



MALDON DISTRICT COUNCIL

2018 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

June 2018

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Executive Summary: Air Quality in Our Area

The 2018 Annual Status Report is designed to provide the public with information relating to local air quality in Maldon, to fulfil Maldon District 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 2017, air quality in the district of Maldon did not comply with the Air Quality Objectives. Maldon District Council proposes to declare an Air Quality Management Area (AQMA) in Market Hill, Maldon where exceedances of the Air Quality Objectives have been measured.

Air Quality in Maldon

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 and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

Traffic emissions are the most significant source of air pollution in Maldon and the A414 is the principle route within the district.

The Council recognises the importance of working with partnering Authorities such as with Essex County Council to make improvements to local transport infrastructure and to fulfil its own regulatory responsibility towards industrial processes.

Air pollution is generally considered to be low across the Maldon district however after an audit of monitoring sites and subsequent installation of diffusion tubes on Market Hill in Maldon, significant exceedances of the nitrogen dioxide (NO₂) air quality objective have been measured.

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Maldon has a bypass that runs between the north and west of the town, however Market Hill is the principal route for traffic from Heybridge, the north of the Borough, Hatfield Peverel and Colchester to gain access to the town centre.

Annual average daily traffic counts identify that approximately 16,500 vehicles use the road every day. The road also has a steep gradient which causes increased emissions especially during heavy traffic and stop/start driving. The street canyon profile of the road significantly reduces dispersal of pollution.

These factors combine to represent a serious challenge that Maldon District Council faces when developing an Air Quality Action Plan with effective measures to deal with the poor air quality measured on Market Hill.

Elsewhere, measured air quality is generally improving and no other locations are close to exceeding the Air Quality Objectives.

Conclusions and Priorities

Summary of Maldon District Council Priority Actions

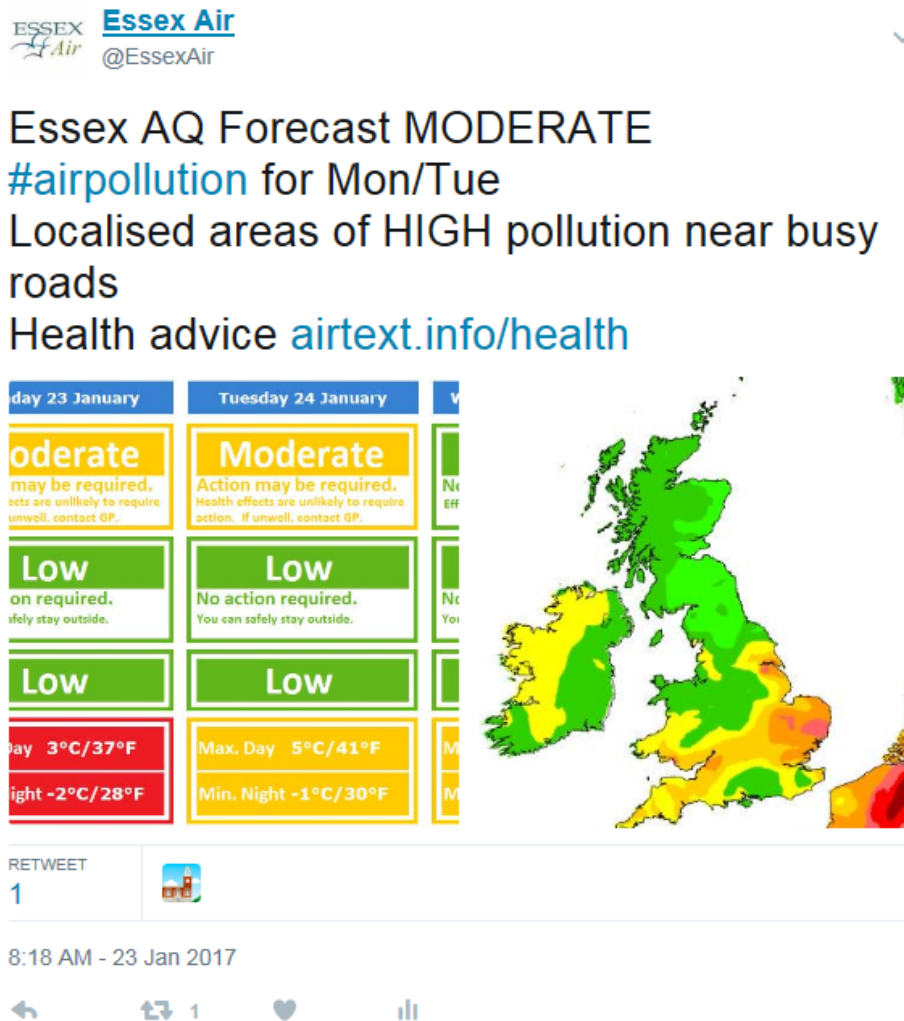
Maldon District Council has prioritised the following air quality actions for the forthcoming year:

- Declare an AQMA in Market Hill, Maldon.
- Develop an AQAP for Market Hill, Maldon.
- Increase air quality monitoring along Market Hill, Maldon.

Local Engagement and How to get Involved

Maldon District Council is a member of the Essex Air Quality consortium. The purpose of Essex Air is to promote improvements in air quality related issues. The Essex Air [web site](#) provides a daily forecast of air pollution. 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.

Essex County Council has worked closely with [Liftshare](#) to develop the Essex Car Share scheme. This operates across Maldon and provides commuters with a car sharing service which could cut congestion and air pollution whilst saving money.

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1 Local Air Quality Management

This report provides an overview of air quality in Maldon District Council during 2017. 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 Maldon District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.2 in Appendix E.

2 Actions to Improve Air Quality

2.1 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 must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Maldon District Council currently has no AQMAs however proposes to declare an AQMA in the area of Market Hill, Maldon. See Appendix F for information about this proposed declaration.

2.2 Progress and Impact of Measures to address Air Quality in Maldon

Maldon District Council expects the following measures to be completed over the course of the next reporting year:

- Declare an AQMA in Market Hill, Maldon
- Develop an AQAP for Market Hill, Maldon
- Increase air quality monitoring in Market Hill, Maldon

Details of all committed measures that have been completed, are in progress or planned are set out in Table 2..

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Essex Liftshare	Alternatives to private vehicle use	Car & lift sharing schemes	Essex County Council	N/A	2014	Number of Users	Not Quantified	Ongoing	N/A	
2	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	Essex Air	N/A	N/A	N/A	Not Quantified	Ongoing	N/A	
3	Environmental Permit Inspection & Enforcement	Environmental Permits	Measures to reduce pollution through IPPC Permits going beyond BAT	Maldon District Council	N/A	N/A	Operator compliance with Environmental Permit	Not Quantified	Ongoing	N/A	
4	A414 Route Improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Essex County Council	2015	2016	Monitored Air Quality	Not Quantified	Complete	2016	
5	Provision of strategic measures to reduce vehicle journeys and therefore reduce vehicle exhaust emissions	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Maldon District Council. Funding to be secured through development agreements	2016	Through Implementation of the Local Plan	Reduced Congestion & Emissions	Not Quantified	Policy Development	Throughout the life of the new Local Plan	New and enhanced public transport links, cycle networks. Installation of EV charging points. Planned Garden Suburb developments are funding a new bus service to Chelmsford and creating a cycle path network linking up to the existing settlement to provide viable alternative to road vehicles.

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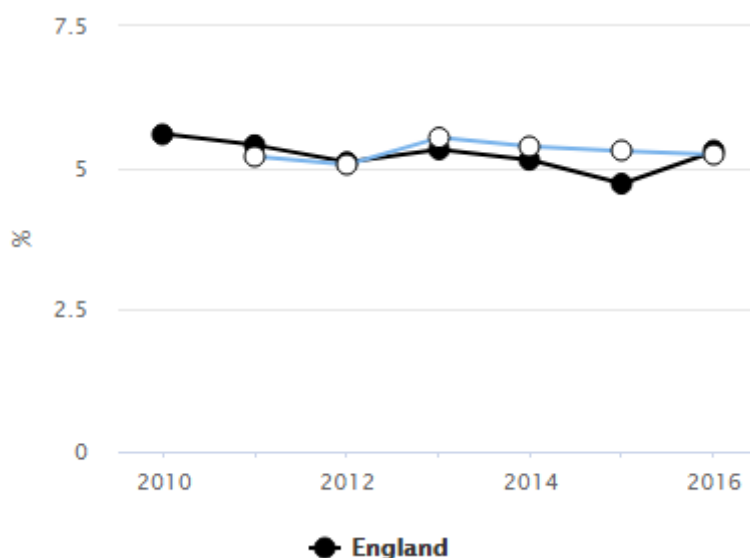
											Relief roads have also been secured to reduce congestion in parts of Maldon.
6	Sustainable Procurement Policy	Policy Guidance and Development Control	Sustainable Procurement Guidance	Maldon District Council	2016	2016	N/A	Not Quantified	Complete	2016	Use the procurement system to ensure that air quality is a consideration within contracts for Maldon District Council
7	Air Quality & Public Health Publicity	Public Information	Other	Maldon District Council	2016	2017	N/A	Not Quantified	Ongoing	Ongoing	Work with Public Health colleagues to inform the public about health impacts of Air Pollution and how they can change behaviour to reduce emissions and reduce exposure
8	Staff Car Share Scheme	Alternatives to private vehicle use	Car & lift sharing schemes	Maldon District Council	2016	2016	Number of Users	Not Quantified	Ongoing	Ongoing	Encouragement of staff to car share including the provision of a car sharing space in the staff car park.
9	Explore grant options for the installation of electric charging points in 2 strategic locations within the district.	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	Maldon District Council	2017	Dependant on the availability of funding streams	Number of Users	Not Quantified	Ongoing	Ongoing	By providing these points it will provide and encourage accessibility to both residents of Maldon and visitors.
10	Assessing Air Quality & Emissions Impacts from Development Technical Document	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Maldon District Council	2016	2017	Formal Adoption of Guidance	Not Quantified	Complete	2017	

2.3 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.

Maldon District Council does not monitor PM_{2.5} concentrations however notes the Public Health Outcomes Framework indicator 3.01 – Fraction of mortality attributable to particulate (PM_{2.5}) air pollution which for 2016 gave a value of 5.2% which has reduced from 5.3% in 2015. These values are broadly similar to other authorities within the region.

Figure 2.1 – Public Health Indicator 3.01 Fraction of Mortality Attributable to Particulate Air Pollution



Maldon District 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.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Maldon District Council does not undertake any continuous automatic monitoring of air quality.

3.1.2 Non-Automatic Monitoring Sites

Maldon District Council undertook non- automatic (passive) monitoring of NO₂ with 23 diffusion tubes at 19 sites during 2017. Table A. in Appendix A provides details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D.

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.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A. in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

At the end of 2016, Maldon District Council carried out an audit of monitoring sites within the district. Air quality monitoring subsequently commenced on Market Hill in Maldon, and significant exceedances of the nitrogen dioxide (NO₂) air quality objective have been measured

The first diffusion tube to be installed, MD20 measured extremely high concentrations of NO₂. The location was checked and it was found to not comply with recommendations within LAQM technical guidance due to being sited on the corner of a building, set back from the façade with only a small gap to the neighbouring property. These features are likely to significantly impair dispersion. 2017 data from MD20 is contained within this report but monitoring will cease at the site.

A new triplicate (three diffusion tubes sited together) monitoring site MD22 (MD22A / MD22B / MD22C) was started within 2m of the original diffusion tube on a lamp post to the front of the building façade monitoring at relevant exposure.

The annual mean average of the three diffusion tubes was measured at 58.2µg/m³ exceeding the annual mean Air Quality Objective of 40µg/m³. Monitored concentrations in excess of 60µg/m³ is an indication that an exceedance of the 1-hour mean objective is may have occurred

It should be noted that monitoring at the site only commenced in the July monitoring period. Concentrations at this site were adjusted by the annualisation process. MD22C had only six valid data points after the measured value for November was regarded as erroneous due to the measurement of 28.2µg/m³ which when compared with the average of the other two diffusion tubes (60.4µg/m³) is significantly lower, and indicating the diffusion tube could have been compromised.

The diffusion tube MD22C located as part of the triplicate set measured (after bias adjusted and annualised process) an annual mean of 62.8µg/m³ and had valid data similar to the other diffusion tubes been measured for MD22C in November, the outcome of annualisation process would have seen the concentration lower, closer to the concentrations of the two other tubes and that the average of the diffusion tubes would have been lower than 58.2µg/m³. Annualisation is the process of estimating an annual mean from the extrapolation of short-term monitoring results.

For these reasons, it is not considered that an exceedance of the 1-hour mean objective has occurred.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
MD1	Opposite CherryOak A414	Roadside	580645	204820	NO ₂	NO	15.9	10.7	NO	2.5
MD2	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO ₂	NO	17	1	NO	2.5
MD2b	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO ₂	NO	17	1	NO	2.5
MD2c	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO ₂	NO	17	1	NO	2.5
MD3	Heybridge Approach	Roadside	584763	208107	NO ₂	NO	17.9	3.7	NO	2.5
MD4	Heybridge Street/ The Causeway	Kerbside	585465	208071	NO ₂	NO	20.1	1.3	NO	2.5
MD5	Colchester Rd/Heybridge Street Junction	Roadside	585914	208104	NO ₂	NO	15.6	3.9	NO	2.5
MD6	High Street (Market Hill Junction)	Urban Centre	585072	207080	NO ₂	NO	0	2.1	NO	2.5
MD7	Wantz Road/High Street	Urban Centre	585307	206943	NO ₂	NO	1.9	1.6	NO	2.5
MD8	Latchingdon/Burnham Road Junction	Kerbside	588575	200492	NO ₂	NO	11.6	0.4	NO	2.5
MD11	Latchingdon Street	Kerbside	588205	200438	NO ₂	NO	0	1.3	NO	2.5
MD12	A414 Spital Road/A414 Bypass	Kerbside	583862	205549	NO ₂	NO	32.4	1.5	NO	2.5
MD13	Limebrook Way/A414 Bypass	Kerbside	584165	205532	NO ₂	NO	31.6	1.5	NO	2.5
MD14	The Causeway	Roadside	585221	207682	NO ₂	NO	0	9	NO	2.5

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MD16	8 Narvik Close	Roadside	584309	205776	NO ₂	NO	3	0.5	NO	2.5
MD17	2 Creasen Butt Close	Suburban	585078	207924	NO ₂	NO	5	0.5	NO	2.5
MD18	Opp 37 Imperial Avenue, Mayland	Suburban	590484.6	202285.5	NO ₂	NO	0	9	NO	2.5
MD19	Adjacent to 16 Mill Road, Maldon	Kerbside	585568.6	206731	NO ₂	NO	3.4	0.2	NO	3
MD20*	10 Market Hill	Roadside	585063	207162	NO ₂	NO	0	2	NO	2.5
MD21	Adjacent to 61 Station Road, Southminster	Kerbside	596175.9	199667	NO ₂	NO	0	0.8	NO	3
MD22A	Market Hill, Maldon	Roadside	585062	207160	NO ₂	NO	0.5	1.5	NO	2.5
MD22B	Market Hill, Maldon	Roadside	585062	207160	NO ₂	NO	0.5	1.5	NO	2.5
MD22C	Market Hill, Maldon	Roadside	585062	207160	NO ₂	NO	0.5	1.5	NO	2.5

Notes:

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).
 (2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2017 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2013	2014	2015	2016	2017
MD1	Roadside	Diffusion Tube	100.0	100.0	30.07	33.62	31.87	33.30	31.45
MD2	Kerbside	Diffusion Tube	100.0	100.0	35.37	40.03	28.41	32.73	29.38
MD2b	Kerbside	Diffusion Tube	100.0	100.0				29.70	27.80
MD2c	Kerbside	Diffusion Tube	100.0	100.0				30.27	27.26
MD3	Roadside	Diffusion Tube	100.0	100.0	31.25	32.35	26.51	30.78	30.16
MD4	Kerbside	Diffusion Tube	100.0	100.0	32.25	31.96	28.90	29.00	30.07
MD5	Roadside	Diffusion Tube	100.0	100.0	31.29	36.57	32.58	32.27	32.23
MD6	Urban Centre	Diffusion Tube	100.0	100.0	34.77	29.55	30.17	30.09	29.68
MD7	Urban Centre	Diffusion Tube	83.3	83.3	32.28	31.12	26.95	29.16	31.59
MD8	Kerbside	Diffusion Tube	100.0	100.0	27.19	26.14	28.39	32.08	32.42
MD11	Kerbside	Diffusion Tube	91.7	91.7	33.42	26.21	25.26	23.27	24.68
MD12	Kerbside	Diffusion Tube	91.7	91.7	34.64	33.71	26.99	28.98	27.62
MD13	Kerbside	Diffusion Tube	100.0	100.0	28.26	27.41	26.25	25.88	25.49
MD14	Roadside	Diffusion Tube	100.0	100.0		39.25	31.34	30.71	29.45
MD16	Suburban	Diffusion Tube	100.0	100.0			16.90	15.71	15.34
MD17	Suburban	Diffusion Tube	91.7	91.7			17.77	18.49	20.88

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MD18	Suburban	Diffusion Tube	100.0	91.7					14.27
MD19	Kerbside	Diffusion Tube	90.1	83.3					21.58
MD20*	Roadside	Diffusion Tube	100.0	91.7					<u>78.97</u>
MD21	Kerbside	Diffusion Tube	90.0	75.0					15.55
MD22A	Roadside	Diffusion Tube	100.0	50.0					55.2
MD22B	Roadside	Diffusion Tube	100.0	50.0					56.7
MD22C	Roadside	Diffusion Tube	83.3	41.7					<u>62.8</u>

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Notes:

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

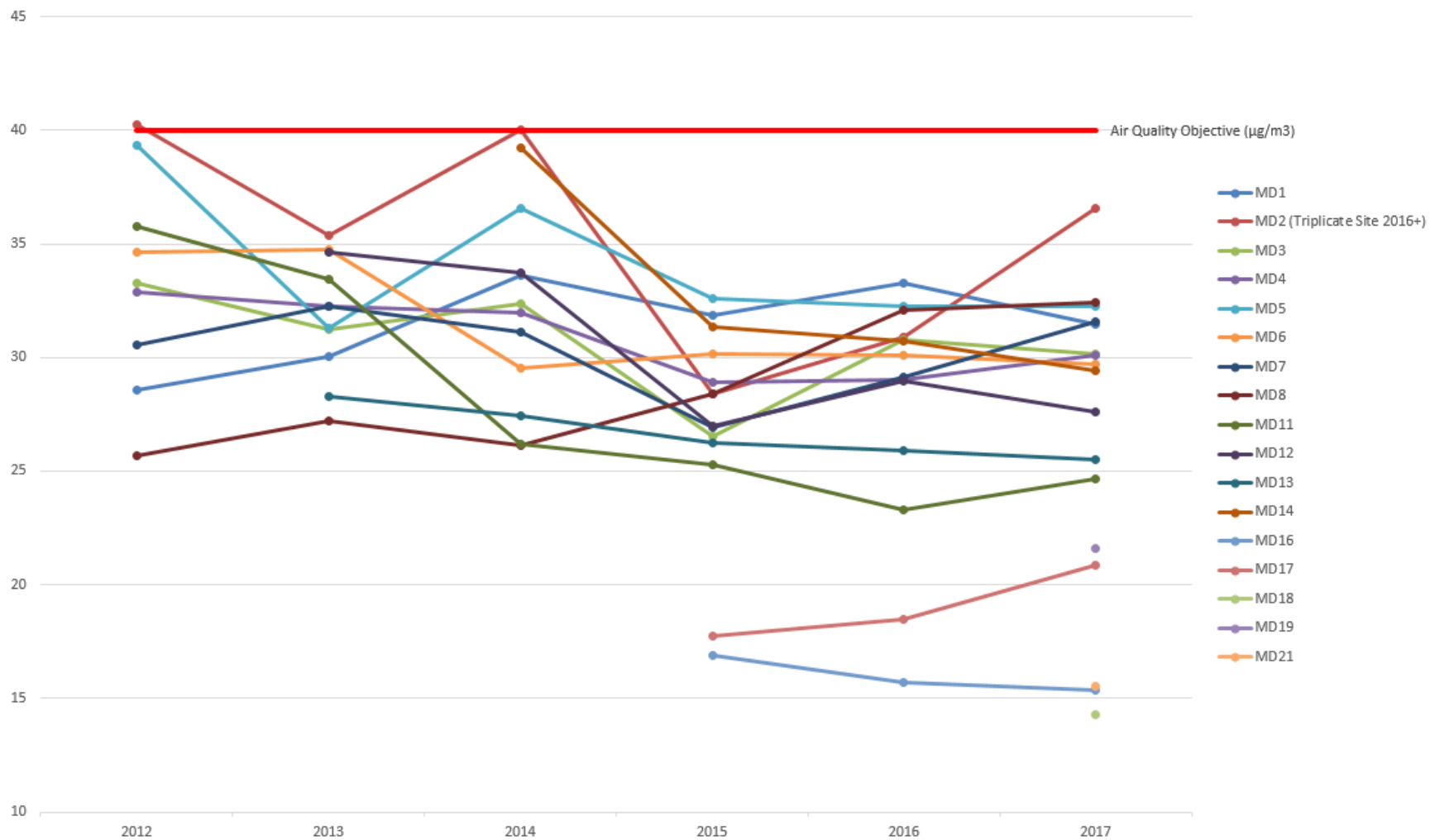
NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(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%).

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations (Excluding Market Hill)



Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2017

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.77) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
MD1	58.4	42.2	44.7	44.2	39.4	40.9	35.3	43.4	27.8	42.2	34.0	37.6	40.8	31.45	23.69
MD2	54.1	44.0	49.3	37.7	41.1	31.9	32.7	28.5	31.5	38.5	32.3	36.3	38.2	29.38	17.97
MD2b	50.7	40.8	42.4	31.4	35	27.4	29.6	36.2	28.5	38.5	35.5	37.3	36.1	27.80	17.31
MD2c	54.2	41.8	44.4	34.6	39.5	25.5	31.3	39.3	27.2	38.1	25.3	23.7	35.4	27.26	17.08
MD3	46.4	44.2	44.6	39.2	34	36	30.9	38.1	38.8	45.5	42.2	30.1	39.2	30.16	20.20
MD4	49.9	47	45.3	34.1	35.9	32.5	28.3	33.9	35.2	40.6	45.3	40.7	39.1	30.07	18.93
MD5	51.2	52.3	50.1	39.8	36.2	36	33.1	41.6	39.8	45.1	45.5	31.6	41.9	32.23	22.91
MD6	54.8	45.7	45.7	34.9	32.5	31.8	26.3	33	34.1	44.5	42.2	37.1	38.6	29.68	29.68
MD7	52.7	44.2	43.2	32.4	37	Missing	Missing	32.4	36.7	43.7	44.1	43.8	41.0	31.59	27.97
MD8	55.3	43.8	45.9	34.1	34.7	45.1	33.5	30.8	35.3	45.9	52.9	47.9	42.1	32.42	18.37
MD11	40.5	34.4	36.2	Missing	20.9	31.5	24.4	24.8	29.7	33.1	37.6	39.4	32.0	24.68	24.68
MD12	49.2	46.4	39.9	30.7	37.2	39.1	33.1	37.6	35.4	Missing	20.6	25.4	35.9	27.62	15.42
MD13	38	35.4	37	32.6	28.5	38.2	25.4	29.1	31.5	33.6	37.6	30.3	33.1	25.49	14.77
MD14	49.5	51.2	30.8	26.8	34.2	33.8	32.3	34.4	41.5	43.5	50.1	30.8	38.2	29.45	29.45
MD16	30.1	30.4	22.2	15.2	13.2	14.5	13	15.8	16.3	21.8	30.3	16.2	19.9	15.34	13.40
MD17	35.3	37.1	29.8	16.6	17.1	50.9	16	18.7	22.1	Missing	33.2	21.5	27.1	20.88	17.50
MD18		25.9	24.7	15.3	13.4	14.9	11.1	12.8	15.2	24.6	20.9	25.1	18.5	14.30	14.30

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MD19		33	35.9	24.4	23.8	24.3	21.2	23.3	27.7	Missing	40.4	26.3	28.0	21.60	16.90
MD20		141.4	143.1	117.4	84.7	54.8	58.7	68	64.3	119.1	140.9	135.7	102.6	<u>79.00</u>	<u>79.00</u>
MD21			25.2	28.2	14.4	16.5	13.3	15.6	17.8	23.3	Missing	27.4	20.2	15.50	15.50
MD22A							59.4	81.2	61.9	73.4	60.6	65.5	67.0	55.20	52.50
MD22B							61.2	81.7	70.8	73.3	60.2	65.7	68.8	56.70	53.90
MD22C							64	75.2	63.7	73	*Erroneous Data Point Removed	67	61.9	<u>62.80</u>	59.70

National bias adjustment factor used

Annualisation has been conducted where data capture is <75%

Where applicable, data has been distance corrected for relevant exposure

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**.

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tubes QA/QC

Maldon District Council undertook monitoring using 23 nitrogen dioxide diffusion tubes at 19 sites in 2017.

The diffusion tubes were supplied by Environmental Scientifics Group (ESG Didcot) (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 2017:

Table C.1 – AIR PT Results 2017

AIR PT Round	AIR PT AR018	AIR PT AR019	AIR PT AR021	AIR PT AR022
Round conducted in the period	January – February 2017	April – May 2017	July – August 2017	September – October 2017
ESG Didcot	100%	100%	100%	100%

Diffusion Tube Bias Adjustment Factors

Maldon District Council uses the national bias adjustment figure.

The Diffusion Tube Bias Adjustment Factors Spreadsheet 03/18 identified that for ESG (Didcot) 50% TEA in acetone diffusion tubes in 2017, a bias adjustment factor of 0.77 should be used. This was derived from orthogonal regression analysis of 27 studies.

Point Sources

No significant new point sources of emissions have been identified.

Diffusion Tube Data Annualisation

Three diffusion tubes (triplicate set) commenced monitoring in the July monitoring period. As these sites had less than 8 months' worth of data it was necessary to annualise the data. The rural background AURN sites at St. Osyth and Rochester Stoke were used for the process.

Table C.2 – MD22A Market Hill Annualisation

MD22A Market Hill		Background Site Mean (B1)	MD22A Market Hill (D1)	B1 when D1 is available
4th January 2017	1st February 2017	28.91		
1st February 2017	1st March 2017	16.80		
1st March 2017	29th March 2017	15.04		
29th March 2017	26th April 2017	11.82		
26th April 2017	31st May 2017	12.49		
31st May 2017	28th June 2017	12.38		
28th June 2017	2nd August 2017	7.81	59.40	7.81
2nd August 2017	30th August 2017	11.32	81.20	11.32
30th August 2017	27th September 2017	12.03	61.90	12.03
27th September 2017	1st November 2017	13.38	73.40	13.38
1st November 2017	6th December 2017	20.19	60.60	20.19
6th December 2017	3rd January 2018	17.56	65.50	17.56
Average		14.74	67.00	13.72
Annualisation Factor			1.07	
Bias Adjustment Figure			0.77	
Average Concentration			55.20	

Table C.3 – MD22B Market Hill Annualisation

MD22B Market Hill		Background Site Mean (B1)	MD22B Market Hill (D1)	B1 when D1 is available
4th January 2017	1st February 2017	28.91		
1st February 2017	1st March 2017	16.80		
1st March 2017	29th March 2017	15.04		
29th March 2017	26th April 2017	11.82		
26th April 2017	31st May 2017	12.49		
31st May 2017	28th June 2017	12.38		
28th June 2017	2nd August 2017	7.81	61.20	7.81
2nd August 2017	30th August 2017	11.32	81.70	11.32
30th August 2017	27th September 2017	12.03	70.80	12.03
27th September 2017	1st November 2017	13.38	73.30	13.38
1st November 2017	6th December 2017	20.19	60.20	20.19
6th December 2017	3rd January 2018	17.56	65.70	17.56
Average		14.74	68.82	13.72
Annualisation Factor			1.07	
Bias Adjustment Figure			0.77	
Average Concentration			56.70	

Table C.4 – MD22C Market Hill Annualisation

MD22C Market Hill		Background Site Mean (B1)	MD22C Market Hill (D1)	B1 when D1 is available
4th January 2017	1st February 2017	28.91		
1st February 2017	1st March 2017	16.80		
1st March 2017	29th March 2017	15.04		
29th March 2017	26th April 2017	11.82		
26th April 2017	31st May 2017	12.49		
31st May 2017	28th June 2017	12.38		
28th June 2017	2nd August 2017	7.81	64.00	7.81
2nd August 2017	30th August 2017	11.32	75.20	11.32
30th August 2017	27th September 2017	12.03	63.70	12.03
27th September 2017	1st November 2017	13.38	73.00	13.38
1st November 2017	6th December 2017	20.19		
6th December 2017	3rd January 2018	17.56	67.00	17.56
Average		14.74	68.58	12.42
Annualisation Factor			1.19	
Bias Adjustment Figure			0.77	
Average Concentration			62.84	

NO₂ Fall Off Estimation

Diffusion tube monitoring shown in Table B.1 in Appendix B has been adjusted for NO₂ falloff between the monitoring location and the point of relevant exposure.

Using the equation from the Air Quality Consultants 'NO₂ Concentrations and Distance from Roads (2008)' report a custom Excel spreadsheet has been developed to derive the NO₂ concentrations at relevant exposure from the measured annual mean concentrations and using 2017 NO₂ background maps.

Estimated Annual Mean at Relevant Exposure:

$$C_z = ((C_y - C_b) / (-0.5476 \times \ln(D_y) + 2.7171)) \times (-0.5476 \times \ln(D_z) + 2.7171) + C_b$$

Where:

C_z is the total predicted concentration (µg/m³) at distance D_z;

C_y is the total measured concentration (µg/m³) at distance D_y;

C_b is the background concentration (µg/m³);

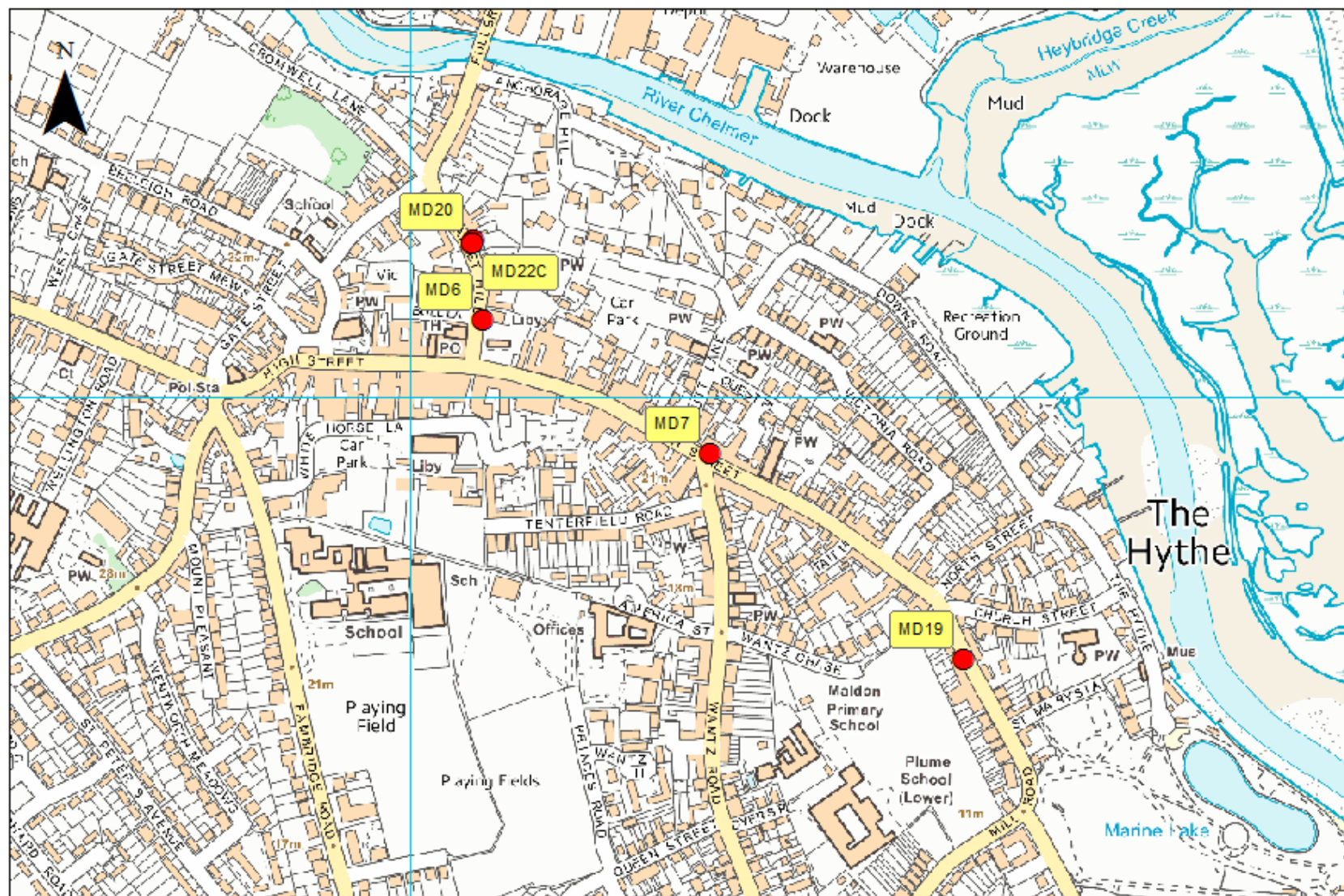
D_y is the distance from the kerb at which concentrations were measured;

D_z is the distance from the kerb (m) at which concentrations are to be predicted; and

Ln(D) is the natural log of the number D

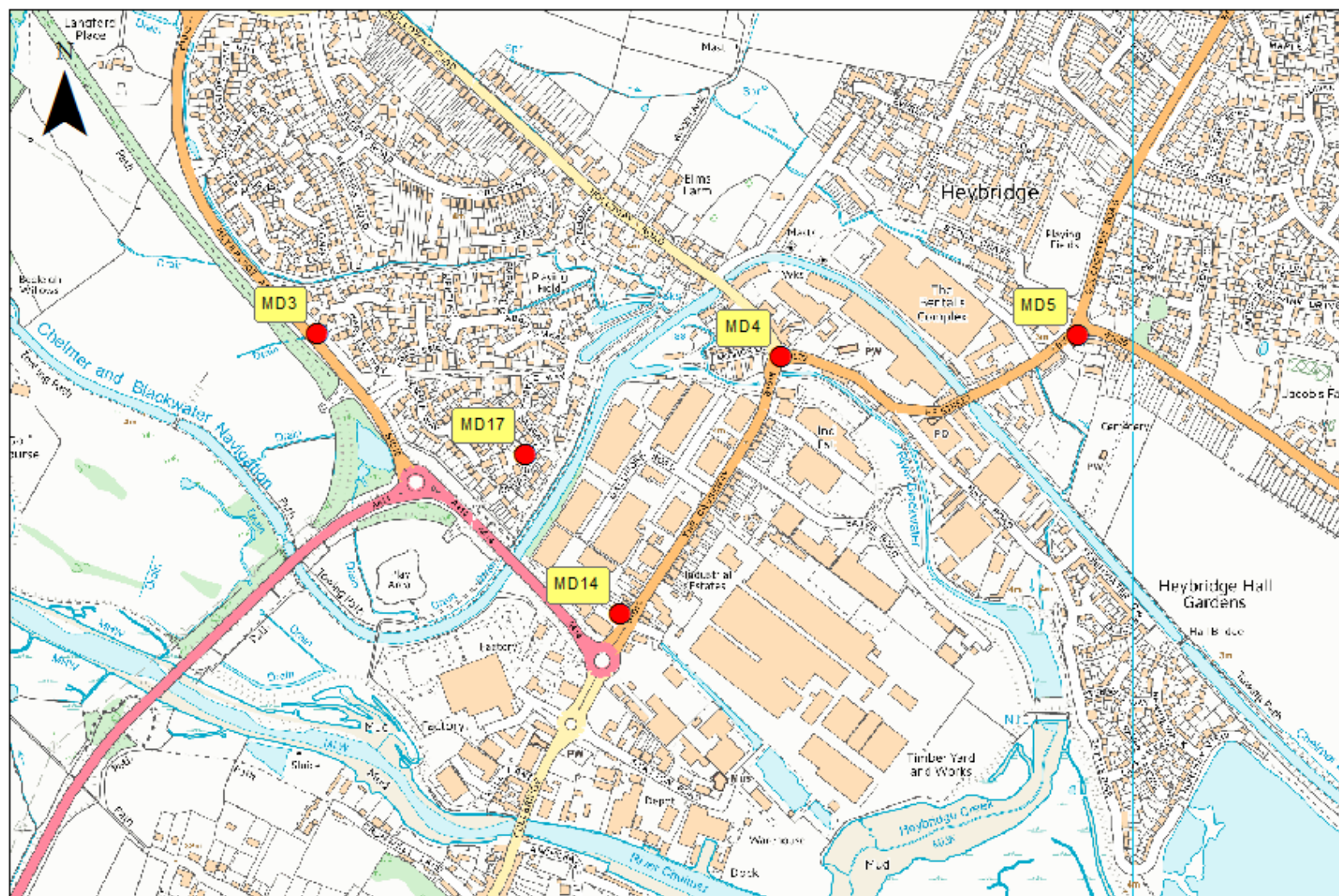
Appendix D: Maps of Monitoring Locations

Figure D.1 – Monitoring Locations Maldon Town Centre



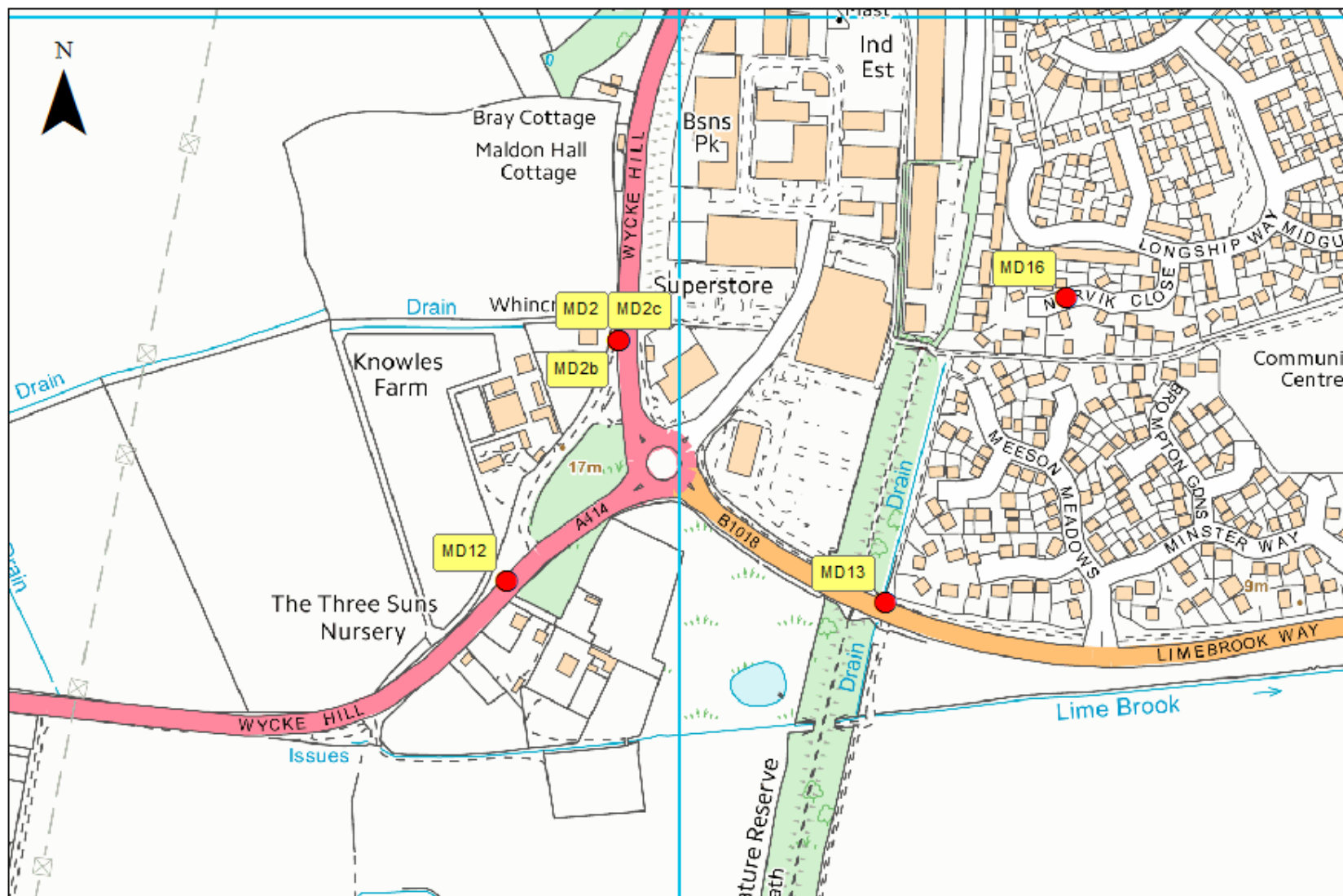
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Figure D.2 – Monitoring Locations Heybridge



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Figure D.3 – Monitoring Locations A14 Wycke Hill / Limebrook Way Roundabout



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Figure D.4 – Monitoring Locations Latchingdon, Maylandsea & Southminster



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Figure D.5 – Monitoring Locations A414 Chelmsford Road



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Appendix E: Summary of Air Quality Objectives in England

Table E.2 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁴	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁴ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Appendix F: Market Hill, Maldon AQMA Declaration Report

Local authorities have a legal requirement to work towards Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 and relevant regulations made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

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.

In 2016, Maldon District Council undertook an audit of the diffusion tube monitoring network. Following this, monitoring commenced in February 2017 adjacent to a property on Market Hill. Measured concentrations were exceptionally high but the site was located on the corner of a building, slightly set back from the façade where the free circulation of air was affected. This site did not fully comply with the Defra Technical Guidance TG.16 and monitoring at a new roadside site close-by commenced in July 2017. The existing site was retained for reference.

The table below provides 2017 monitoring data for the two monitoring locations on Market Hill and two nearby locations on the Causeway and junction with the High Street.

Diffusion Tube Monitoring Results


Site ID	Monitoring Address	Nitrogen Dioxide concentrations measured in $\mu\text{g}/\text{m}^3$																
		Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Raw Annual Mean	Valid Data Capture rate	Annualisation Adjustment	Bias Adjusted Annual Mean (0.77)	Estimated Concentration at Adjacent Receptor
MD6	High Street (Market Hill Junction)	54.8	45.7	45.7	34.9	32.5	31.8	26.3	33	34.1	44.5	42.2	37.1	38.55	100%	N/A	29.68	29.68
MD14	The Causeway	49.5	51.2	30.8	26.8	34.2	33.8	32.3	34.4	41.5	43.5	50.1	30.3	38.2	100%	N/A	29.45	29.45
MD20~	Side of 10 Market Hill, Maldon	N/A	141.4	143.1	117.4	84.7	54.8	58.7	68	64.3	119.1	140.9	135.7	102.55	92%	N/A	<u>78.97</u>	<u>78.97</u>
MD22A	Front of 10 Market Hill	N/A	N/A	N/A	N/A	N/A	N/A	59.4	81.2	61.9	73.4	60.6	65.5	67.30	50%	1.07	55.20	52.53
MD22B	Front of 10 Market Hill	N/A	N/A	N/A	N/A	N/A	N/A	61.2	81.7	70.8	73.3	60.2	65.7	69.44	50%	1.07	56.70	53.93
MD22C	Front of 10 Market Hill	N/A	N/A	N/A	N/A	N/A	N/A	64.0	75.2	63.7	73	*Erroneous Value Removed	67.0	68.58	42%	1.19	<u>62.84</u>	59.69

~ Site MD20 is not compliant with TG.16 guidance and has been retained for reference only.

* MD22C November 2017 data point removed. The concentration from the laboratory report was $28.7\mu\text{g}/\text{m}^3$ which when compared with the other tubes, highlighted poor precision and was removed to ensure overall reliability for the data set.

The average of the MD22 monitoring tubes is $58.25\mu\text{g}/\text{m}^3$ which when applying the NO_2 drop off calculation estimates the concentration at the receptor (residential property) as $55.40\mu\text{g}/\text{m}^3$ which is a significant exceedance of the Air Quality Objective ($40\mu\text{g}/\text{m}^3$)

MD22 Estimation of NO_2 Concentration at the Receptor



Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	2	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu\text{g}/\text{m}^3$)?	12.9129	$\mu\text{g}/\text{m}^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu\text{g}/\text{m}^3$)?	58.25	$\mu\text{g}/\text{m}^3$
Result	The predicted annual mean NO_2 concentration (in $\mu\text{g}/\text{m}^3$) at your receptor	55.40	$\mu\text{g}/\text{m}^3$

Market Hill

Market Hill is the only access between Maldon Town Centre and Heybridge and is a busy route throughout the day.

The road has a steep gradient between Anchorage Hill and Bull Lane. When vehicles travel up inclines, engines are required to work harder to overcome gravity and emissions are significantly higher. The opposite occurs for vehicles travelling downhill however a general increase in emissions usually occurs when compared with flat roads.

Areas of the road have street canyon characteristics which is where the road is flanked by buildings on both sides. Street canyons significantly reduce the dispersal of pollution. The MD22 monitoring site is at a location on Market Hill where the gradient is steep and within a partial street canyon.

Google Streetview image of Market Hill to indicate street canyon characteristics and gradient



Air Quality Management Area Declaration

This report contains a draft Air Quality Management order which would designate the stretch of Market Hill and properties between Anchorage Hill and Bull Lane as an Air Quality Management Area. This is for likely breaches of the annual mean Air Quality Objective for Nitrogen Dioxide.

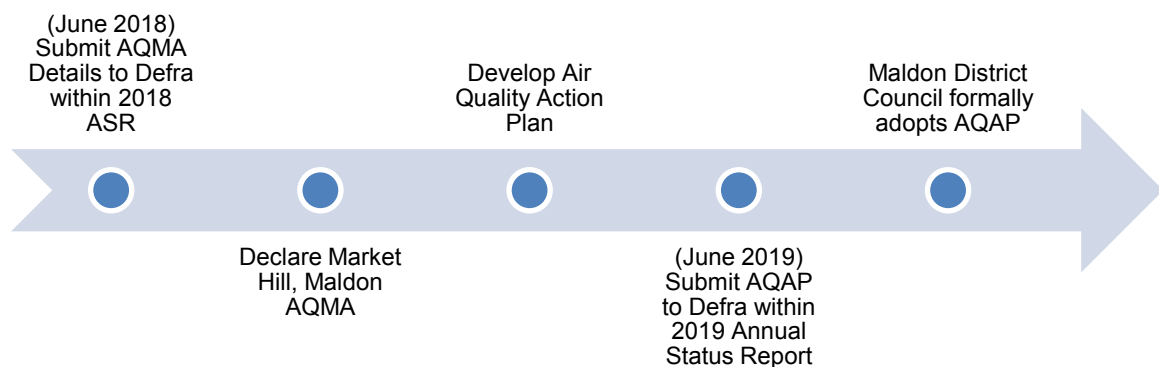
Breaches of the 1-hour objective are not considered likely because the monitored annual mean does not exceed $60\mu\text{g}/\text{m}^3$ which can be considered a proxy measurement.

The boundary of the Air Quality Management Area has been chosen using the following information:

- At Anchorage Lane, properties begin to form a street canyon and the gradient increases. Emissions are likely to increase due to the gradient and dispersion will take place at a lower rate than in open areas.
- Monitoring at the top of Market Hill opposite Bull Lane has never exceeded the Air Quality Objectives. At this location, the gradient levels off meaning lower emissions and the street canyon finishes allowing for better dispersion.

Project Timeline

Development and delivery of the project would take place across the following anticipated timeline:



Development of the Air Quality Action Plan would likely include the following tasks:

- Creation of steering group
- Source apportionment & dispersion modelling of area in and surrounding AQMA
- Development and quantification of measures (effectiveness, cost/benefit)
- Identify how measures would be delivered and funding streams
- Writing of Air Quality Action Plan
- Internal and external consultation

Draft Air Quality Management Area Order:

Environment Act 1995 Part IV Section 83(1)
Maldon District Council
Air Quality Management Order

Maldon District Council in exercise of the powers conferred upon it by Section 83(1) of the Environment Act 1995, hereby makes the following Order.

This Order may be cited/referred to as the Maldon District Council Air Quality Management Area number 1.

Area 1 – Market Hill, Maldon.

And shall come into effect on **[date]**.

The areas shown on the attached maps in red are to be designated as air quality management area 1. The designated area incorporates the stretch of road and properties between Anchorage Hill and Bull Lane.

The map may be viewed at the Council Offices.

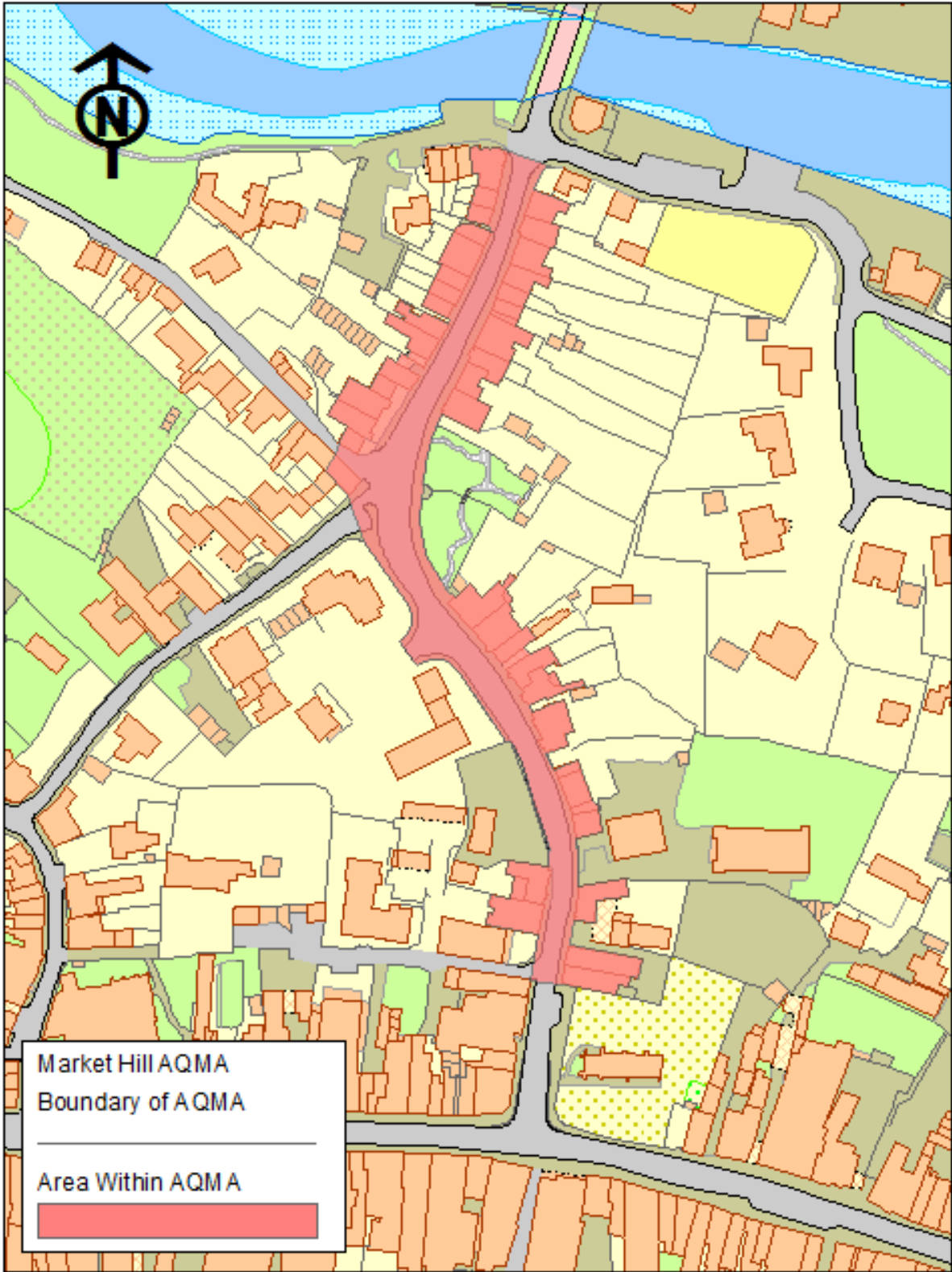
Area 1 is designated in relation to the likely breach of the nitrogen dioxide annual mean as specified in the Air Quality Regulations 2000.

This Order shall remain in force until it is varied or revoked by a subsequent order.

The Common Seal of Maldon District Council was hereunto affixed in the presence of:

Authorised signatory

.....



1:1,500 0 25 50 100 150 200 Metres

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Glossary of Terms

Abbreviation	Description
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre
AIR-PT	An independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL)
Annualisation	The process of estimating annual means from the extrapolation of short-term monitoring results
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
AQO	Air Quality Objectives
ASR	Air Quality Annual Status Report
Bias Correction	For NO ₂ diffusion tubes, bias represents the overall tendency of the tubes to under or over-read relative to the reference chemiluminescence analyser. This should not be confused with precision, which is an indication of how similar the results of duplicate or triplicate tubes are to each other. It is necessary to calculate a bias factor and adjust monitored results accordingly
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
Exceedance	Where ambient concentrations for a given pollutant and averaging period are above that which is given as the objective limit in the Air Quality Strategy at a location representative of public exposure
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5 μm or less
QA/QC	Quality Assurance and Quality Control
Street Canyon	Generally defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, leading to the formation of vortices and recirculation of air flow that can trap pollutants and restrict dispersion
TEA	Triethanolamine – substance used in diffusion tubes for absorbing nitrogen dioxide
UKAS	United Kingdom Accreditation Service

References

Air Quality Consultants (AQC) NO₂ Concentrations and Distance from Roads (2008) available at; <https://laqm.defra.gov.uk/documents/FallOffWithDistanceReptJuly08.pdf>

Defra Air Quality web pages available at: <http://uk-air.defra.gov.uk>.

Defra Diffusion Tube Bias Adjustment Factors Spreadsheet available at; https://laqm.defra.gov.uk/assets/Database_Diffusion_Tube_Bias_Factors_v03_18%20FINAL.xls

Defra LAQM Summary of Laboratory Performance in AIR NO₂ PT Scheme available at; <https://laqm.defra.gov.uk/assets/AIR-PT-Rounds-13-to-24-Apr-2016-Feb-2018.pdf>

Defra PG.16 Air Quality Policy Guidance available at; <https://laqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf>

Defra TG.16 Air Quality Technical Guidance available at; <https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>

Essex Air Quality Consortium available at: <http://www.essexair.org.uk/Default.aspx>

EssexCarShare.com available at: <https://essex.liftshare.com/>

Essex Air Twitter Feed available at: <https://twitter.com/essexair>

Maldon District Council Statutory Air Quality Reports available at; <http://www.essexair.org.uk/AQInEssex/LA/Maldon.aspx?View=reports&ReportType=MALDON>

Nitrogen Dioxide Fall Off With Distance Calculator available at; <https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

Public Health Outcomes Framework Indicator 3.01 available at; <http://www.phoutcomes.info/>

UK-AIR Background Mapping Data for Local Authorities available at; <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>