2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June, 2022

Local Authority Officer	David Carter
Department	Environmental Health & Enforcement
Address	Council Offices Ingrave Road Brentwood Essex CM15 8AY
Telephone	01277 312500
E-mail	david.carter@brentwood.gov.uk
Report Reference number	BRE/ASR2022
Date	14th June 2022
Written by	Tim Savage
Scientific Team Public Health & Protection Services Chelmsford City Council Duke Street Chelmsford Essex CM1 1JE	

Executive Summary: Air Quality in Our Area

The 2022 Annual Status Report 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 2021, 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 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

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 (NO_2). However, no exceedances at relevant exposure have been measured in these AQMAs.

[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, July 2021
[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

Conclusions and Priorities

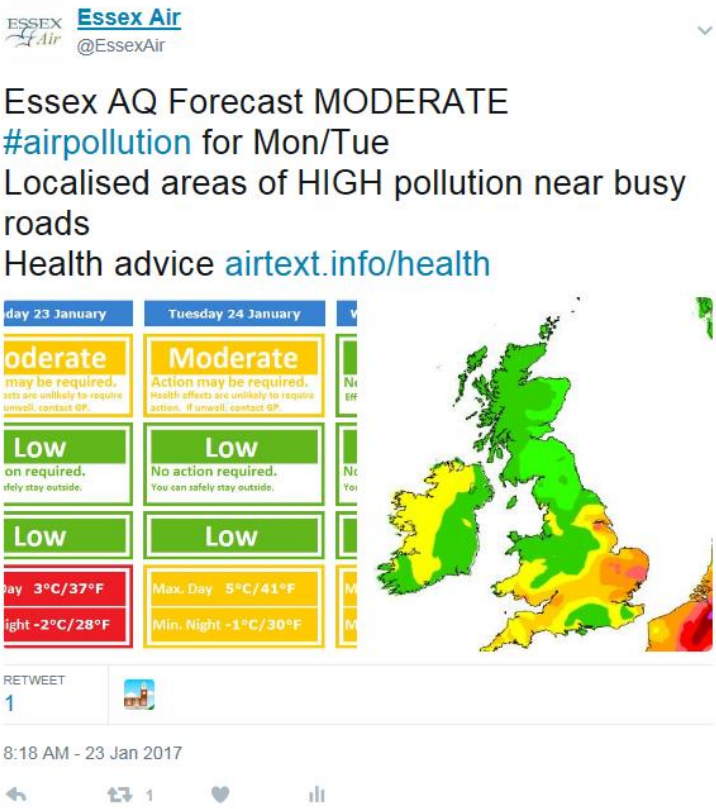
Brentwood Borough Council have concluded that:

- 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).

Local Engagement and How to get Involved

Brentwood Borough Council is a member of the Essex Air Quality consortium. The Essex Air web site provides a daily forecast of air pollution which is based off UK-AIR data feeds. Also, 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.

Local Responsibilities and Commitment

This ASR was prepared on behalf of Brentwood Borough Council's Environmental Health 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:

Telephone: 01277 312500

Email: david.carter@brentwood.gov.uk

Address: Council Offices

Ingrave Road

Brentwood

Essex

CM15 8AY

Table of Contents

Executive Summary: Air Quality in Our Area ii

Air Quality in Brentwood ii

Conclusions and Priorities iii

Local Engagement and How to get Involved iii

Local Responsibilities and Commitment iv

1 Local Air Quality Management 1

2 Actions to Improve Air Quality 2

Air Quality Management Areas 2

Progress and Impact of Measures to address Air Quality in Brentwood 4

$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations 5

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance 6

Summary of Monitoring Undertaken 6

3.1.1 Automatic Monitoring Sites 6

3.1.2 Non-Automatic Monitoring Sites 6

Individual Pollutants 6

3.1.3 Nitrogen Dioxide (NO_2) 7

Appendix A: Monitoring Results 8

Appendix B: Full Monthly Diffusion Tube Results for 2021 14

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC 16

New or Changed Sources Identified Within Brentwood During 2021 16

Additional Air Quality Works Undertaken by Brentwood Borough Council During 2021 16

QA/QC of Diffusion Tube Monitoring 16

Diffusion Tube Annualisation 17

Diffusion Tube Bias Adjustment Factors 17

NO_2 Fall-off with Distance from the Road 17

Appendix D: Maps of Monitoring Locations and AQMAs 18

Appendix E: Summary of Air Quality Objectives in England 24

Glossary of Terms 25

References 26

Figures

Figure i.1 Essex Air Twitter Air Quality Notifications iii
Figure 2.1 – Public Health Framework Indicator D01 Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution.....5
Figure A.2 – Trends in Annual Mean NO_2 Concentrations.....13
Figure D.1 – Monitoring Location Map: BRW2 AQMA, A12 & M25 18
Figure D.2 – Monitoring Location Map: BRW4 AQMA & A12/Warescot Road/Hurstwood Avenue/Ongar Road 19
Figure D.3 – Monitoring Location Map: BRW7 AQMA & Brentwood Town Centre 20
Figure D.4 – Monitoring Location Map: South Weald Rural Background.....21
Figure D.5 – Monitoring Location Map: West Horndon 22
Figure D.6 – Monitoring Location Map: Ingatestone & Margaretting.....23

Tables

Table 2.1 – Declared Air Quality Management Areas.....2
Table 2.2 – Progress on Measures to Improve Air Quality.....4
Table A.1 – Details of Non-Automatic Monitoring Sites 8
Table A.2 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3) 12
Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3) 14
Table C.1 – AIR PT Results 2021.....16
Table C.2 – Bias Adjustment Factor 17
Table E.1 – Air Quality Objectives in England 24

1 Local Air Quality Management

This report provides an overview of air quality in Brentwood during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 pursuit of the objectives. 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 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Brentwood Borough Council can be found in The 2020 Annual Status Report identified that pollutant concentrations are well below the Air Quality Objectives (at relevant exposure) and that it is appropriate to revoke the remaining AQMAs.

Brentwood Borough proposes to revoke:

- AQMA 2: Parts of Brook Street, Brentwood and the A12.
- AQMA4: 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).

Table 2.1. The table presents a description of the three AQMAs that are currently designated within Brentwood. Appendix D: Maps of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objective pertinent to the current AQMA designations is nitrogen dioxide ($NO_{2)}$ annual mean.

The 2020 Annual Status Report identified that pollutant concentrations are well below the Air Quality Objectives (at relevant exposure) and that it is appropriate to revoke the remaining AQMAs.

Brentwood Borough proposes to revoke:

- AQMA 2: Parts of Brook Street, Brentwood and the A12.
- AQMA4: 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).

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	Level of Exceedance: Current Year	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	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	2008	
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	2008	

☒ **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

Brentwood Borough Council and Essex County 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	Estimated / Actual Completion Year	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	

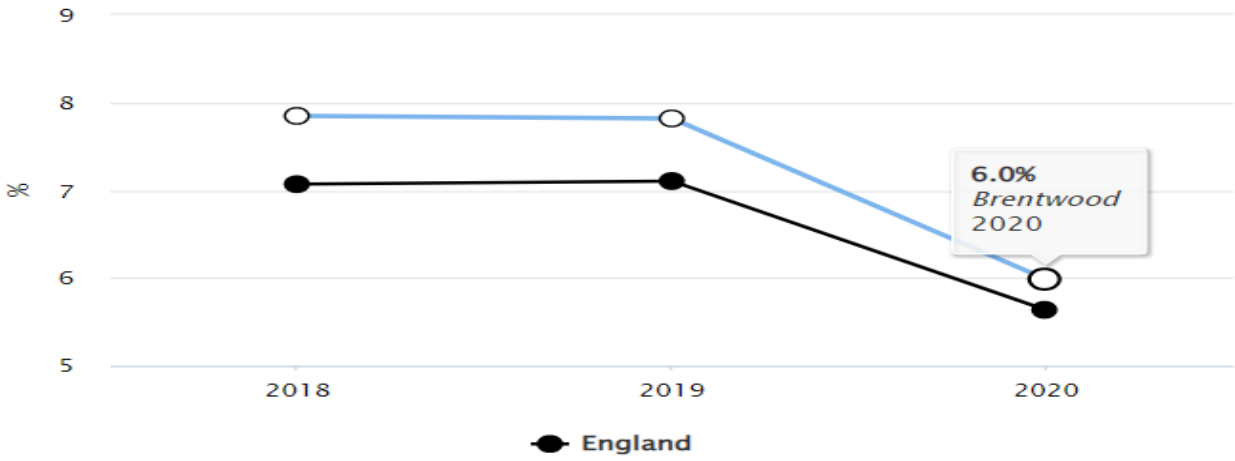
$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), 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 2021 models a maximum annual mean concentration of 11.0µg/m^3 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 2019 gave a value of 6.0% which has improved from 7.8% in 2018. These values are broadly similar to other authorities within the region.

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 $PM_{2.5}$
- Working with Essex County Council (highway authority) to deliver Major Transport improvement schemes to alleviate congestion. In addition to reduced exhaust emissions, these schemes will reduce non-exhaust emissions from brake and tyre wear by making traffic flows smoother.
- Operation of Smoke Control Orders. A number of residential locations within Brentwood are covered by orders to prevent smoke being emitted from chimneys.

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

This section sets out the monitoring undertaken within 2021 by Brentwood Borough Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

No exceedances of the nitrogen dioxide air quality objectives have been identified and the long-term trend for monitored concentrations is downwards.

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 NO_2 at 33 sites during 2021. 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

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.

3.1.3 Nitrogen Dioxide (NO_2)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1.

No exceedances of the air Quality Objectives have been measured.

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	Yes BRW2	16.3	1.3	No	2.5
BRW 6	Freeway Cottage, 63 Brook Street	Roadside	557014	192493	NO2	Yes BRW2	0.9	1.3	No	2.5
BRW 7	13 Nags Head Lane - on fence trellis	Roadside	557118	191978	NO2	No	5	15.6	No	2.5
BRW 8	3 High Street - front facade	Roadside	559691	193912	NO2	Yes BRW7	9.4	9.8	No	2.5
BRW 9	Caffe Uno, High Street - front facade	Roadside	559643	193889	NO2	Yes BRW7	0.9	8.1	No	2.5
BRW 10	5/7 Ongar Road - lamp-post	Roadside	559699	193948	NO2	Yes BRW7	0.7	3.2	No	2.5
BRW 11	36 Ongar Road - front facade	Roadside	559604	194035	NO2	Yes BRW7	0	5.7	No	2.5
BRW 12	Corner of Kings Road/Hart Street/High Street	Roadside	559187	193658	NO2	No	5.3	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 14	145 High Street - front facade	Roadside	559148	193660	NO2	No	0	2.6	No	2.5
BRW 15	4 Westbury Road - downpipe on corner of house	Roadside	559085	193601	NO2	No	2	6.9	No	2.5
BRW 16	24 Wingrave Crescent - rear boundary fence	Urban Background	557379	192900	NO2	No	8.3	25.1	No	2.5
BRW 17	51 Spital Lane - side garden	Roadside	557632	193151	NO2	No	3.8	9.3	No	2.5
BRW 18	46 Selwood Road - rear garden tree stump	Urban Background	557826	193333	NO2	No	6	20	No	2.5
BRW 19	61 Warescot Road - front facade	Roadside	558769	194873	NO2	Yes BRW4	0	10.4	No	2.5
BRW 20	76 Warescot Road - lamp-post	Kerbside	558818	194913	NO2	Yes BRW4	7	0.2	No	2.5
BRW 21	316 Ongar Road - side gatepost	Roadside	558681	194799	NO2	Yes BRW4	9.9	8.2	No	2.5
BRW 22	339 Ongar Road - front facade	Roadside	558683	194894	NO2	Yes BRW4	0	7.1	No	2.5
BRW 23	12 Hurstwood	Roadside	558742	194928	NO2	Yes BRW4	0	8.2	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)
	Avenue - front facade									
BRW 24	Highwood Close - lamp-post	Roadside	558624	194695	NO2	No	18.8	1	No	2.5
BRW 25	65 Greenshaw - lamp-post	Roadside	558482	194547	NO2	No	5.5	21.4	No	2.5
BRW 26	289 Chelmsford Road - telegraph pole	Roadside	562278	196649	NO2	No	15.2	2.1	No	2.5
BRW 28	Ingatestone Junior School, The Furlongs - playground pergola	Urban Background	564446	199509	NO2	No	11	37	No	2.5
BRW 29	1 Trimble Close - lamp-post	Roadside	564617	199849	NO2	No	8.9	11	No	2.5
BRW 30	8 Trimble Close - rear facade	Roadside	564654	199898	NO2	No	0	9.5	No	2.5
BRW 31	New Road, Ingatestone - telegraph pole	Roadside	565186	200071	NO2	No	19.2	18.7	No	2.5
BRW 32	The Poplars, Brook Street	Urban Background	556964	192288	NO2	Yes BRW2	0	45	No	2.5
BRW 33	108 Doddinghurst	Urban Background	559139	195012	NO2	No	1.6	16.3	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)
	Road - front facade									
BRW 34	La Clarentet, Talbrook - carport	Roadside	557719	193226	NO2	No	2.2	2.7	No	2.5
BRW 36	Lincolns Lane - background	Rural	556603	194628	NO2	No	N/A	0.6	No	2.5
BRW 38	58 Roman Road	Roadside	563659	198314	NO2	No	9.6	26.3	No	2.5
BRW 39	Thorndon Avenue/A127	Roadside	562412	189153	NO2	No	21.3	2.2	No	2.5
BRW 40	131 High St - lamp-post	Kerbside	559191	193681	NO2	No	3	1	No	2.5
BRW 41	88 High St - lamp-post	Kerbside	559292	193710	NO2	No	3	1	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 NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

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 2021 (%) (2)	2017	2018	2019	2020	2021
BRW 5	556887	192412	Roadside	100.0	100.0	**47.0**	39.6	**42.1**	31.1	31.5
BRW 6	557014	192493	Roadside	100.0	100.0	37.6	34.2	32.6	25.6	24.1
BRW 7	557118	191978	Roadside	100.0	100.0	29.6	25.1	23.8	19.5	19.3
BRW 8	559691	193912	Roadside	100.0	100.0	36.5	33.9	35.1	26.3	27.4
BRW 9	559643	193889	Roadside	100.0	100.0	35.1	31.9	31.0	22.3	26.4
BRW 10	559699	193948	Roadside	90.4	90.4	40.0	36.4	33.6	24.6	27.9
BRW 11	559604	194035	Roadside	100.0	100.0	35.5	31.1	30.5	24.6	24.5
BRW 12	559187	193658	Roadside	92.3	92.3	28.2	26.9	26.2	20.7	22.3
BRW 14	559148	193660	Roadside	100.0	100.0	37.0	31.9	29.6	23.7	25.4
BRW 15	559085	193601	Roadside	100.0	100.0	22.7	20.5	19.7	15.6	16.7
BRW 16	557379	192900	Urban Background	100.0	100.0	31.4	28.1	27.3	21.3	21.7
BRW 17	557632	193151	Roadside	100.0	100.0	29.6	26.0	26.6	20.5	19.9
BRW 18	557826	193333	Urban Background	100.0	100.0	26.3	23.4	22.5	18.5	17.6
BRW 19	558769	194873	Roadside	100.0	100.0	29.2	26.8	26.7	21.1	21.2
BRW 20	558818	194913	Kerbside	100.0	100.0	36.6	32.3	31.9	26.2	27.5
BRW 21	558681	194799	Roadside	92.3	92.3	27.1	23.7	23.7	19.8	16.8
BRW 22	558683	194894	Roadside	100.0	100.0	34.5	30.3	30.0	23.5	23.1
BRW 23	558742	194928	Roadside	100.0	100.0	39.5	33.3	33.5	25.5	25.9
BRW 24	558624	194695	Roadside	100.0	100.0	27.9	23.8	24.6	19.4	19.1
BRW 25	558482	194547	Roadside	100.0	100.0	32.9	28.5	26.7	26.3	21.8
BRW 26	562278	196649	Roadside	100.0	100.0	32.1	26.4	26.7	20.9	21.3
BRW 28	564446	199509	Urban Background	100.0	100.0	31.6	28.3	28.4	22.4	23.1
BRW 29	564617	199849	Roadside	100.0	100.0	28.2	24.6	24.5	19.6	18.6
BRW 30	564654	199898	Roadside	100.0	100.0	30.0	26.4	26.9	21.0	20.6
BRW 31	565186	200071	Roadside	100.0	100.0	27.5	28.3	25.9	19.5	20.8
BRW 32	556964	192288	Urban Background	100.0	100.0	35.7	29.7	28.5	23.6	22.0
BRW 33	559139	195012	Urban Background	100.0	100.0	23.7	22.1	22.6	17.9	17.8
BRW 34	557719	193226	Roadside	100.0	100.0	29.8	22.9	23.4	19.5	19.2
BRW 36	556603	194628	Rural	92.3	92.3	18.7	15.9	16.0	12.4	11.9
BRW 38	563659	198314	Roadside	100.0	100.0	20.6	18.5	19.1	21.8	13.8
BRW 39	562412	189153	Roadside	100.0	100.0	31.0	27.1	25.7	20.8	20.4
BRW 40	559191	193681	Kerbside	100.0	100.0	**44.1**	39.1	36.9	32.0	30.9
BRW 41	559292	193710	Kerbside	100.0	100.0	**45.6**	39.2	38.4	30.8	31.7

☒ **Annualisation (where data capture is <75% and >25%) has not been required**

☒ **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 µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

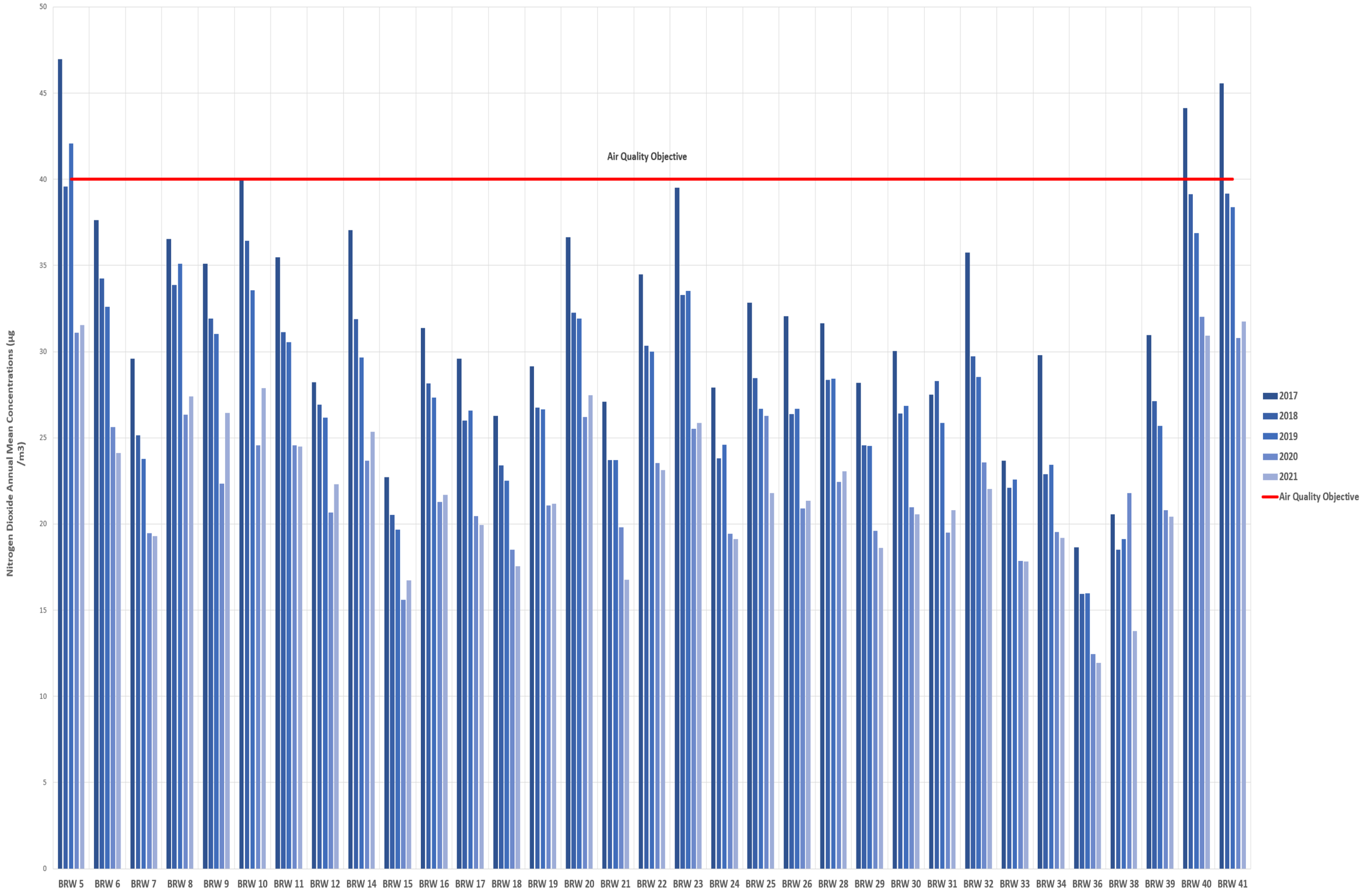
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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.2 – Trends in Annual Mean NO_2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results ($\mu g/m^3$)

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 (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
BRW 5	556887	192412	49.7	32.5	47.2	33.7	35.6	35.0	33.1	24.7	46.7	49.5	46.9	50.7	40.4	31.5		
BRW 6	557014	192493	38.4	27.0	32.7	28.7	22.0	24.9	23.5	26.2	36.1	36.1	39.0	36.1	30.9	24.1		
BRW 7	557118	191978	35.0	23.3	27.5	16.6	20.7	18.9	16.1	20.8	23.7	30.2	35.0	29.1	24.8	19.3		
BRW 8	559691	193912	42.1	31.6	29.8	33.7	29.3	34.4	29.8	28.9	39.2	39.6	44.9	38.4	35.1	27.4		
BRW 9	559643	193889	42.5	30.2	33.5	33.1	30.2	30.4	22.4	29.6	39.2	37.1	43.6	35.0	33.9	26.4		
BRW 10	559699	193948	36.9	36.5	36.5	36.0	31.7	35.4	Missing	27.3	41.7	34.0	41.1	35.8	35.7	27.9		
BRW 11	559604	194035	38.6	33.1	34.4	26.4	20.3	29.3	27.2	24.1	34.0	37.9	40.5	30.8	31.4	24.5		
BRW 12	559187	193658	36.7	32.7	29.8	25.6	25.1	21.6	24.1	18.9	Missing	30.4	37.9	31.6	28.6	22.3		
BRW 14	559148	193660	33.5	31.9	36.7	32.1	25.4	31.4	29.3	23.9	35.2	34.0	44.8	31.9	32.5	25.4		
BRW 15	559085	193601	30.6	23.3	23.0	17.4	15.9	14.2	14.7	14.9	23.0	24.7	30.0	26.0	21.5	16.7		
BRW 16	557379	192900	34.8	27.0	33.5	24.1	21.4	22.4	20.7	27.0	27.5	31.7	35.4	28.5	27.8	21.7		
BRW 17	557632	193151	31.9	22.2	27.3	24.1	20.3	21.6	21.2	21.0	27.9	29.3	34.0	25.6	25.5	19.9		
BRW 18	557826	193333	29.6	23.0	28.1	21.6	13.4	17.4	17.4	16.4	21.6	23.5	32.5	25.6	22.5	17.6		
BRW 19	558769	194873	33.9	29.1	32.3	29.3	21.2	23.7	21.8	12.0	31.9	29.5	32.5	28.5	27.1	21.2		
BRW 20	558818	194913	39.8	31.0	40.0	38.6	29.6	33.9	33.3	28.9	41.3	32.9	40.2	33.3	35.2	27.5		
BRW 21	558681	194799	28.1	27.3	Missing	24.3	26.4	26.6	20.8	7.8	9.4	9.0	31.6	25.1	21.5	16.8		
BRW 22	558683	194894	31.6	32.1	28.7	22.6	29.1	22.2	23.9	23.1	35.6	41.3	31.2	34.4	29.6	23.1		
BRW 23	558742	194928	33.5	32.1	33.3	26.8	31.9	28.5	28.7	25.1	38.3	42.6	41.9	35.2	33.2	25.9		
BRW 24	558624	194695	34.4	23.9	30.4	21.6	18.6	19.3	17.4	13.6	25.1	28.3	34.4	27.2	24.5	19.1		
BRW 25	558482	194547	39.4	27.5	35.2	27.2	23.3	17.6	21.8	22.8	31.6	31.0	27.0	31.2	28.0	21.8		
BRW 26	562278	196649	37.1	27.0	33.9	26.8	22.8	23.3	19.7	23.0	26.2	29.1	37.5	22.2	27.4	21.3		
BRW 28	564446	199509	38.3	24.3	33.9	26.0	20.7	26.2	22.2	29.8	30.2	30.4	40.5	32.5	29.6	23.1		
BRW 29	564617	199849	27.5	24.1	28.1	21.4	19.1	18.6	10.5	19.3	28.5	28.3	33.1	27.7	23.9	18.6		
BRW 30	564654	199898	34.0	25.8	33.9	26.0	16.3	22.6	19.3	17.0	28.1	28.7	35.4	29.3	26.4	20.6		
BRW 31	565186	200071	29.3	20.8	27.7	31.4	17.8	28.1	23.1	23.9	30.4	24.3	33.9	29.1	26.6	20.8		
BRW 32	556964	192288	29.5	27.5	29.8	21.4	24.1	21.4	18.9	24.7	28.3	38.8	40.5	33.9	28.2	22.0		
BRW 33	559139	195012	30.8	22.6	27.0	18.7	17.0	16.6	14.9	15.1	23.9	26.2	34.0	27.3	22.9	17.8		

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 (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
BRW 34	557719	193226	32.7	21.6	28.9	20.5	19.9	20.5	15.1	18.6	19.7	26.4	46.1	25.2	24.6	19.2		
BRW 36	556603	194628	22.8	17.6	16.8	10.7	11.3	Missing	7.8	9.9	15.5	15.5	21.4	19.1	15.3	11.9		
BRW 38	563659	198314	23.1	21.6	15.1	12.2	17.4	14.9	14.9	10.1	21.0	20.7	19.5	21.4	17.7	13.8		
BRW 39	562412	189153	34.2	22.6	29.6	27.7	22.6	24.3	15.5	17.2	28.7	27.2	37.1	27.7	26.2	20.4		
BRW 40	559191	193681	33.9	41.3	47.8	36.0	35.6	39.6	36.0	28.7	46.7	45.9	45.5	38.8	39.6	30.9		
BRW 41	559292	193710	44.2	38.6	42.3	34.2	38.4	37.7	33.1	32.1	50.1	47.2	46.5	43.8	40.7	31.7		

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1**

☒ **Annualisation (where data capture is <75% and >25%) has not been required**

☒ **National bias adjustment factor used**

☒ **Distance correction for relevant exposure has not been required**

☒ **Brentwood Borough Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 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 During 2021

Brentwood Borough Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Brentwood Borough Council During 2021

Brentwood Borough Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

Within this section provide details relating to the following aspects of non-automatic (i.e. passive) monitoring using diffusion tubes:

- Brentwood Borough Council undertook monitoring using 33 nitrogen dioxide diffusion tubes at 33 sites in 2021.
- 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 NO_2 proficiency testing scheme found that the laboratory achieved the following percentage of results determined as satisfactory for 2021:

Table C.1 – AIR PT Results 2021

AIR PT Round	AIR PT AR42
Round conducted in the period	January – March 2021
SOCOTEC	100%

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Brentwood recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

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.TG16 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/NO_2 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 0.78 to the 2021 monitoring data. A summary of bias adjustment factors used by Brentwood Borough Council the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.78
2020	National	03/21	0.77
2019	National	03/20	0.75
2018	National	03/19	0.76
2017	National	03/18	

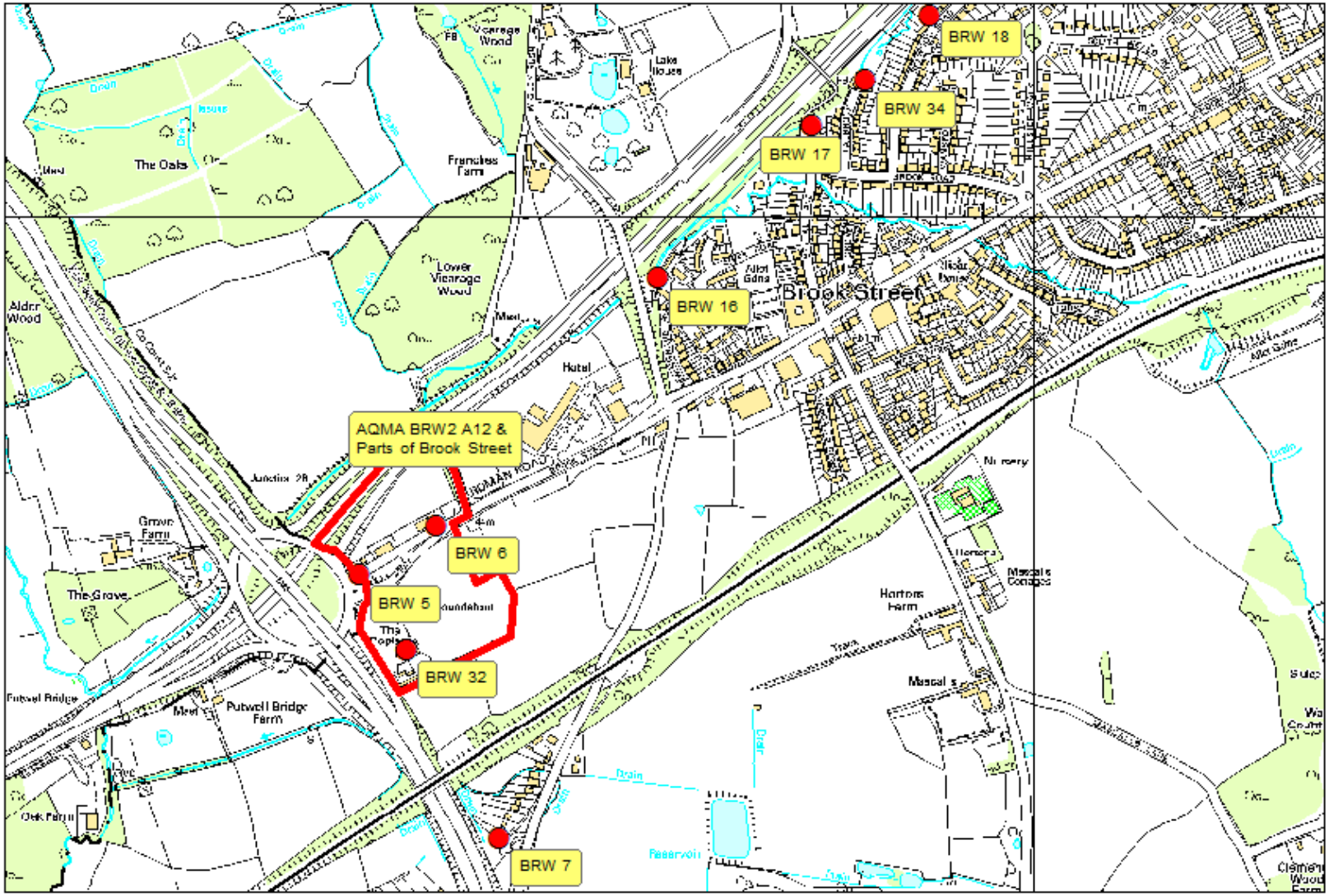
NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

No diffusion tube NO_2 monitoring locations within Brentwood required distance correction during 2021.

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Monitoring Location Map: BRW2 AQMA, A12 & M25



Crown copyright and database rights 2021 Ordnance Survey 100023562

Figure D.2 – Monitoring Location Map: BRW4 AQMA & A12/Warescot Road/Hurstwood Avenue/Ongar Road

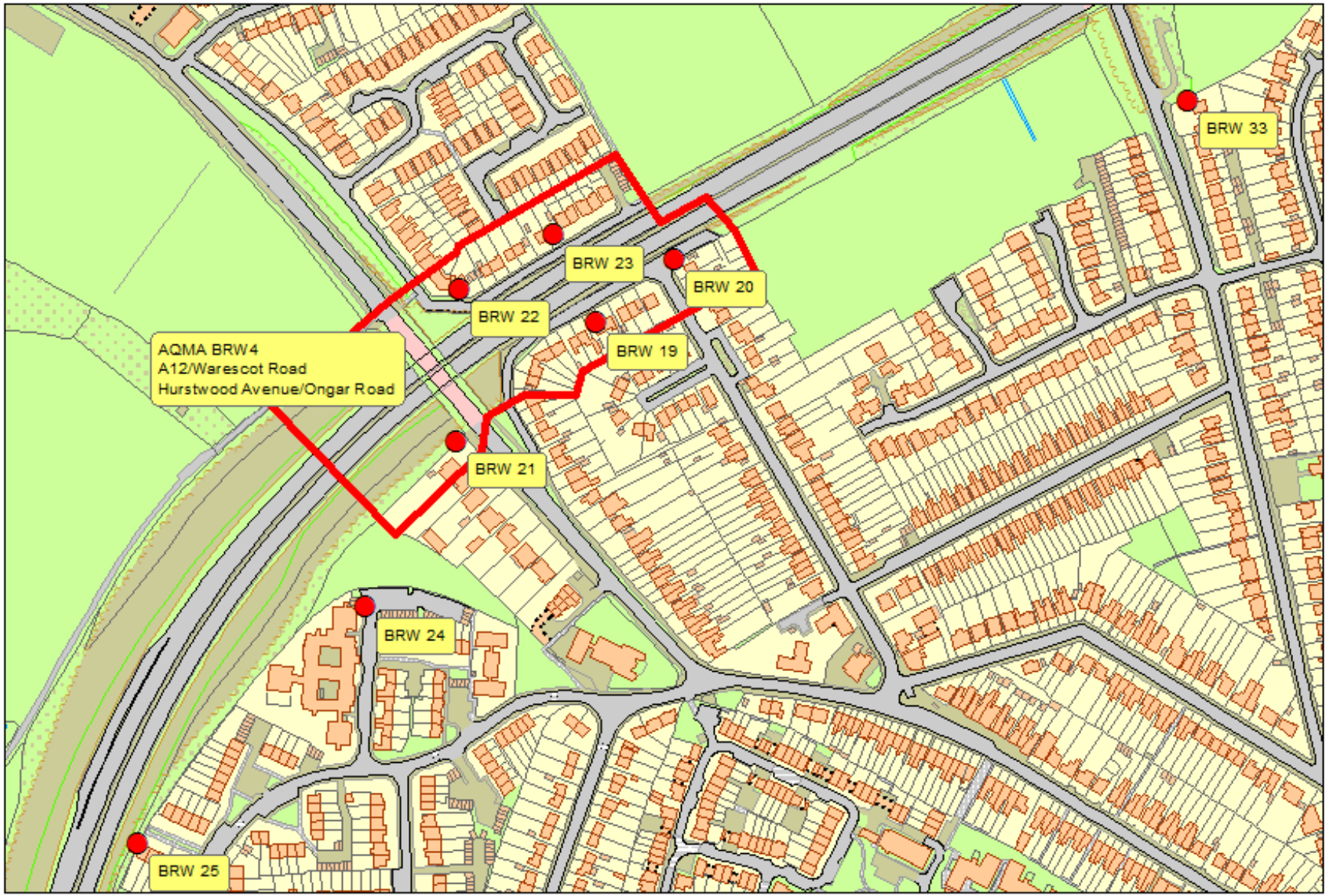


Figure D.3 – Monitoring Location Map: BRW7 AQMA & Brentwood Town Centre

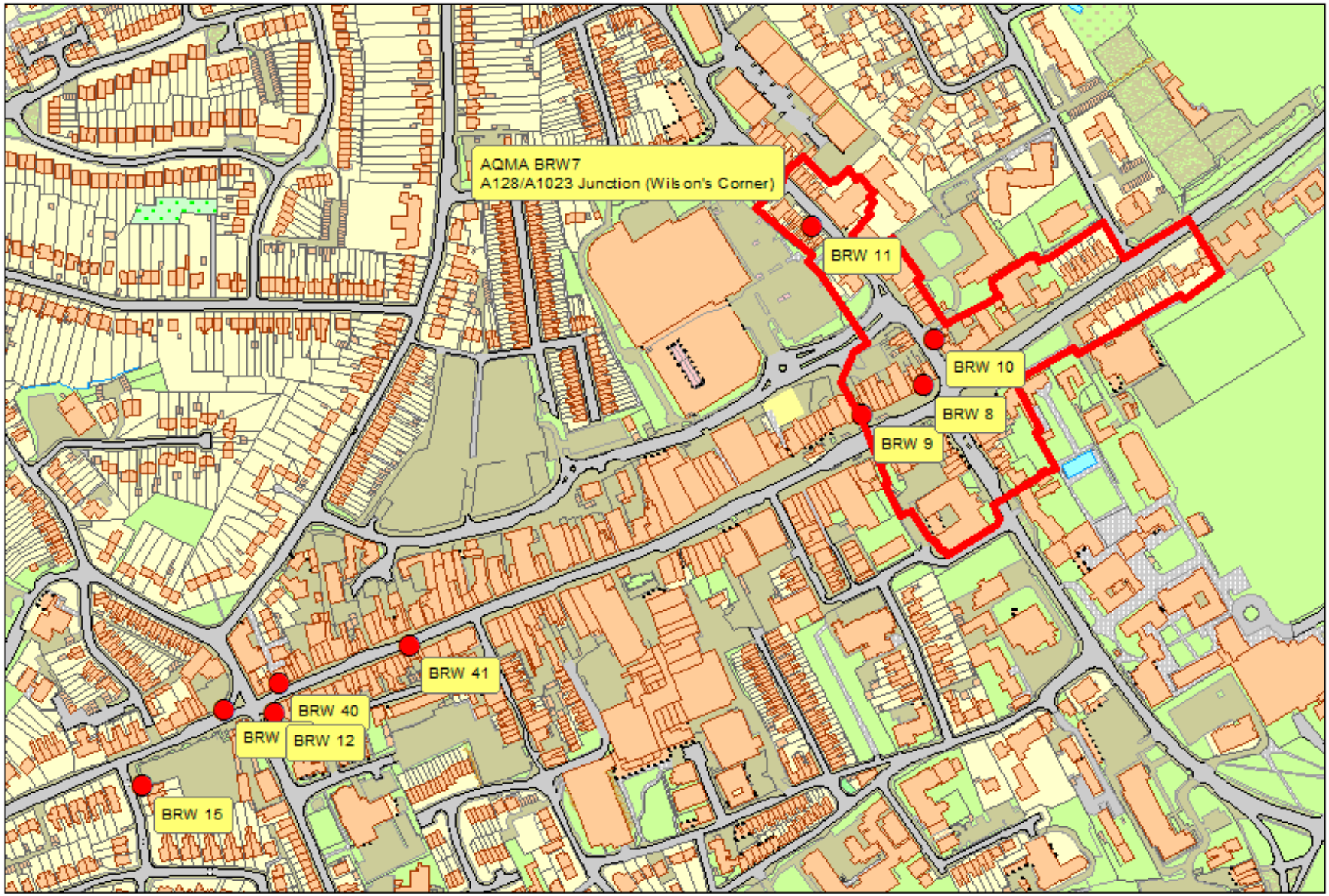


Figure D.4 – Monitoring Location Map: South Weald Rural Background

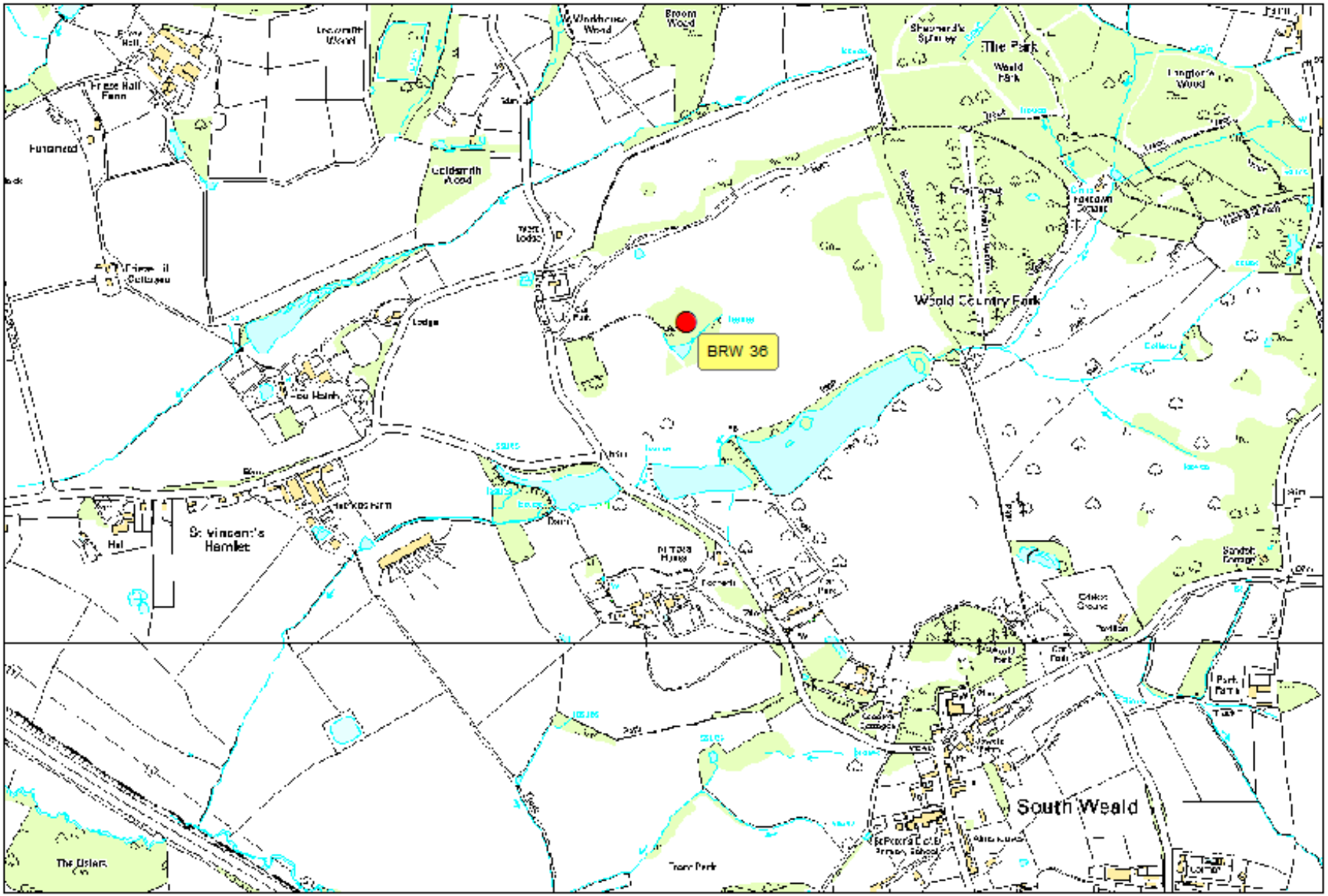


Figure D.5 – Monitoring Location Map: West Horndon

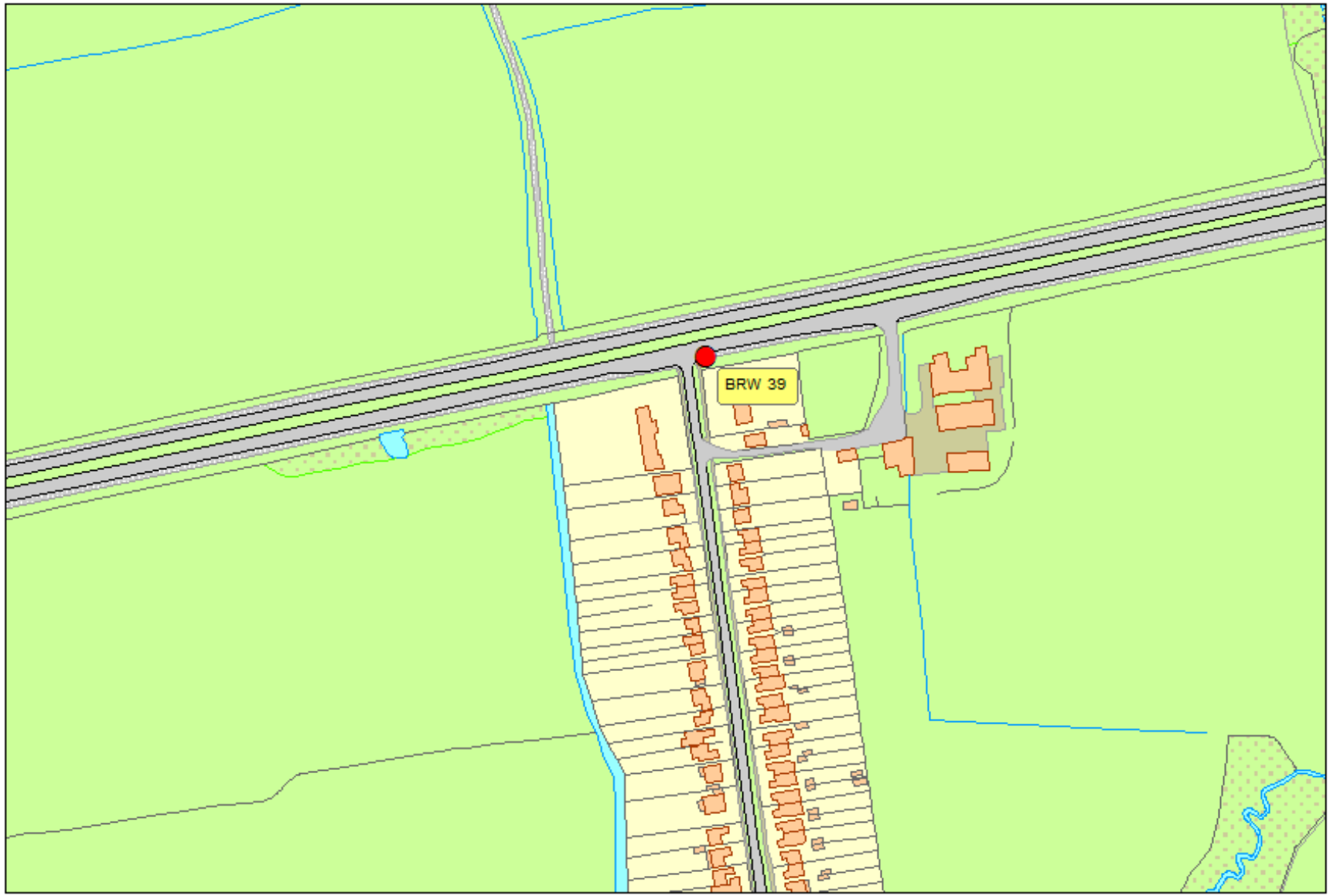
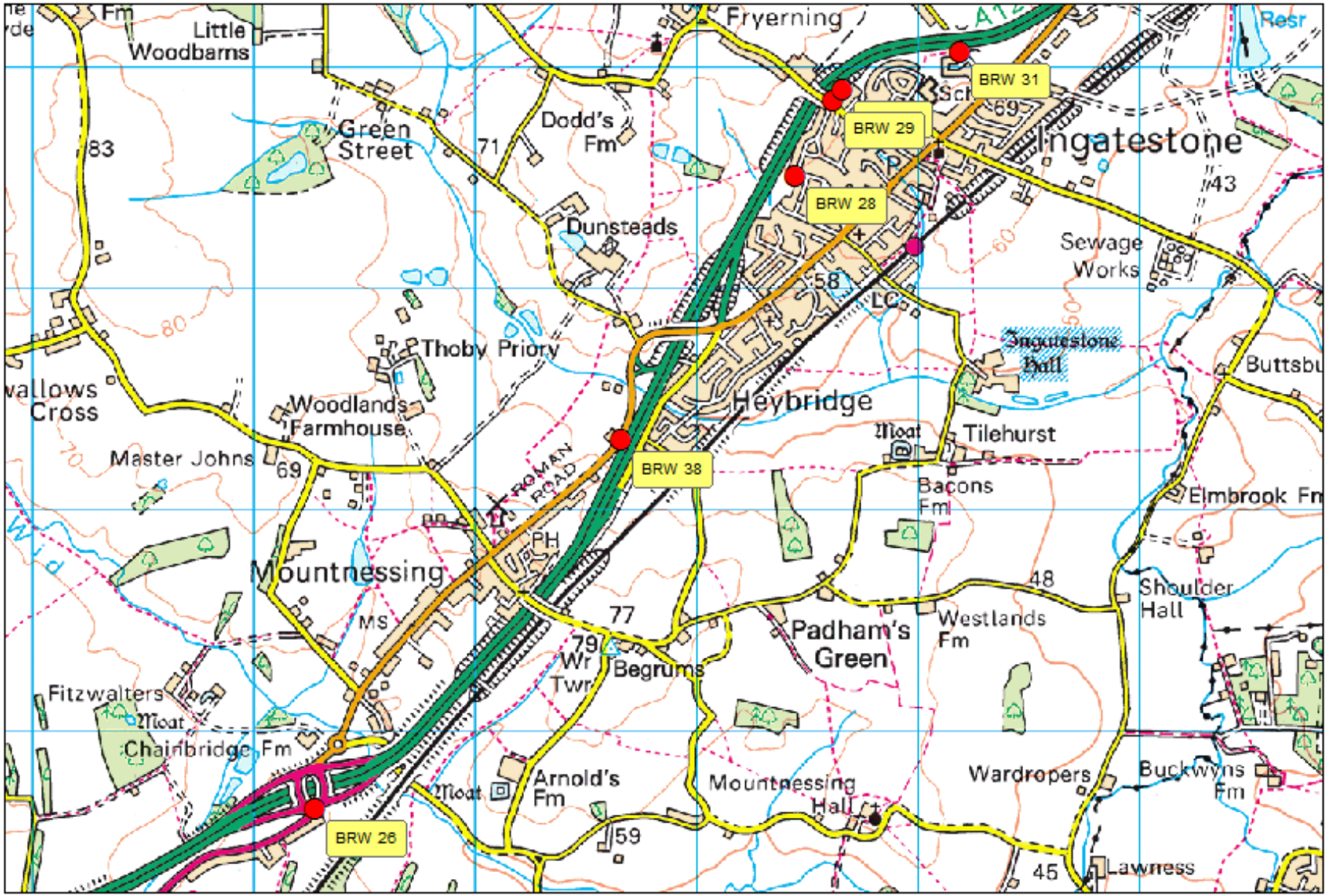


Figure D.6 – Monitoring Location Map: Ingatestone & Margaretting



Crown copyright and database rights 2021 Ordnance Survey 100023562

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[5]

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/m^3).

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
EU	European Union
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

References

- Brentwood Borough Council 2021 Air Quality Annual Status Report available at; https://essexair.org.uk/Reports/BrentwoodBoroughCouncil2021ASR.pdf
- 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 NO_2 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
- EssexCarShare.com available at; https://liftshare.com/uk/community/essex
- Essex Air Twitter Feed available at; https://twitter.com/essexair
- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. 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/technical-guidance/
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. 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/documents/LAQM-PG16-April-16-v1.pdf
- Public Health Outcomes Framework Indicator D01 available at; https://fingertips.phe.org.uk/profile/public-health-outcomes-framework