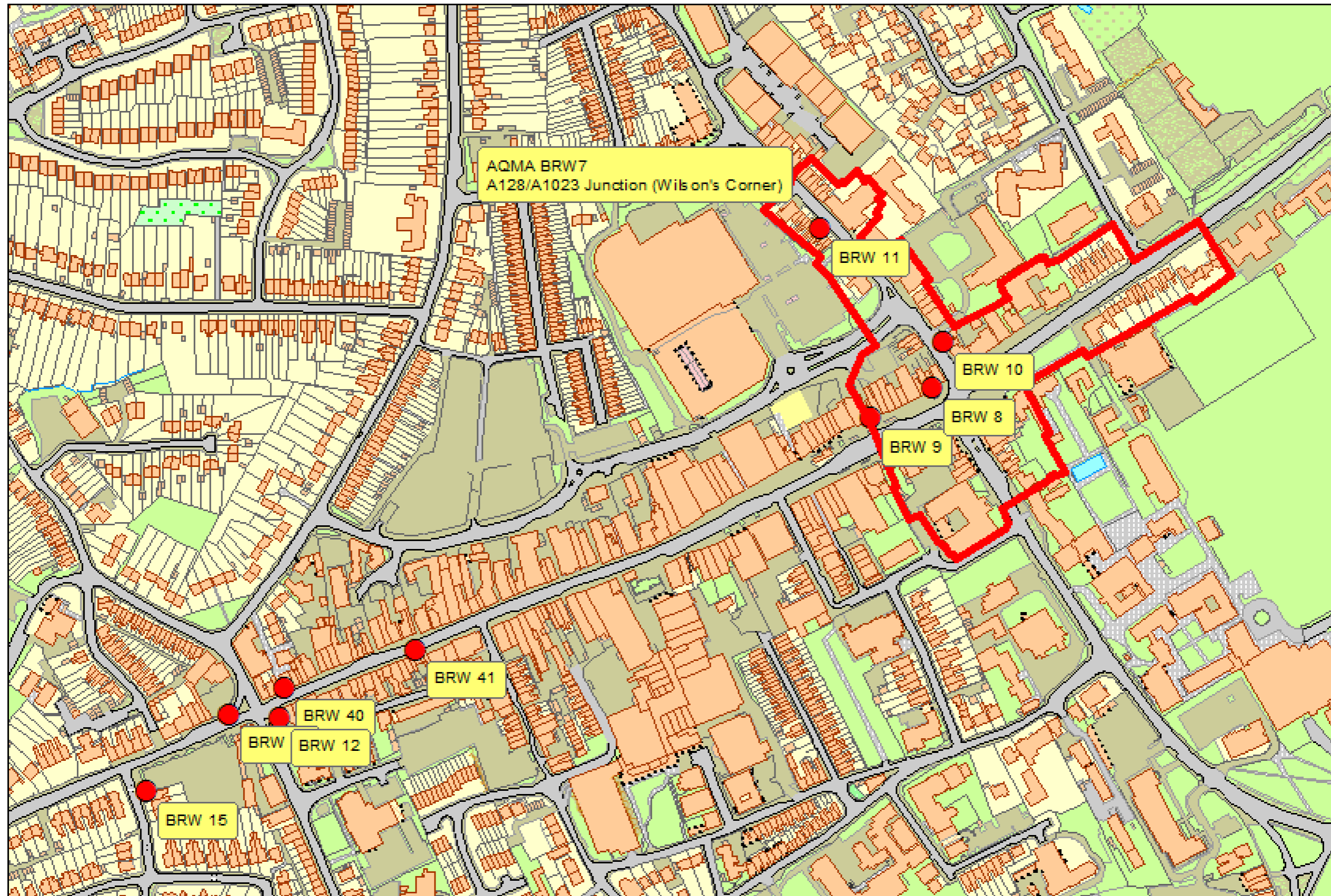


Figure D.5 – Map of Non-Automatic Monitoring Sites: West Horndon

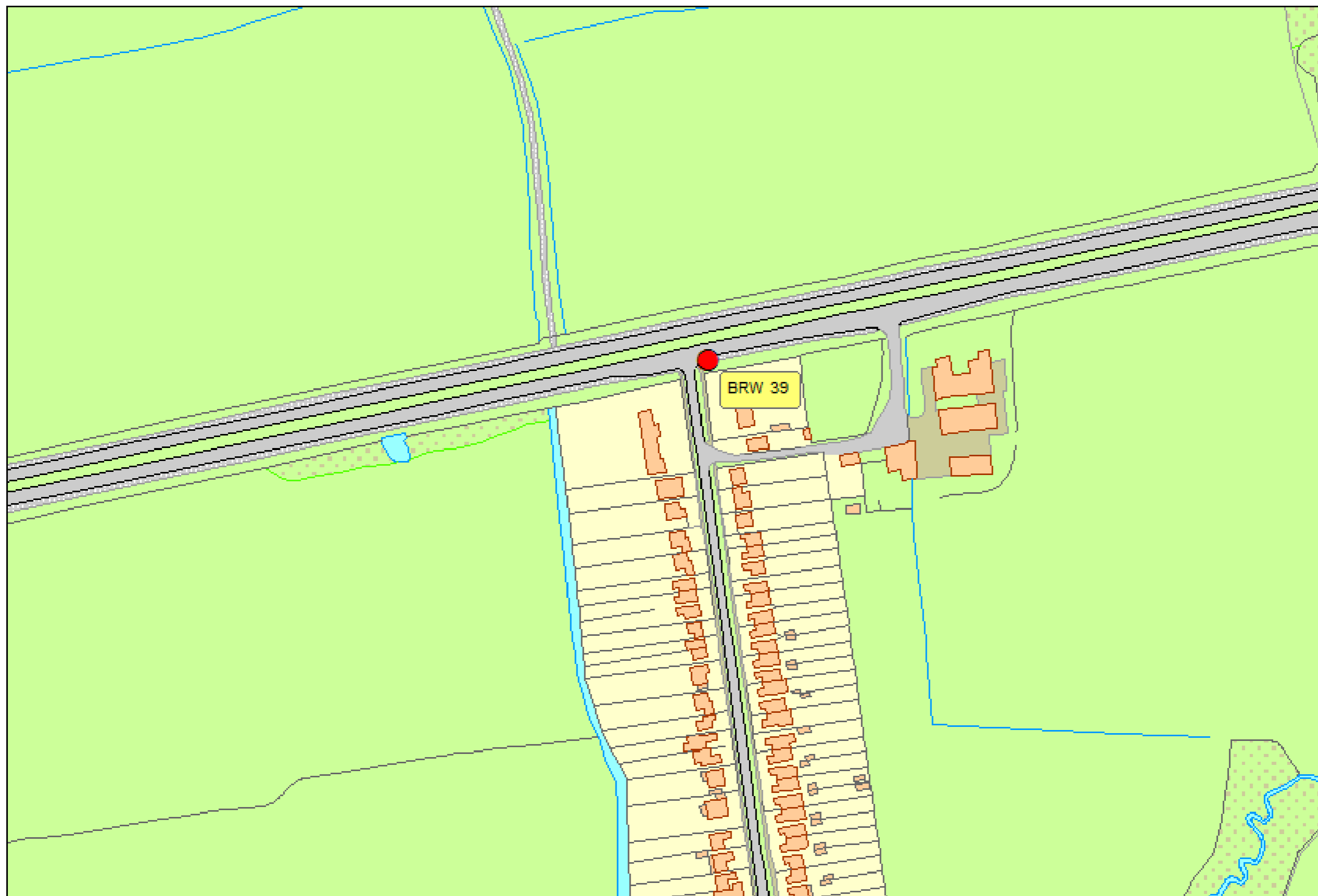
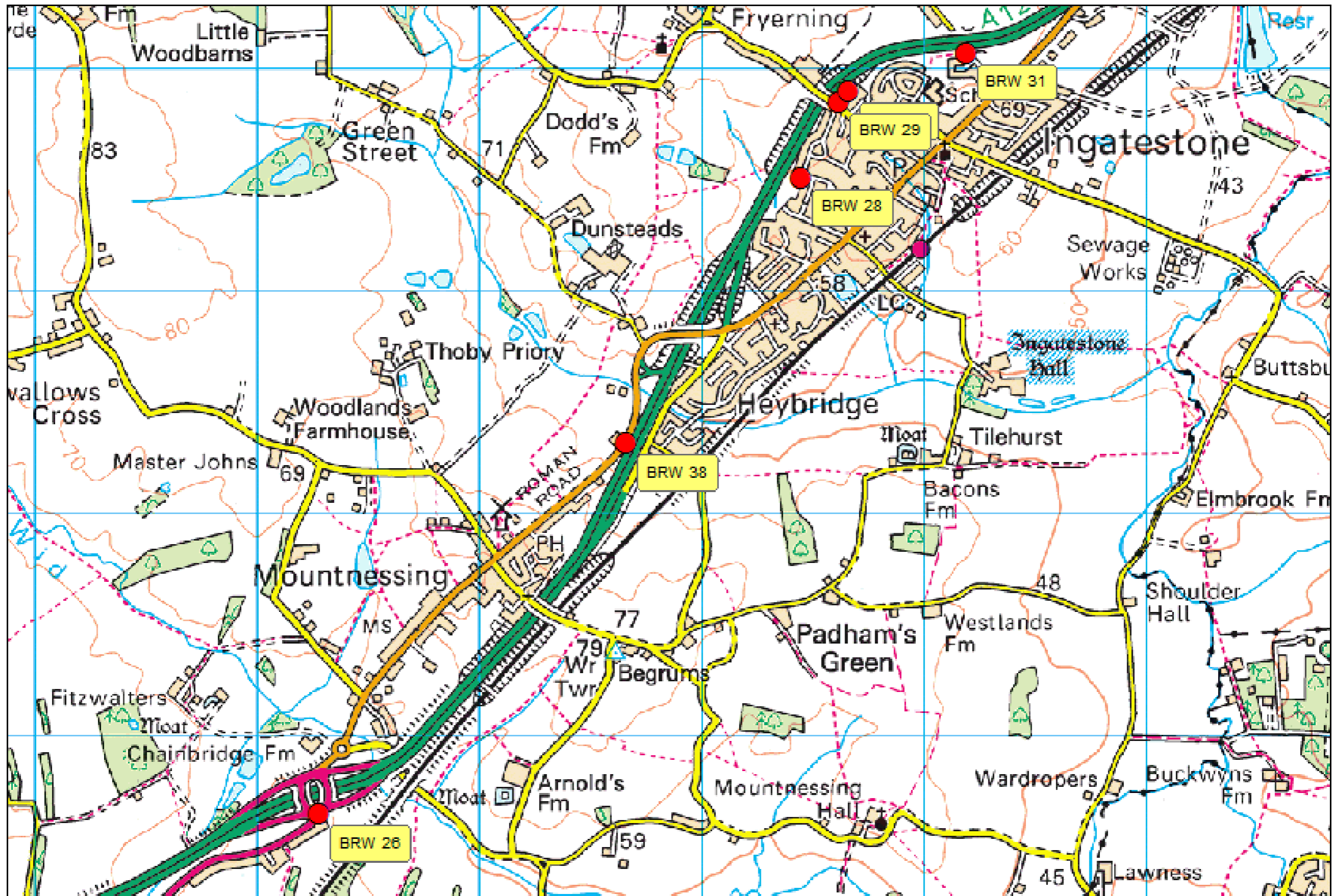


Figure D.6 – Map of Non-Automatic Monitoring Sites: Ingatestone & Margaretting



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁵

| Pollutant | Air Quality Objective: Concentration | Air Quality Objective: Measured as |
|--|---|------------------------------------|
| Nitrogen Dioxide (NO ₂) | 200µg/m ³ not to be exceeded more than 18 times a year | 1-hour mean |
| Nitrogen Dioxide (NO ₂) | 40µg/m ³ | Annual mean |
| Particulate Matter (PM ₁₀) | 50µg/m ³ , not to be exceeded more than 35 times a year | 24-hour mean |
| Particulate Matter (PM ₁₀) | 40µg/m ³ | Annual mean |
| Sulphur Dioxide (SO ₂) | 350µg/m ³ , not to be exceeded more than 24 times a year | 1-hour mean |
| Sulphur Dioxide (SO ₂) | 125µg/m ³ , not to be exceeded more than 3 times a year | 24-hour mean |
| Sulphur Dioxide (SO ₂) | 266µg/m ³ , not to be exceeded more than 35 times a year | 15-minute mean |

⁵ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

| Abbreviation | Description |
|-------------------|---|
| AQAP | Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values' |
| AQMA | Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives |
| ASR | Annual Status Report |
| Defra | Department for Environment, Food and Rural Affairs |
| LAQM | Local Air Quality Management |
| NO ₂ | Nitrogen Dioxide |
| NO _x | Nitrogen Oxides |
| PM ₁₀ | Airborne particulate matter with an aerodynamic diameter of 10µm or less |
| PM _{2.5} | Airborne particulate matter with an aerodynamic diameter of 2.5µm or less |
| QA/QC | Quality Assurance and Quality Control |
| SO ₂ | Sulphur Dioxide |

References

- Defra Diffusion Tube Bias Adjustment Factors Spreadsheet available at; <https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>
- Defra LAQM Summary of Laboratory Performance in AIR NO₂ PT Scheme available at; <https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html>
- Essex Air Quality Consortium available at; <http://www.essexair.org.uk>
- Essex Air Twitter Feed available at; <https://twitter.com/essexair>
- EssexCarShare.com available at; <https://liftshare.com/uk/community/essex>
- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland available at; <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland available at; <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-Policy-Guidance-2022.pdf>
- Public Health Outcomes Framework Indicator D01 available at; <https://fingertips.phe.org.uk/profile/public-health-outcomes-framework>