



**WATFORD
BOROUGH
COUNCIL**

2016 Air Quality Annual Status Report (ASR)

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

Date February 2017

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Executive Summary: Air Quality in Our Area

This Annual Status Report forms part of the seventh round of air quality Review and Assessment carried out by Watford Borough Council. It sets out updated air quality monitoring data and assesses whether any new or proposed developments are likely to have a significant effect on air quality concentrations.

Furthermore, this report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 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 exceedences are considered likely, the local authority must then 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.

Air Quality Monitoring Data

Across Hertfordshire, where monitoring is undertaken, the concentrations of nitrogen dioxide (NO₂) have been declining, which means air quality has been improving. In Watford this trend is also apparent apart from the monitoring location at the Lower High Street.

The real-time analysers located at the Town Hall continue to monitor oxides of nitrogen and PM₁₀ particulates. The council was successful in achieving additional funding and began PM_{2.5} monitoring on Tuesday, 8th December 2015. In addition, we have a network of diffusion tubes monitoring long term nitrogen dioxide concentrations. This network now stands at 18 tubes and includes sites that will be able to assess long term trends in concentrations close to the Health Campus and associated link road –which opened in November 2016, as well as concentrations in Gammons Lane, where local concerns about queuing traffic have been raised. Concentrations across all of the nitrogen dioxide diffusion tube monitoring sites

continue to decline and there are now only three existing and one new site where results suggest that the National Air Quality Objective level could be exceeded.

The air quality problem in Watford is predominantly a result of emissions from road vehicles, for example, idling engines at busy junctions.

Not all car journeys made will start or end within the borough boundaries and so it is vital to work with other agencies. Watford is part of the Hertfordshire and Bedfordshire Air Quality Network which meets approximately four times a year at which transport officers from the county council are also in attendance.

A key initiative to improve air quality has been the installation of electric vehicle charging points in various locations in the borough.

Furthermore, a detailed assessment of NO₂ concentrations in each of the AQMA's was carried out and based upon the findings these need to be reviewed and this work is expected to take place in 2017.

The new road connecting to health campus opened in 2016 and this will impact upon traffic flows in the Bushey Arches locality.

Air Quality in Watford

Watford is a concentrated urban area situated to the North West of London, with a population of around 93,700. It is a well established regional shopping centre with major rail and road communication links. It has both mainline and underground train stations, the M1 lies along the northern boundary of the borough and the M25 is situated to the west. The borough is also served by several major trunk roads, including the A41, A411, A412 and A405.

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.

The main pollutants of interest in the borough continue to be NO₂ and PM₁₀ particulates. These are mainly associated with road traffic. NO₂ is formed during the combustion process when Nitrogen in the air bonds with Oxygen.

From the data gathered during 2015, there was a reduction in NO₂ concentrations across the borough. We will be reviewing our existing AQMA's in 2017.

There are four AQMA's within Watford:

- AQMA 1: St Albans Road.
- AQMA 2: Vicarage Road.
- AQMA 3A: Aldenham Road/Chalk Hill.
- AQMA 5: A405 / Horseshoe Lane.

Further information can be found at:

https://www.watford.gov.uk/info/20010/your_environment/196/local_air_quality

Actions to Improve Air Quality

A key initiative has been the installation of electric vehicle charging points in each of the following car parks:

- Avenue Car Park
- Bushey Arches Car Park

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

- Gade Car Park
- Longspring Car Park
- Queens Car Park
- Sutton Car Park
- Timberlake Car Park
- Town Hall Car Park
- Watford Business Park Car Park

In addition, a 'Rapid Charging Point' which is able to charge vehicles in approximately 20 minutes, is also available for use in 'Service Road Q', just off the northbound side of Beechen Grove.



Figure 1: A charging point located off Beechen Grove.

In addition, in November 2015, due to its success, the e-car scheme was extended for a further two years and further information can be found at:

<https://ecarclub.co.uk/locations/hertfordshire/watford-history/>

As set out in our AQAP other measures were to be implemented including infrastructure improvements. The major projects are the two new link roads:

1. Health Campus link road (<http://www.watfordhealthcampus.org/>) opened in November 2016. This link road is expected to affect air quality at the Chalk Hill and Horner's Gyratory/Wiggenhall Rd AQMAs.

The road links Wiggenhall Road and the Campus with Dalton Way. The link road is expected to help alleviate the localised congestion and improve access to the hospital for emergency vehicles, for example in the Chalk Hill and Horner's Gyratory/Wiggenhall Road AQMAs. In addition, transport improvements associated with the Watford Health Campus include:

- The introduction of pedestrian and cycle routes in new green spaces around the site;
- Increased proportion of journeys made via public transport, with the hope of new bus services being attracted to the site;
- Increased links to London through more direct road and rail provision;
- More accessible car parking for visitors to the site;
- Provision of new access and link roads to the site; and
- Support for the introduction of the Croxley Rail Link for direct access to the site and beyond by train.

2. Watford Junction link road which is expected to significantly improve air quality on St Albans Rd in AQMA 1. This proposal is still in the planning stage.

Other schemes delivered in Watford by the county council were done through the Integrated Transport Programme. These schemes contribute to reducing vehicle pollution through lower speeds, or by encouraging more travel by non-car modes.

The following schemes were delivered between January and December 2015. Many of these benefited from DfT Local Sustainable Transport Funding.

Table 1: Schemes delivered through Integrated Transport Programme.

HCC Ref	Scheme name	Detail
ITP12037	Clarendon Road pedestrian improvements phase 2	<p>Footway and crossing improvements along Clarendon Road from Watford Junction station to Beechen Grove junction.</p> <p>Decluttering of footways;</p> <p>Installation of subway wraps;</p> <p>Pedestrian directional street name plates;</p> <p>Way-finding monoliths outside the rail station;</p> <p>Promotional banners along Clarendon Road.</p> <p>Station Road, Clarendon Road, Woodford Road and Orphanage Road incorporated into 20mph zone.</p>
ITP13075	A412 St Albans Road cycle route phase 1 & 2 (Hempstead Road to Station Road)	<p>Cycle improvements from the Stratford Way junction with A411 Hempstead Road to Station Road junction with St Albans Road. Works include shared foot and cycle way, directional signage and signalised junction improvements.</p>
ITP14017	A412 St Albans Road cycle route phase 3 (Station Road to	<p>Cycle improvements from the Station Road junction with St Albans Road to</p>

	Dome Roundabout)	<p>the Dome Roundabout.</p> <p>On street marked cycle lanes for parts of the route (Station Road to Balmoral Road junctions, north and south bound);</p> <p>Shared foot and cycle way north bound from just north of Balmoral Road junction to Vauxhall car dealership;</p> <p>Cycle and bus lane north bound from car dealership to Longspring car park;</p> <p>On road marking and part bus and cycle lane to the Dome;</p> <p>On road marked advisory cycle lane and parts bus and cycle lane south bound from Dome to Balmoral Road;</p> <p>On road cycle lane marking southbound from Brixton Road to Station Road junction.</p>
ITP13080	A412 St Albans Road cycle route phase 4 (Dome Roundabout)	Installation of toucan crossings on all arms of the roundabout. Widened footways to provide shared foot and cycle ways.
ITP14064	Cassiobridge pedestrian and cycle link phase 1	<p>Pedestrian and cycle improvements from Rickmansworth Road/Whippendell Road junction to Gade Avenue, as first stage of improved links to the proposed new Cassiobridge Met Line station on Ascot Road. Scheme included:</p>

		<p>Toucan crossing on Rickmansworth Road;</p> <p>Lighting refurbishments and enhancements;</p> <p>Footways linking crossing to Cassiobury Park and Gade Avenue;</p> <p>Wayfinding signage.</p>
ITP14062	Queens Avenue cycle route	<p>Scheme to enhance cycling facilities between Cassiobury Park and the proposed new MLX station on Ascot Road:</p> <p>New Toucan crossing on Hagden Lane;</p> <p>New lighting columns in the recreation ground;</p> <p>Resurfacing works at the entrance/exit at Vicarage Road;</p> <p>New and refreshed line marking denoting cycle link through the recreation ground;</p> <p>New wayfinding signage.</p>
ITP13073	Market Street cycle route	<p>Contraflow cycle lane from High Street to Exchange Road and toucan crossings ring road.</p>
ITP14044	Water Lane shared use crossing	<p>Installation of a shared use zebra crossing on Water Lane</p>
ITP14097	Cow Lane 20mph zone	<p>Implementation of a 20mph zone on Cow Lane, Heronslea, Cezanne Road, Ley Farm Close and Edward</p>

		<p>Amey Close.</p> <p>Uncontrolled pedestrian crossing comprising of tactile paving and dropped kerbs.</p> <p>Implementation of no waiting at any time parking restrictions (double yellow lines).</p>
ITP14096	West of Leavesden Road 20mph zone	Implementation of a 20mph zone covering Shakespeare Street, Milton Road, Copsewood, Garfield Road, Parker Street, Stanmore Road, and Nevill Grove.
ITP12036a	St Albans Road West 20mph zone	<p>Implementation of a 20mph zone covering Ridge Street, Judge Street, Cecil Street, Regent Street and Victoria Road.</p> <p>Kerb buildouts, footway construction, resurfacing and tactile paving.</p>

Local Priorities and Challenges

The high demand for housing has led to a number of new homes being built and this set to increase with a number of number proposed developments within the borough. Meeting the housing demand against the air quality requirements presents a major challenge.

Another priority for Watford is to improve working relationships with stakeholders and partners to continue to drive improvements. In addition, improving the quantity and quality of information available on our air quality webpage will help to inform as well as promote air quality improvements.

Effective partnership working is essential to ensure that we are able to deliver the objectives set out in our AQAP.

How to Get Involved

All our residents, visitors and businesses play a role in improving air quality, for example, walking, cycling or using public transport instead of driving. For those of us who need a car, replacing it with a greener vehicle such as an electric one is a great way of improving air quality. If individuals or businesses are not ready to replace their existing vehicles, they should ensure that at least they are serviced and in particular, tyre pressures are at the appropriate level as doing so will help lower emissions as well as saving money.

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1 Local Air Quality Management

This report provides an overview of air quality in Watford Borough during 2015. 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 Watford Borough 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.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) 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 the objectives.

A summary of AQMA's declared by Watford Borough Council can be found in

Table 2.1. Further information related to declared or revoked AQMA's, including maps of AQMA boundaries are available online at:

https://www.watford.gov.uk/info/20010/your_environment/196/local_air_quality

Following the Ricardo Energy & Environment report (Detailed Assessment of Nitrogen Dioxide in the Watford Air Quality Management Areas (2015), dated Monday, 16th May 2016) In 2017, we will be considering the recommendations to revoke AQMA 1 and AQMA 5 as concentrations have remained below the annual mean concentration of 40 µg/m³ and amend the remaining AQMA's (see monitoring section).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	One Line Description	Action Plan
AQMA 1 St Albans Road	NO ₂ annual mean	A combination of residential and commercial buildings along a main road. Queuing traffic and street canyon.	https://watford.jdi-consult.net/documents/pdfs5/Air%20Quality%20Action%20Plan%202011.pdf
Watford AQMA 2 Vicarage Road	NO ₂ annual mean	A predominately residential area with a cluster of commercial buildings within and as well as close to the vicinity. Queuing traffic.	
Watford AQMA 3A Aldenham Road/Chalk Hill	NO ₂ annual mean	A combination of residential and commercial buildings along a main road within close proximity to Bushey Station. Queuing traffic.	
AQMA 5 A405 / Horseshoe Lane	NO ₂ annual mean	A predominately residential area within close proximity to main roads and motorway.	

Watford Borough Council has taken forward a number of measures during the current reporting year in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Work is being done to revise the existing Local Plan Strategy to include air quality policy requirements that will seek to mitigate through design.

We will be improving the information we provide to our residents and businesses, for example, updating our webpage.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
Intelligent Transport Systems. To manage traffic movement more efficiently throughout the County	Traffic Management	Strategic highway improvements	HCC	Complete	Complete	NI167 congestion	Improve traffic flow and reduce emissions.	Complete	Complete	None
Road Infrastructure Improvements Ease congestion in St Albans Road AQMA. Further improvements are recommended in the Congestion study	Traffic Management	Strategic highway improvements	HCC/WBC	Complete	Partially complete	Schemes completed	Ease congestion and reduce emissions	Partially complete	On going	Local Sustainable Transport Fund 20 Zone west of St. Albans Road planned New cycle route along St.Albans Road The congestion study was completed 'some time ago' and signals at two junctions have been adjusted. Some permanent loops are in place so there will be some journey time information. St.Albans Road link road on hold Health Campus Link Road due to start construction in January 2015 DEFRA bid submitted to improve access and signage for Abbey Way cycle path (Sept 2014)

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Implement the intalink project Increase the integration of public and sustainable transport movements	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	HCC/WBC	Complete	Complete / on going	Bus and rail patronage, number of cyclists and pedestrians	Reduce private car use and so reduce emissions. Medium impact.	On going	On going	On going promotion
Watford Junction interchange improvement Increase the accessibility of the rail station	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	HCC/WBC	Complete	Partially complete	Completed scheme	High in the vicinity of the junction	Partially complete	On going	Forecourt and other work done as part of national station improvement scheme. No start date as yet for major work such as link road
Promotion of car sharing scheme. Increase car sharing to ease congestion	Alternatives to private vehicle use	Car & lift sharing schemes	WBC	Complete	Complete / on going	Registered members on liftshare Number of private schemes	Low	Complete / on going	Complete / on going	On going promotion through council's commuting officer
Promotion of Travel Plans. Increase in sustainable transport	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	WBC	Complete	Complete / on going	Number of travel plans in schools and businesses	Low	Complete / on going	Complete / on going	On going promotion through council's commuting officer
Annual Council vehicle fleet review. Maintain clean Council vehicle fleet	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	WBC	On going	On going	Age and Euro standard of Council vehicle fleet	Low	Underway	On going	Corporate procurement policy being developed
Promote air quality within the Borough. Increase awareness of AQ as a health issue and the	Public Information	Other policy	WBC	Complete	On going	"Hits" on Herts&Beds Air Quality website	Low	Complete	Complete	This is being considered across Hertfordshire and HCC Public Health Director has committed funding. We have worked with HCC and other LA's to draft a Hertfordshire Air Quality Strategy. http://www.hertfordshire.gov.uk/docs/pdf/a/airqualitystrategicplan.pdf

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Continue to monitor air quality. Maintenance of air quality monitors and data management	Public Information	Other policy	WBC	Complete	Complete	Number of operational monitors	Low	On going	On going	Despite budgetary pressures Watford has continued to fund existing monitoring and has also funded the maintenance of new PM 2.5 monitors.
Undertake feasibility studies. To investigate the air quality impact of any potential future schemes	Policy Guidance and Development	Other policy	WBC	On going	On going	Not applicable	Not applicable	On going	On going	Site allocation traffic light system put in place with planning policy Constraint information for developers included in planning information
Enforcement of parking policy. Minimise emissions due to reduced traffic flow caused by obstructions	Traffic Management	Enforcement on highway	WBC	Complete	Complete	Number of warnings, fines and prosecutions for such offences	Low	On going	Outstanding	Outstanding
Installation of EV charging points. Encourage the uptake of electric vehicles	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	HCC/WBC	Complete	Complete	Number of charging points installed	Low	Complete	Complete	None
Implement bus strategy. Encourage the increase of bus patronage	Alternatives to private vehicle use	Other	HCC/WBC	Complete / on going	Complete / on going	Bus patronage	Medium	Complete / on going	Complete / on going	Local Sustainable Transport Fund On-going partnerships and promotion with local bus companies through council
Promotion of TravelSmart. Personalised travel planning to reduce car use	Alternatives to private vehicle use	Other	WBC	Complete	Complete	Progress on the Croxley programme	Low	Complete / on going	Complete / on-going	TravelSmart continues to be promoted Croxley Rail link commencement order agreed but currently stalled

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Promotion of cycling and walking. Increase sustainable transport	Promoting Travel Alternatives	Promotion of walking	WBC/HCC	Complete	Complete	Number of cyclists and pedestrians	Low	Complete / on going	Complete / on going	<p>New cycle route along St.Albans Road</p> <p>Ebury Road route planned</p> <p>Grand union canal route planned</p> <p>New road signs with pedestrian info being implemented</p> <p>SW Herts cycling strategy planned</p> <p>Permanent loop monitoring planned</p> <p>DEFRA bid submitted to improve access and signage for Abbey Way cycle path</p>
Develop Supplementary Planning Document for Air Quality. Develop SPD on AQ for inclusion in the 2011 Development Plan Document	Policy Guidance and Development	Air Quality Planning and Policy Guidance	WBC	On going	On going	Publication of SPD; Number of planning applications made using the guidance;	Low	On going	On going	<p>HCC Public Health Director has expressed wish for there to be a county wide strategy.</p> <p>As part of the Local Plan Strategy we will be considering the need for supplementary planning guidance.</p>

2.2 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.

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

- Establish an effective partnership working arrangements with Hertfordshire County Council Public Health. This has occurred as a result of three key drivers:
 - Increased evidence and awareness of the harm from exposure to PM_{2.5}
 - The transfer of central government funding from a central public health body to County Councils
 - The existence of the Public Health Outcome Indicator (PHOI) for the fraction of mortality attributable to particulate air pollution measured as fine particulate matter PM_{2.5}.
- Access to Public Health Funding for each of the ten Hertfordshire Local Authorities to purchase and establish PM_{2.5} monitoring equipment in their areas. Watford has installed a FIDAS monitor on Tuesday, 8th December 2015.
- Watford Council has not yet identified any measures targeted specifically at reducing PM_{2.5} and it is considered unlikely that any such measures will be identified over the coming years. Instead it is anticipated that:
 - Measures to reduce emissions of NO_x by encouraging a move away from internal combustion engine vehicles to ultra low emission vehicles (ULEV) will reduce PM_{2.5} emissions from exhausts
 - Measures to reduce road travel altogether will reduce PM_{2.5} emissions from brake and tyre wear and dust re-suspension.

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

This section sets out what monitoring has taken place and how it compares with objectives.

Watford Borough Council undertook automatic (continuous) monitoring at one site during 2015. Table A.1 in Appendix A shows the details of the sites. Further information regarding the monitoring data for this site can be found at

http://www.airqualityengland.co.uk/site/latest?site_id=HB004

http://www.airqualityengland.co.uk/local-authority/?la_id=408

National monitoring results are available at:

<https://uk-air.defra.gov.uk/data/>

A map showing the location of the monitoring site is provided in Appendix D (Fig 3). Further details on how the monitors are calibrated, and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Watford Borough Council undertook non- automatic (passive) monitoring of NO₂ at 18 sites during 2015. Table A.2 in Appendix A shows the details of the sites.

A map showing the approximate locations of the monitoring sites are provided in Appendix D (Fig2). Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 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 2015 dataset of monthly mean values is provided in Appendix B.

The only exceedances found during 2015 were in areas declared as AQMA's, there were no further exceedences of this objective/concentration in 2015.

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. There were no exceedences of the NO₂ hourly mean objective of 200 µg/m³ at the Watford Town Hall site in 2015.

The annual average has remained fairly constant in recent years and is well below the objective concentration. In addition apart from 2012, there were no exceedences of the hourly mean objective in the period 2010 to 2014.

In 2016 the council commissioned Ricardo Energy & Environment to carry out a Detailed Assessment of NO₂ within its four AQMA's.

The report issued by Ricardo Energy & Environment made the following comments and recommendations,

- “In AQMA1 there are no predicted exceedances of the 40 µg/m³ annual mean objective at any ground level or 1st floor height locations where there is relevant human exposure present. **Watford Borough Council may wish to consider revoking the boundary of AQMA1.**
- In AQMA2 the results indicate that there may be exceedances of the NO₂ annual mean objective at up to 50 residential properties at ground level, some of which are within the current AQMA boundary. The results also indicate that there are exceedances of the objective at locations on Wighenhall Road which are not within the existing AQMA boundary. **Watford Borough Council should consider revising the boundary of AQMA2 to include these locations.**
- In AQMA3A the results indicate that there may be exceedances of the NO₂ annual mean objective at up to 55 residential properties at both ground level and first floor height. Most of which are within the existing AQMA3A boundary with the exception of some properties on Lower High St, Pinner Road and Aldenham Road. **Watford Borough Council should consider revising the boundary of AQMA3A to include these locations.**
- In AQMA5 there are no predicted exceedances of the 40 µg/m³ annual mean objective at any ground level or 1st floor height locations where there is relevant exposure. **Watford Borough Council may wish to consider revoking the boundary of AQMA5.”**

The Council will be reviewing these recommendations during 2017 and will also review its Action Plan to ensure that any changes are suitably reflected.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

Table A.6 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 35 times per year.

The annual average has remained fairly constant in recent years and is well below the objective concentration. In addition there were no exceedences of the hourly mean objective in the period 2010 to 2014. There were 5 exceedences in 2015 which was well below the permitted 35 days.

3.2.3 Particulate Matter (PM_{2.5})

Table A.7 in Appendix A presents the ratified and adjusted monitored PM_{2.5} annual mean concentrations.

Monitoring of PM_{2.5} commenced Tuesday, 8th December 2015 resulting in a data capture of 6.4% and therefore, it is not possible to make a meaningful comparison against the national objective. However, concentrations did not exceed this criteria.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
WF46	Watford Town Hall	Roadside	510540	196780	NO2, PM2.5, PM10	N	Chemiluminescent, TEOM (oscillating microbalance) and FIDAS (Optical)	N/A	10m	1.5m

(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 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
WF02	Grove Pumping Station	B	508700	198950	NO ₂	N	N	N	N/A	N
WF03	Hospital	K	510570	195800	NO ₂	N	N	N	4m	Y
WF06	Woodside Playing Fields	B	510985	200710	NO ₂	N	N	N	N/A	N
WF29	Pinner Road	K	511940	195320	NO ₂	AQMA3A	N	Y – 6m	2m	Y
WF36	Ravenscroft	I	512240	199910	NO ₂	N	N	Y – 8m	N/A	Y
WF37	358, St. Albans Road	K	510970	198535	NO ₂	AQMA1	N	Y – 5m	1m	Y
WF38	A405 / Horseshoe Lane	K	511680	200700	NO ₂	AQMA5	N	Y – 2m	4m	Y
WF39	Balmoral Road	K	511000	198270	NO ₂	AQMA1	N	N	1m	Y
WF40	Salisbury Road	K	510930	198000	NO ₂	AQMA1	N	N	2m	Y
WF41	Leavesden Road	K	510850	197780	NO ₂	AQMA1	N	N	1m	Y
WF42	Queens Road	K	511160	197000	NO ₂	N	N	Y – 4m	1m	Y
WF43	Farraline Road	K	510800	196020	NO ₂	AQMA2	N	Y – 4m	2m	Y
WF44	Chalk Hill	K	511920	195450	NO ₂	AQMA3A	N	Y – 6m	2m	Y
WF45	Wellington Road	K	510750	197230	NO ₂	AQMA1	N	Y-10m	4m	Y
WF46	Town Hall	R	510565	196800	NO ₂	N	Y	N	6m	Y

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
WF47	Willow Lane	K	510335	195610	NO ₂	N	N	Y - 3m	1m	Y
WF48	Lower High Street	K	511725	195619	NO ₂	N	N	Y - 4m	1m	Y
WF49	Gammons Lane	K	510499	198454	NO ₂	N	N	Y - 5m	1m	Y

Note: B = background; K = kerbside; I = intermediate; R = roadside.

(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.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	In AQMA?	Period of monitoring	Valid Data Capture 2015	Annual Mean Concentration µg/m ³					
					2010	2011	2012	2013	2014	2015
Watford Town Hall	Roadside	N	Full year	99.54%	39	39	38	39	40	35

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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO₂ Monitoring ResultsResults of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Site ID	Site Type	In AQMA?	Period of monitoring	Valid Data Capture 2014	Number of Exceedences of hourly mean (200 µg/m ³)					
					2010	2011	2012	2013	2014	2015
Watford Town Hall	Roadside	N	Full year	99.54%	0	0	1	0	0	0

Notes: Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(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) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Type	Within AQMA?	Valid Data Capture 2015 %	Confirm Gravimetric Equivalent	Annual Mean Concentration µg/m ³					
					2010	2011	2012	2013	2014	2015
Watford Town Hall	Roadside	N	90	Y	24	25	22	24	21	22

Data capture was above 90% for all years

Table A.6 – Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m ³)					
					2010	2011	2012	2013	2014	2015
Watford Town Hall	Roadside	N	90.2	Y	7	20	13	7	6	5

Notes: Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold**.

(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) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Data capture was above 90% in all years

Table A.7 – PM_{2.5} Monitoring Results

Site ID	Site Type	Valid Data Capture 2015 (%) (1)	PM2.5 Annual Mean Concentration (µg/m3) (2)				
			2011	2012	2013	2014	2015
Watford Town Hall	Roadside	6.4%	-	-	-	-	10

(1) 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%).

(2) All means have been “annualised” as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2015

Site ID	Site Type	NO ₂ Mean Concentrations (µg/m ³)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
														Raw Data	Bias Adjusted ⁽¹⁾
WF02	Grove Pumping Station Hempstead Road	24.5	28.4	22.7	17.4	15.8	9.1	13.14	16.3	19.5	27	18.4	19.4	19.3	15.4
WF03	Hospital Vicarage Road	53	53.3	47.2	45.7	43.7	34.4	33.07	37.1	44.8	49.8	42.3	37.7	43.5	34.8
WF06	Woodside Playing Fields	31.9	34.8	21.5	23.3	14.6	13.6	16.9	22.3	22.2	31.8	missing	26.7	23.6	18.9
WF29	Pinner Road	79.1	79.6	68.4	61.6	54.2	48.6	39.3	46.5	54.9	71.4	62.4	56.3	60.2	48.2
WF36	Ravenscroft	36.8	30	34.9	33.4	24.5	25.5	26.1	28.3	35.2	40.5	30.2	35	31.7	25.4
WF37	o/S 358 St Albans Rd	missing	missing	missing	32.2	31.8	33.8	28.7	42.8	49.9	59.6	32	46.5	39.7	31.8
WF38	A405 Horseshoe Lane	62.6	62.9	51.8	50.3	37.8	36.2	39.3	45.7	56.3	59.1	50.9	60.1	51.1	40.9
WF39	Balmoral Road	55.6	54.1	52.1	44.9	31.7	31	35.6	40.8	51.2	58.1	43.5	46	45.4	36.3
WF40	Salisbury Road	47	55.7	46.7	46.9	29.6	30.2	27.7	36.5	50.4	48.4	39.8	37.6	41.4	33.1
WF41	Leavesden Road	45.7	50.8	46.9	38	33.9	28.9	31.2	31.2	40.5	54	36.8	44.5	40.2	32.2
WF42	Queens Road	53.1	56.9	45.9	36.3	28.1	29	28.1	27.7	42.4	49.6	37.3	41.4	39.7	31.7
WF43	Farraline Road	74.3	64.7	63.1	56.3	52.1	36.6	48.4	54.5	59.1	68.9	55.2	39.1	56.0	44.8
WF44	Chalk Hill	95.7	102	97.2	68	80.7	79.7	90.4	89.6	90.5	101.4	81.1	84	88.4	70.7
WF45	Wellington Road	49.3	46.7	42.7	35.3	26.5	25.6	33.6	33.3	42.4	52	40.3	45.8	39.5	31.6

Site ID	Site Type	NO ₂ Mean Concentrations (µg/m ³)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
														Raw Data	Bias Adjusted ⁽¹⁾
WF46	Town Hall no 2 Colocation	50.1	52.2	42.6	34.4	35.6	31.5	32.9	34	44.4	42.8	40	40	40.0	32.0
WF47	Willow Lane	44.8	50.8	41	38	28.7	27.7	29.5	28.9	39.4	46.4	31.9	36.6	37.0	29.6
WF48	High Street	65.9	65.8	55.8	missing	45.5	38.2	48.3	50.8	missing	missing	67.7	62.3	55.6	44.5
WF49	Gammons Lane (o/s 67)	NOT IN PLACE				28.9	24.2	25.8	25.9	33.3	42.3	45.9	36.4	32.8	26.3

(1) See Appendix C for details on bias adjustment

Table B.2 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2015)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m ³					2015 (Bias Adjustment Factor = 0.8)
			2010* (Bias Adjustment Factor = 0.86)	2011 (Bias Adjustment Factor = 0.83)	2012 (Bias Adjustment Factor = 0.79)	2013 (Bias Adjustment Factor = 0.80)	2014 (Bias Adjustment Factor = 0.81)	
WF02	Grove Pumping Station	N	22	18	21	18	16	15.4
WF03	Hospital, Vicarage Road	N	44	38	38	36	33	34.8
WF06	Woodside Leisure Centre	N	27	22	25	21	20	18.9
WF29	Pinner Road	AQMA 3A	62	52	56	51	49	48.2
WF36	Ravenscroft	N	34	30	25	29	30	25.4

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					2015 (Bias Adjustment Factor = 0.8)
			2010* (Bias Adjustment Factor = 0.86)	2011 (Bias Adjustment Factor = 0.83)	2012 (Bias Adjustment Factor = 0.79)	2013 (Bias Adjustment Factor = 0.80)	2014 (Bias Adjustment Factor = 0.81)	
WF37	St Albans Road 2	AQMA 1	46	36	40	35	36	31.8
WF38	A405 Horseshoe Lane	AQMA 5	45	38	40	37	39	40.9
WF39	Balmoral Road	AQMA 1	51	45	(45)	43	37	36.3
WF40	Salisbury Road	AQMA 1	48	41	42	39	35	33.1
WF41	Leavesden Road	AQMA 1	40	33	36	36	36	32.2
WF42	Queens Road	N	39	33	(37)	34	32	31.7
WF43	Farraline Road	AQMA 2	58	48	55	49	46	44.8
WF44	Chalk Hill	AQMA 3A	<u>91</u>	<u>83</u>	<u>(84)</u>	<u>84</u>	<u>80</u>	70.7
WF45	Wellington Road	AQMA 1	42	36	40	35	33	31.6
WF46	Town Hall collocation	N	39	37	37	34	33	32.0
WF47	Willow Lane	N	n/a	n/a	35	35	32	29.6
WF48	Lower High Street	N	n/a	n/a	n/a	n/a	42	44.5

Note: Bias adjusted annual means in excess of the $40 \mu\text{g}/\text{m}^3$ annual mean NO_2 objective are shaded grey.
Annual means $> 60 \mu\text{g}/\text{m}^3$ are underlined, indicating a potential exceedence of the NO_2 hourly mean objective
Figures in brackets are those for which data capture was below 75%

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

The following analysers have been in operation at Watford Town Hall:

1. API M200E chemiluminescent NOX analyser from Envirotechnology; and
2. Rupprecht & Patashnick TEOM analyser, gathering PM10 data.
3. In December 2015 a Fidas 200 system replaced the TEOM analyser and monitored PM₁₀ and PM_{2.5}:

<https://www.ecotech.com/wp-content/uploads/2015/03/Product-Brochure-Fidas-200.pdf>

The monitoring station is classified as a Roadside monitoring site, and is situated approximately 10 metres from the kerb of Rickmansworth Road.

Until October 2011, data was collected via modem by the King's College London Environmental Research Group (ERG). Since October 2011, since has been collected by Air Quality Data Management (AQDM), where the data is also validated and reported. Ricardo Energy & Environment took over this role in October 2016. Real time data, as well as weekly month and annual reports are available from Herts & Beds Air Pollution Monitoring Network website;

http://www.airqualityengland.co.uk/local-authority/?la_id=408

Since December 2014 servicing and maintenance had been overseen by Envirotechnology. Periodic calibration of the equipment is overseen by Kings College London.

PM10 data collected using the TEOM instrument is converted by AQDM to reference equivalence using the volatile correction method (VCM).

Tubes are supplied and analysed by Environmental Scientifics Group (ESG) Didcot, formerly Harwell Scientific Services, a UKAS accredited laboratory. The tubes are prepared using 50% TEA (triethanolamine) in acetone.

The ESG laboratory participates in the field intercomparison scheme and the Workplace Analysis Scheme for Proficiency (WASP) programme, operated by the Health and Safety Laboratory (HSL). This compares results from diffusion tube monitoring and analysis with those from automatic monitoring. For the period presented, ESG / Harwell Scientific demonstrated 'good' performance in the WASP scheme for analysis of NO₂ diffusion tubes. Results and bias corrections factors can be seen at:

<http://laqm.defra.gov.uk/diffusion-tubes/diffusion-tubes.html>

The bias correction factors used are shown in Table 2.3, and the national spread sheet can be found at:

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

Appendix D: Map(s) of Monitoring Locations

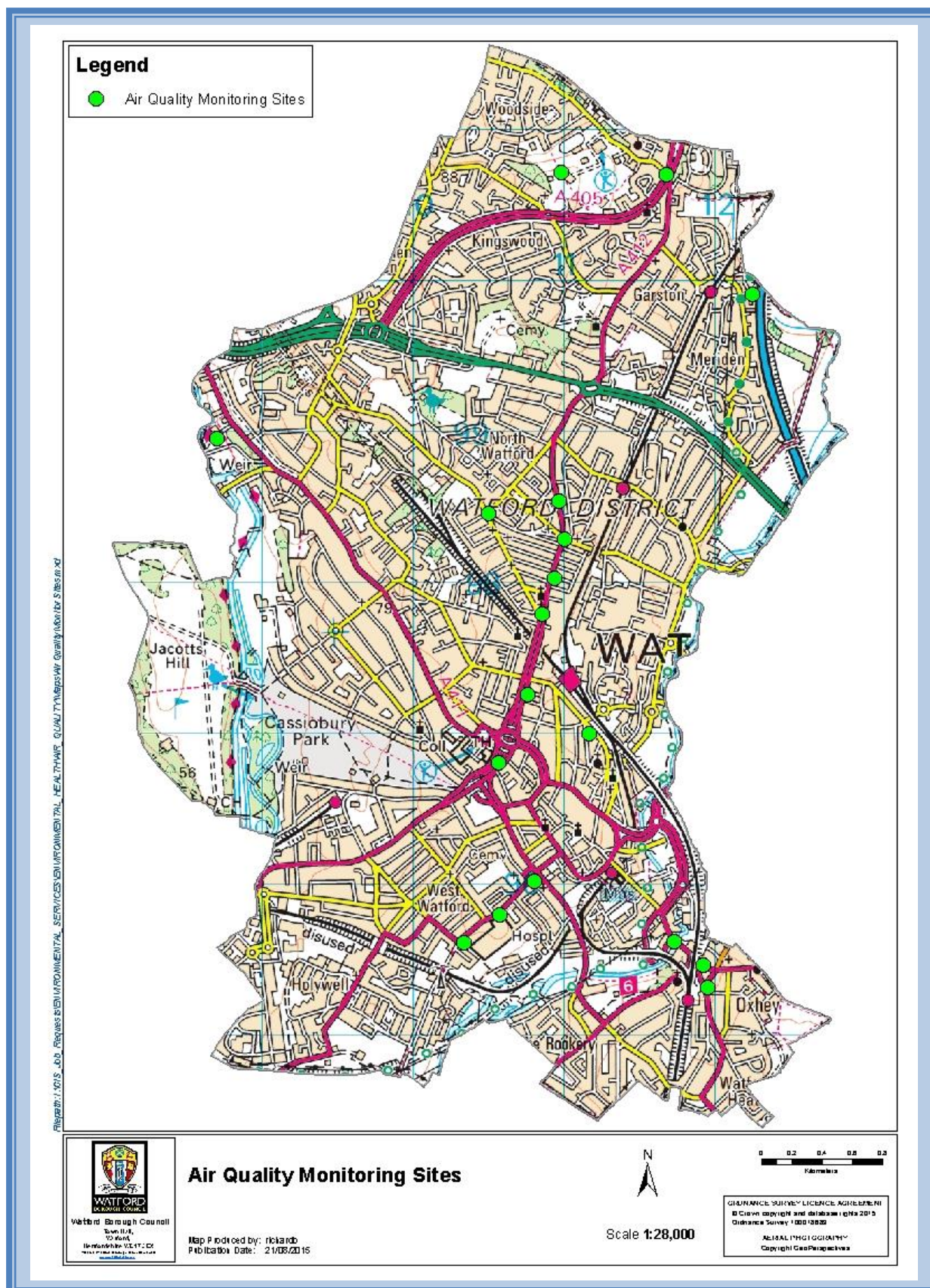
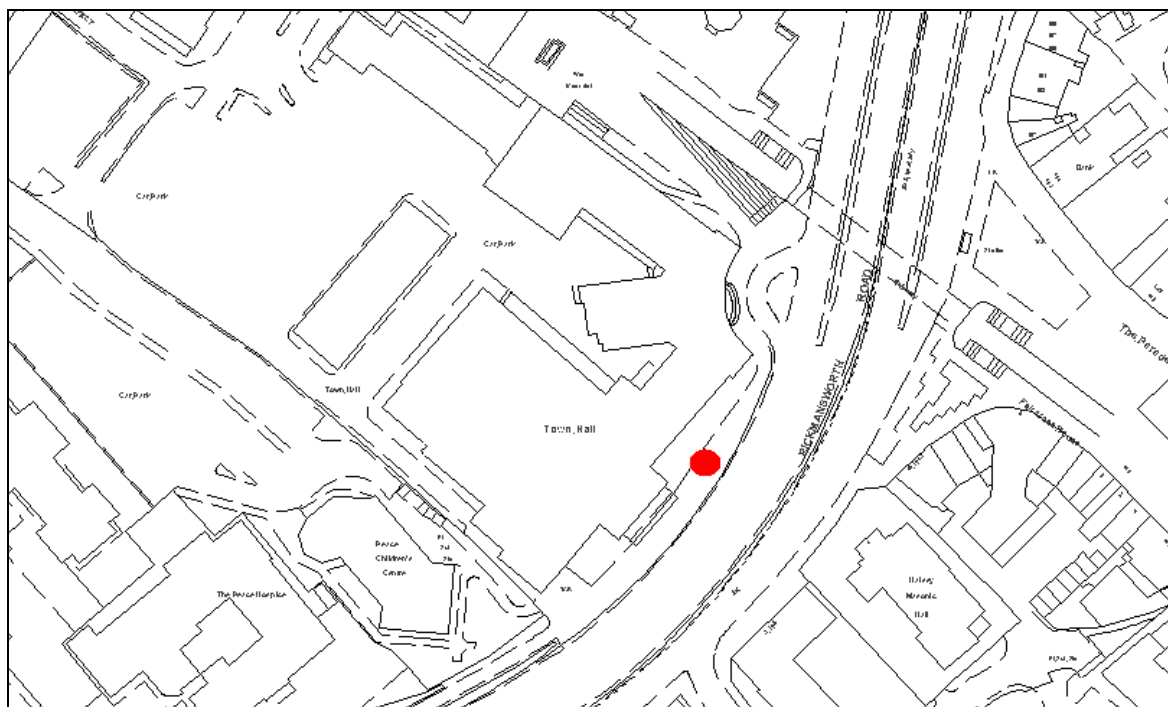


Figure 2 Approximate location of nitrogen dioxide diffusion tube monitoring sites

Details of Automatic Monitoring Sites

Site Name	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
Watford Town Hall	X 510540 Y 196780	NO ₂ , PM ₁₀	N	N	10m	Y

Figure 3 Location of Watford Town Hall automatic monitoring station



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Figure 4: Photograph showing the automatic monitoring at Watford Town Hall.



Current Air Quality Management Areas:

Figures 5,6,7,8,9 Maps showing St. Albans Road Air Quality Management Area No.1

Figure 5:



Figure 6:



Figure 7:



Figure 8:

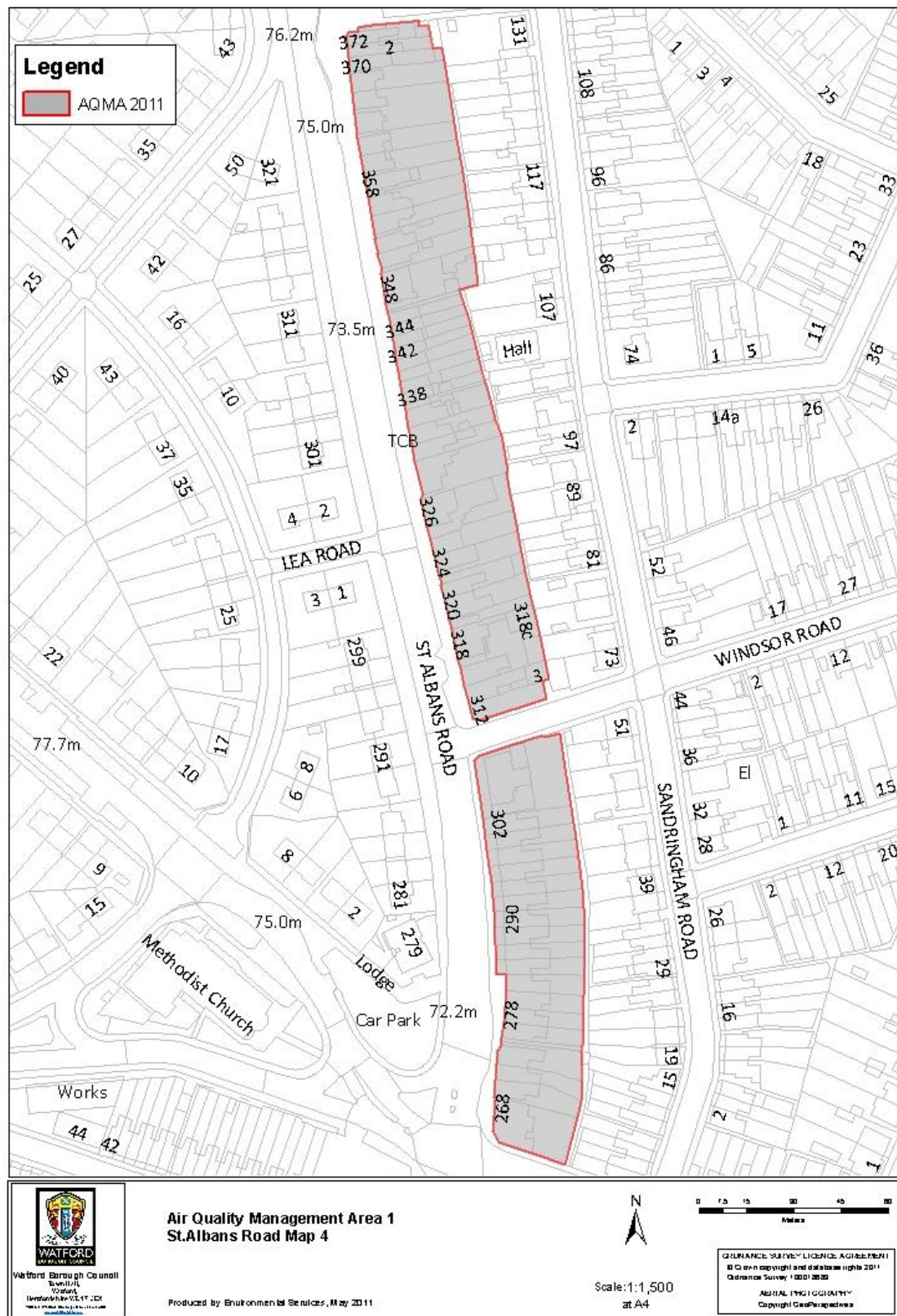
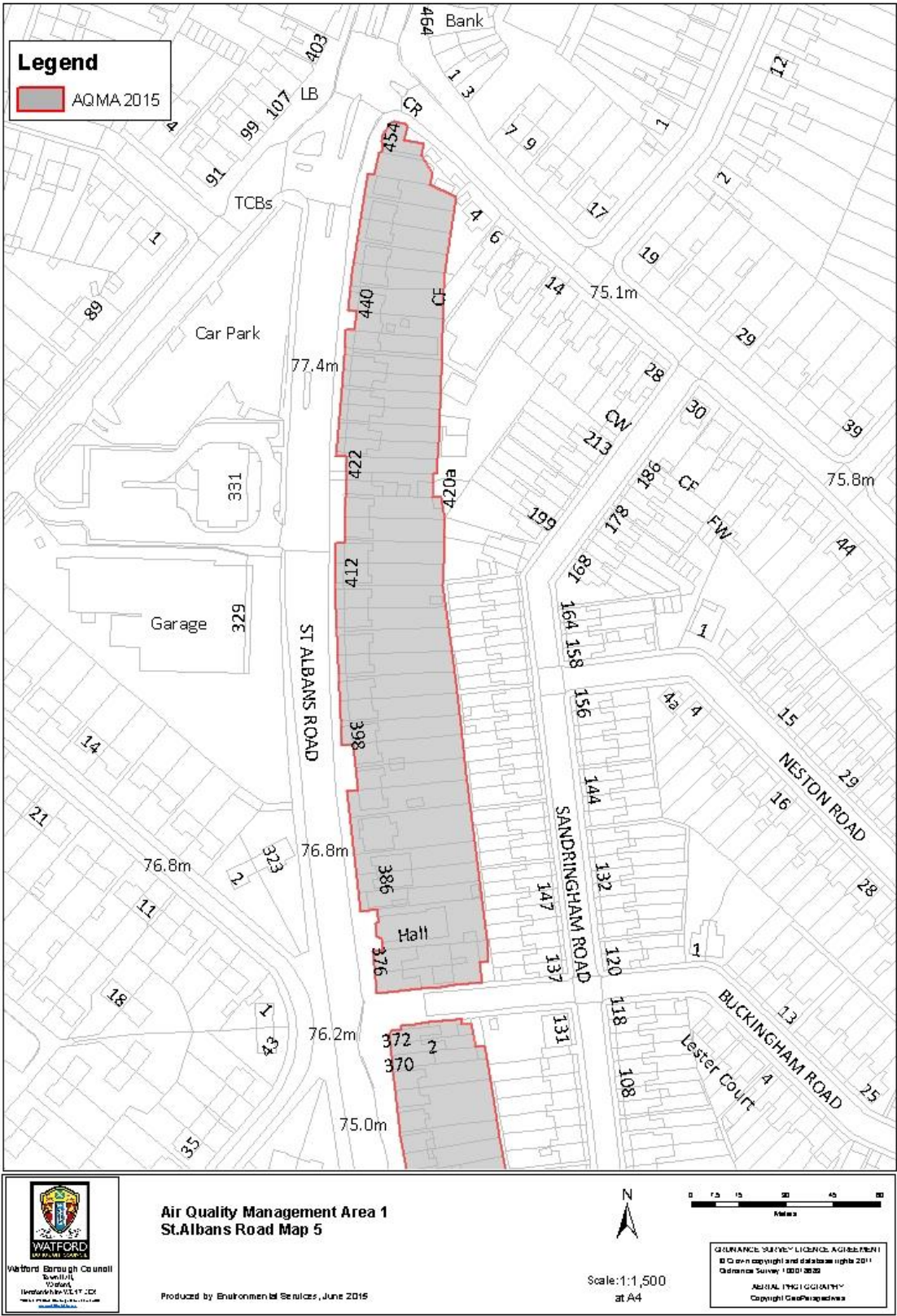


Figure 9:



Figures 10 and 11: Maps showing Vicarage Road / Hornet Air Quality Management Area No.2

Figure 10:

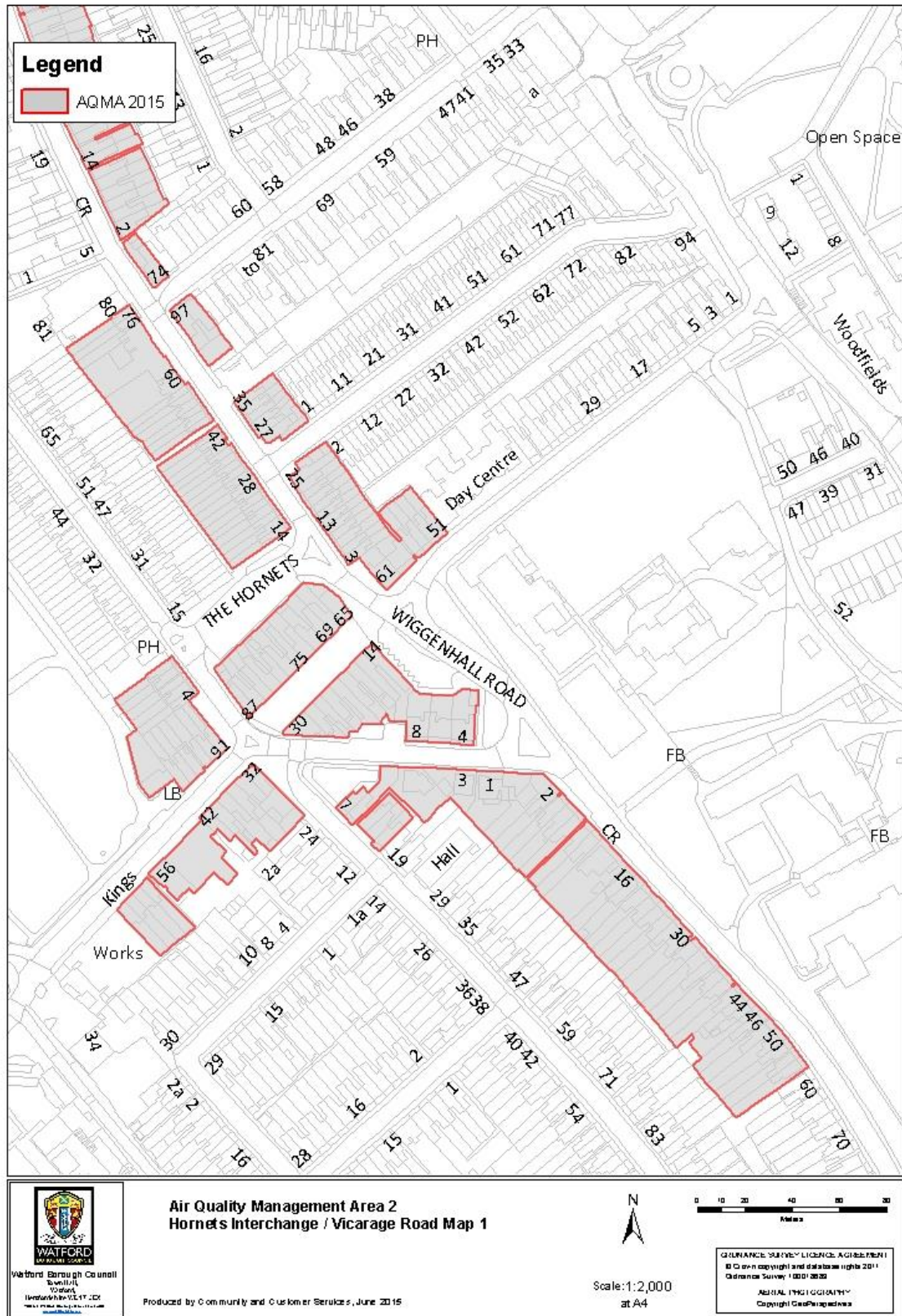


Figure 11:

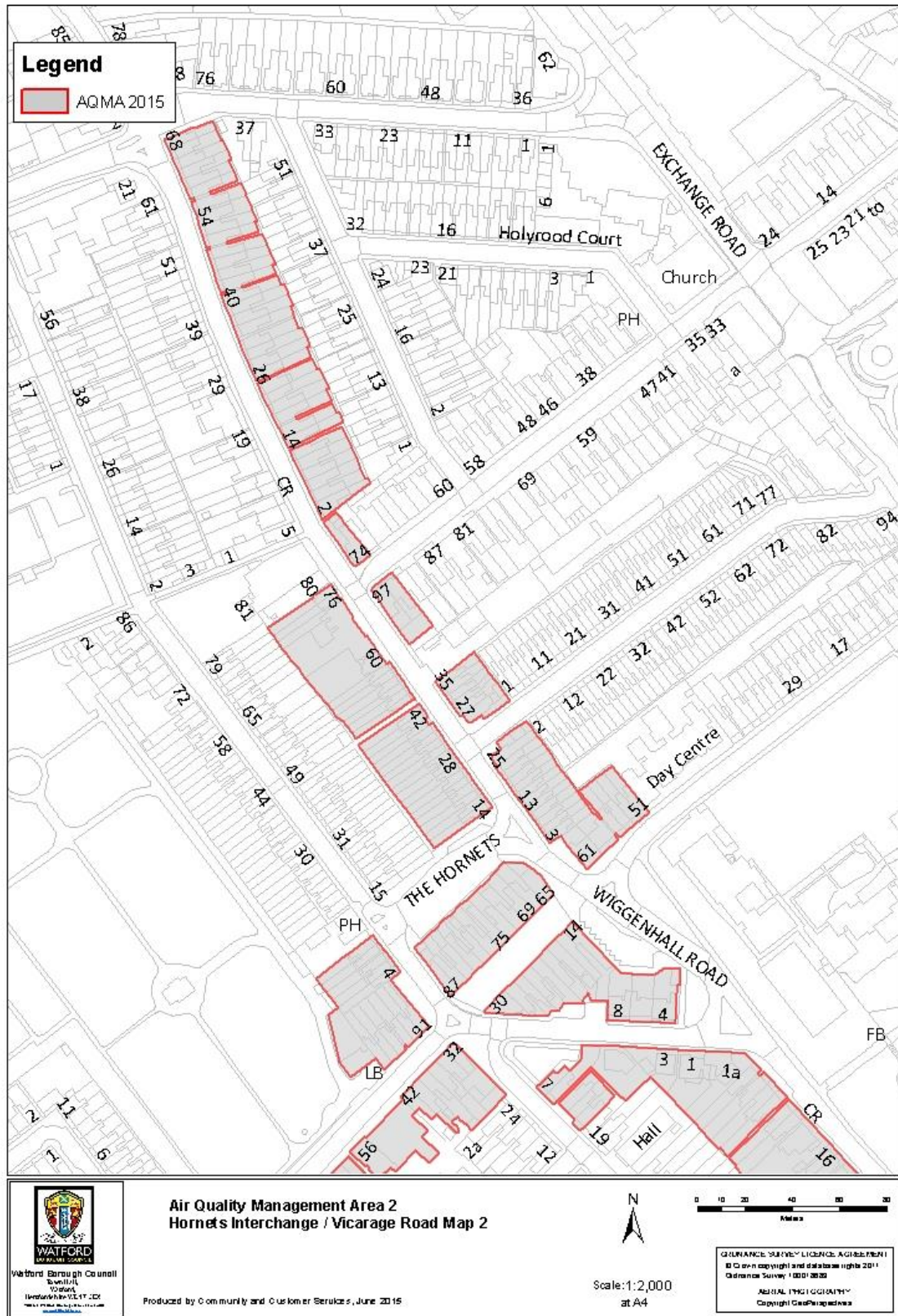
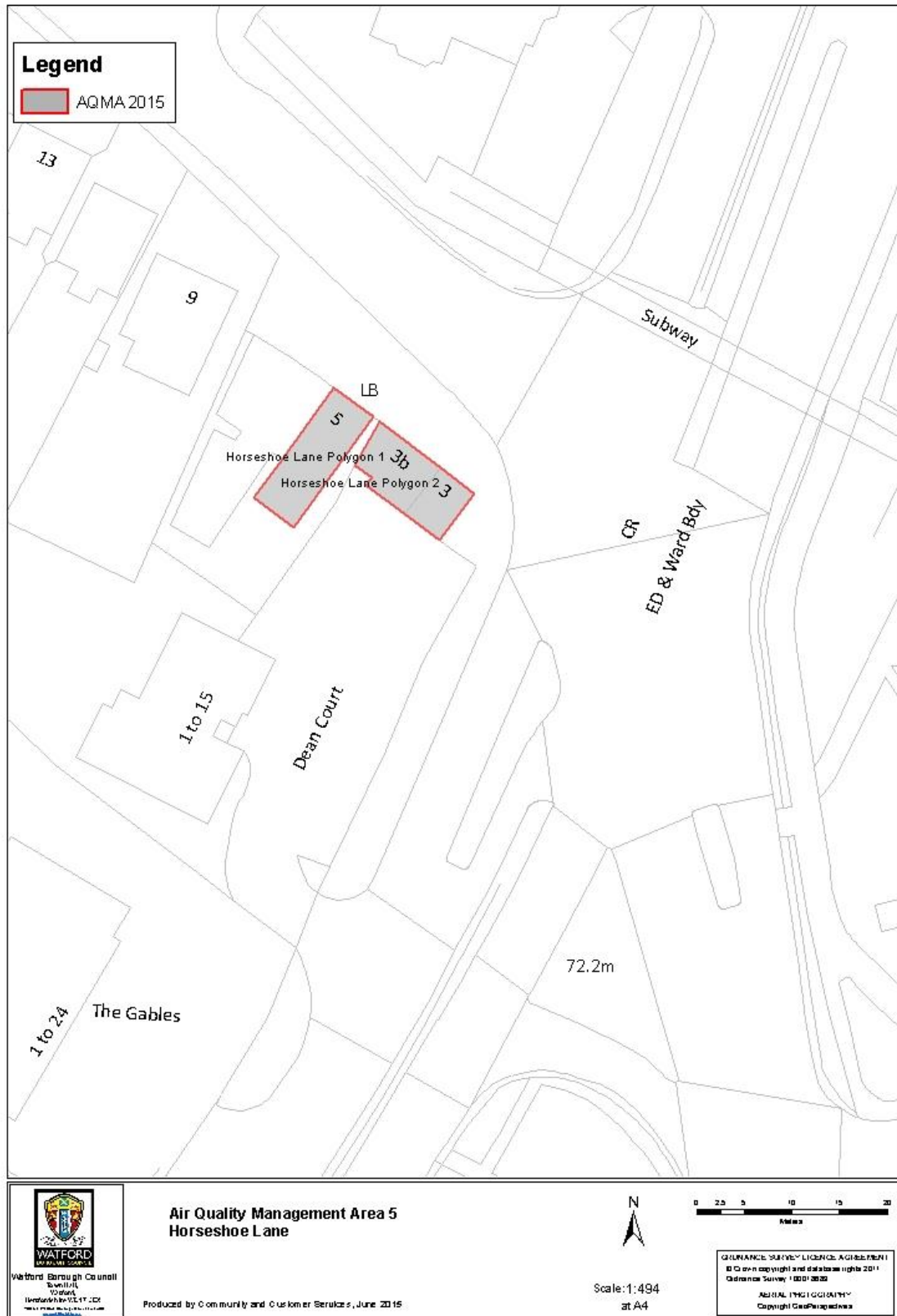




Figure 13: Map showing Horseshoe Lane / A405 Air Quality Management Area No.5



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – 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

⁴ 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	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) 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

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- Goodlad, Gill Air Quality Strategic Plan. (2015)
<http://www.hertfordshire.gov.uk/docs/pdf/a/airqualitystrategicplan.pdf>
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https://www.watford.gov.uk/site/scripts/google_results.php?q=housing+strategy
- Local Air Quality Management DEFRA Technical Guidance LAQM.TG (09)
- Brown, Richard *2015 Updating and Screening Assessment for Watford Borough Council* (2015)
- Google Street View