COTSWOLD
DISTRICT COUNCIL

2019 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management
June 2019

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Report Reference number	COTS ASR 2019
Date	June 2019

Executive Summary: Air Quality in Our Area

Cotswold District Council has continued the diffusion tube monitoring survey for nitrogen dioxide across the district. The sites are representative of relevant exposure and relate to emissions from traffic.

Monitoring carried out within the Air Quality Management Area (AQMA) near the junction of Thames Street, Lechlade, shows nitrogen dioxide levels had dropped considerably from the previous year and were not at risk of exceeding the national air quality objective, set to protect the health of residents. Monitoring will continue so that we can keep a check on the situation, which is affected by meteorological conditions as well as the number and type of vehicles using the junction, and congestion levels here.

At the Air Balloon Roundabout in Birdlip the diffusion tube data also shows reduced levels of nitrogen dioxide (NO_2) compared to last year but they remain above the national objective level. This is expected as the cause of the exceedance is traffic emissions and there has been no significant change in the usage of the road.

Traffic management within our air quality management areas (AQMAs) is outside the direct control of Cotswold District Council, but the Council has been working with the County Highways Department regarding the traffic management controls at the junction in Lechlade. Alterations in the timing of the traffic lights to improve traffic flows and reduce periods of congestion appear to have had a positive impact on levels and combined with reduced pollutant emissions from newer vehicles, air quality has improved considerably at this junction.

The Council will continue to encourage and support any measures considered by the Highways Agency to improve the situation at the Birdlip AQMA. The Government's Road Investment Strategy identified this road section as requiring measures to improve safety, and to ease congestion and reduce pollution. Public consultation on two potential options was carried out between February 18th and March 29th 2018. Details can be found here.

The air quality issue is principally related to the quantity of vehicles using this section of road, including HGVs, and the topography; the steep incline on the approach to the roundabout from the Gloucester direction gives rise to the slow moving traffic labouring along this section of the road. The proposed improvement to the roads is likely to improve air quality at the Air Balloon roundabout as the majority of the traffic would be diverted along a new section of road before approaching the roundabout.

The recommended changes to the road network in this area are subject to funding from Government being provided and the timeframe for any future alterations is not known.

In 2018 our diffusion tube network monitored nitrogen dioxide levels at 14 locations. We have long term results at 4 of these locations, 3 within our AQMAs and 1 in Cirencester. The remaining 10 locations are around Cirencester and a new for 2018 location at Bourton-on-the-Water.

There are no new areas of concern that have been identified within Cotswold District Council's area. Monitoring will continue around the district and will be carried out in accordance with Defra guidance LAQM TG(16). An updated air quality report will be produced in 2020.

Air Quality in Cotswold District Council

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 billion[3].

Air Quality in the Cotswold Area is generally very good. There are however air pollution hotspots where nitrogen dioxide associated with traffic emissions is higher and where it has been necessary to declare Air Quality Management Areas (AQMA).These areas are typically where houses are very close to a busy road and the pollution from the traffic can be exacerbated by problems with congestion as well as the topography, the presence of street canyons and meteorological conditions such as inversion layers and fog.

There are two AQMAs in the district, both declared because nitrogen dioxide levels, related to traffic emissions, exceeded the national objective at the time of the declaration.

The two Air Quality Management Areas (AQMA) are:

- the Air Balloon Roundabout in Birdlip, declared in 2008
- an area of Thames Street Lechlade, declared in 2014.

The AQMA at the Air Balloon roundabout is related to the quantity of traffic using the strategic trunk roads and the tailback of traffic on the hill which approaches the roundabout from the Gloucester direction.

In Thames Street, Lechlade, the AQMA is related to the road which has in the past suffered congestion at the traffic light controlled junction, during rush hours in particular. A street canyon effect combined with frequent foggy conditions when there is an inversion layer due to proximity to the nearby River Thames, exacerbates the accumulation of traffic exhaust emissions as atmospheric dispersion and dilution is inhibited. Nitrogen dioxide levels monitored here have fallen during both 2017 and 2018, since alterations to the timing of the traffic lights, such that the area is no longer suffering poor air quality.

[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

Air quality monitoring, using a network of diffusion tubes to measure nitrogen dioxide (NO_2) levels, is undertaken throughout the district. Previous review and assessment of air quality has established that this is the only pollutant of concern in the area. The monitoring results give an annual average for nitrogen dioxide which is assessed for compliance with the National Air Quality Objective and compared with the monitoring results from previous years. Current monitoring indicates that background levels were very similar to those of recent years but levels at the more trafficked monitoring sites were noticeably lower. We monitor air quality at 12 locations throughout the district. They are roadside locations, of which one is at a site measuring “background” levels and two are situateted by junctions in an area of farmland that is to be developed in the future (Chesterton).

The survey shows that NO_2 levels during 2018 were comfortably below the National Air Quality Objective in all locations except the Air Balloon roundabout at Birdlip, where levels had fallen since last year but still exceeded the National Air Quality Objective of 40 ug/m^3, set to protect health. The exceedance is expected, as it is a very heavily trafficked section of road which suffers severe congestion during both morning and afternoon periods (an extended “rush hour”), and there has been no change in the layout or usage of the roads at this roundabout.

The levels in our other AQMA, in Thames Street, Lechlade, tend to increase when we have poor meteorological conditions. The annual average appears to be linked to the amount of time each year that we experience poor dispersion conditions. During 2018 the annual average NO_2 level was acceptable, lying below the National Air Quality Objective.

The monitoring survey does not indicate any additional areas of concern with regard to air quality within the District. There are no industrial developments with air pollution implications and any development proposals have been considered with regard to their potential to increase traffic pollution in the AQMAs and other areas. We continue to monitor around Chesterton, where we are expecting a major residential development in the future, thus collecting information which will help us identify any change in nitrogen dioxide levels as vehicular traffic in that area increases.

Defra has an internet site containing Air Quality Reports from all local authorities that have AQMAs. The page for Cotswold District Council reports can be found here: https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=68

Actions to Improve Air Quality

Air Quality in the District is mainly very good. In 2012 an Action Plan to address the AQMA at the Air Balloon roundabout was published. The high nitrogen dioxide levels are due to traffic on the major trunk route, management of which is outside the control of Cotswold District Council. The Action Plan concluded that Cotswold District Council would provide support and encouragement for measures that may help to control traffic and encourage alternative transport, through a working group led by the County Highways Department.

The Government's Road Investment Strategy identified this road section as requiring measures to improve safety, and to ease congestion and reduce pollution. Public consultation on two potential options was carried out between February 18th and March 29th 2018. Details can be found here.

There has been no air pollution exceedance in the AQMA at Lechlade this year, but levels in Thames Street are thought to be linked to meteorological conditions and the prevalence of poor dispersion conditions in any year. The levels remain quite high, so monitoring will continue in this location and the AQMA will not be revoked until levels are consistently below the national air quality objective level. The County Highways Department has implemented new traffic controls with amended delay times, to try to improve traffic flows and reduce congestion at the T junction, in order to improve air quality in this AQMA.

Local Priorities and Challenges

Over the next year we will continue the diffusion tube monitoring survey. We will continue discussions with the County Council considering the traffic issues in our AQMAs, the impact of measures taken to date and what more might be done to further reduce congestion.

In addition to any financial consideration, a further constraint upon the progress of any Action Plan has been the political implication (and potential impasse) which might arise as traffic is diverted from one sensitive area towards another area of similar concern within a neighbouring District. This requires consideration and we discuss such issues with our neighbouring authorities through "air quality" liaison groups, which meet approximately twice a year.

How to Get Involved

As the air pollution of concern in the district is related to traffic emissions, we can all do our bit to reduce emissions, by not using a car unless entirely necessary. Walking or cycling, or taking public transport or car sharing rather than driving an otherwise empty car, reduces our individual carbon footprint.

The solution to congestion related pollution lies to a large extent in road traffic management and District authorities do not have the remit to manage this. Local interest groups can however lobby County Councils directly to influence the content of Local Transport Plans (LTP).

Copies of the latest Air Quality Report can be found on Cotswold District Council's Website at:

http://www.cotswold.gov.uk/residents/environment/environmental-health/air-quality/

Any queries about Air Quality should be directed to the Environmental Pollution team within Cotswold District Council.

This team can be contacted by e mail on: ers.pollution@publicagroup.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Cotswold District during 2018.

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 Cotswold 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.1 in Appendix E.

2 Actions to Improve Air Quality

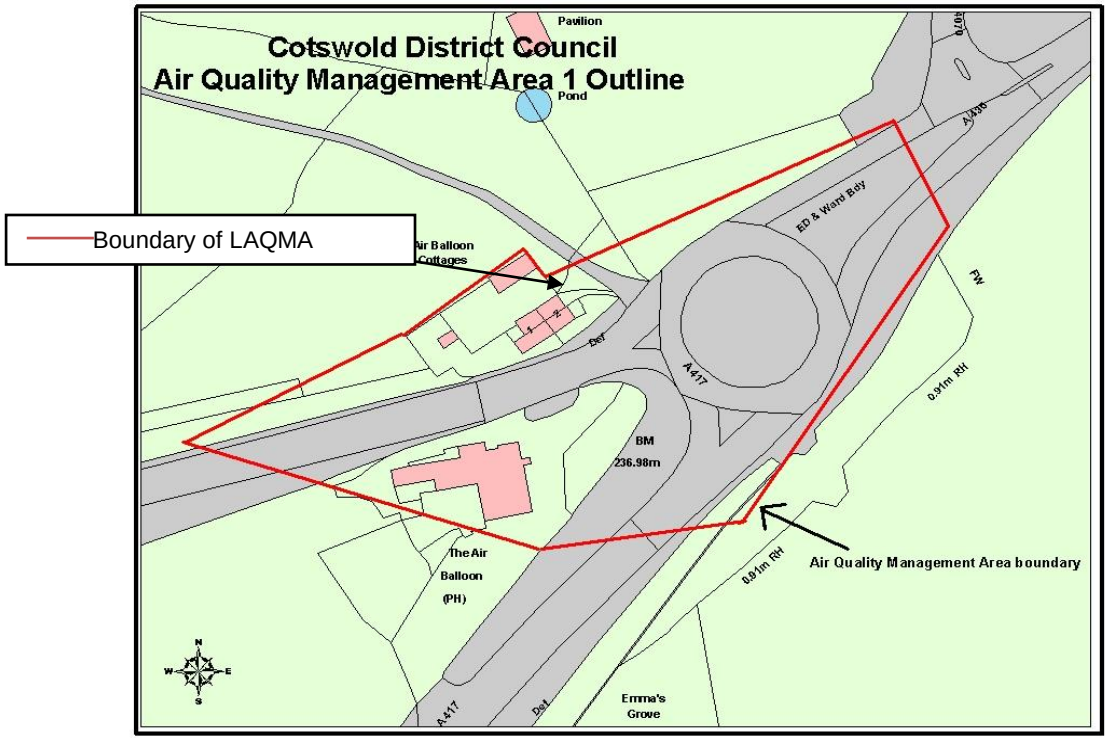
2.1 Air Quality Management Areas

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) setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Cotswold District Council can be found in Table 2.1. Further information related to declared AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=68 and on the Council air quality webpage at: http://www.cotswold.gov.uk/residents/environment/environmental-health/air-quality/

Figure 2.1 Maps of AQMA Boundaries

Air Balloon Birdlip



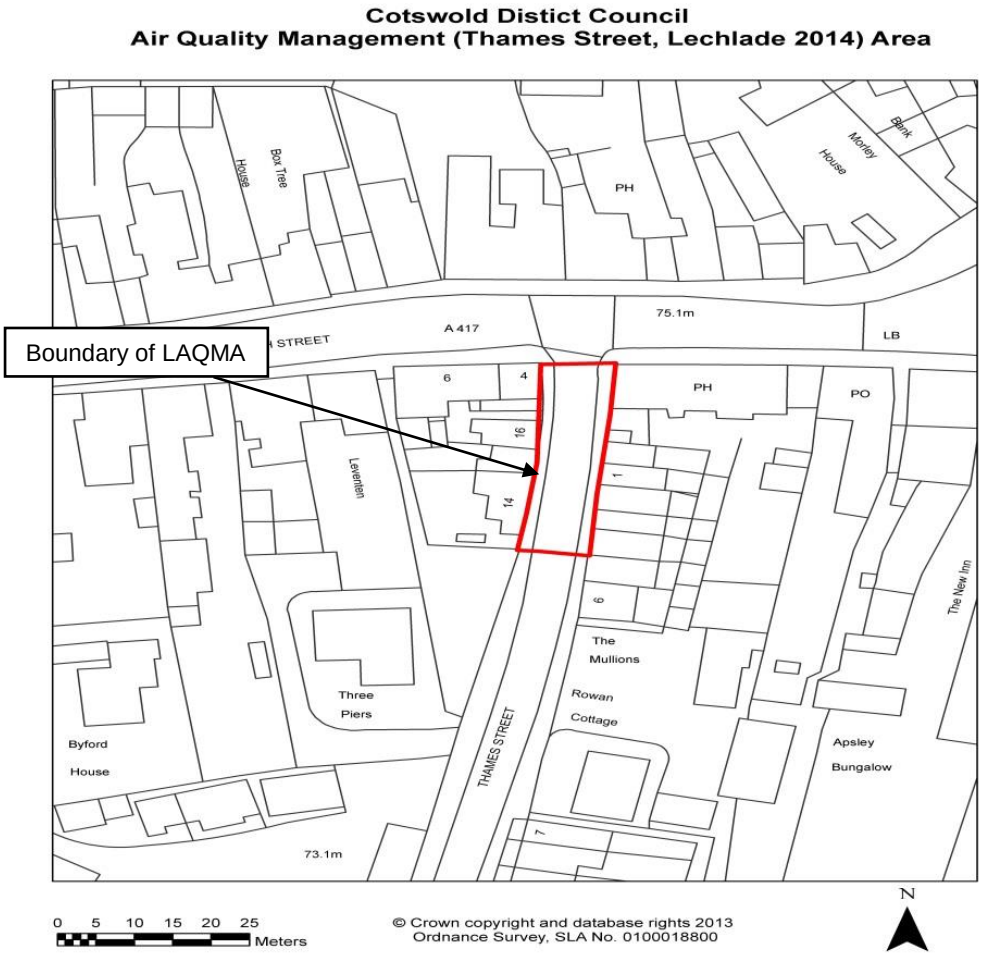


Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Air Balloon Roundabout	NO_2 annual mean	Birdlip	An area encompassing properties adjacent to the roundabout on a strategic trunk route	Government Road Investment Strategy - to consider new road layout
Thames Street, Lechlade	NO_2 annual mean	Lechlade	Residential properties along Thames Street near the junction with the High Street.	County Council traffic management controls

2.2 Progress and Impact of Measures to address Air Quality in Cotswold District Council

Central Government has made funds available for major alterations to the Air Balloon Roundabout in due course. At the time of writing no details as to effects and timescales are available, but a public consultation has been carried out regarding two key options and a preferred route announced. It is possible that because of the topography of the area, mainly the steep incline, and the high volume of HGVs using this route, proposed changes in upgrading part of the route and changing the road lay out will have minimal effect on the air quality at the roundabout, although it may improve flows and improve air quality in “rat runs” around the area. Cotswold District Council will keep a watching brief on the development of this project.

In the Lechlade AQMA at the Thames Street junction with the High Street, Gloucestershire County Council Highways Department has carried out works on the traffic management controls at the T junction to improve flows and reduce congestion. The overall impact of this work has not yet been established in terms of air quality, which is closely linked to meteorological conditions especially in the winter months when poor dispersion conditions can prevail due to the proximity of the river as well as the street canyon effect. Therefore monitoring continues at this location.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	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
1	Air Balloon Roundabout	Freight and Delivery Management	Trunk route management/ Strategic routing strategy for HGVs	Gloucestershire County Council	LTP	TBC	Reduced NO_2 levels recorded	Annual average NO_2 to be reduced to meet AQ objective	Public consultation carried out in Spring 2017	Not known	Awaiting allocation of government funds
2	Thames Street, Lechlade	Freight and Delivery Management	Trunk route management	CDC	1	2017	Reduced NO_2 levels recorded	Annual average NO_2 to be reduced to meet AQ objective	Improved traffic controls, reducing delay times	Completed 2017	Work completed
3	CDC	Promoting Low Emission Transport	Promote LEVs	CDC	Promote LEV infrastructure through Planning controls	In conjunction with government 2019 Clean Air Strategy (CAS)	Increased number of LEVs	Reduced NO_2	Major planning applications affected	It will be an ongoing project	See Government CAS 2019
4	CDC	Promoting Travel Alternatives	Facilitate home-working	CDC			Less journeys	Reduced NO_2	Ongoing	Ongoing	

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 PM2.5 (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM2.5 has a significant impact on human health, including premature mortality, allergic reactions and cardiovascular diseases.

Other than the potential source from vehicles, no other significant source of $PM_{2.5}$ has been identified within the District. Therefore the control at this stage is aligned with the measures designed to achieve a reduction in vehicular emissions.

Liaison with Gloucester County transport and health committees will be pursued, to ensure air quality is considered in policy making.

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

3.1 Summary of Monitoring Undertaken

This section sets out the monitoring that has taken place and how it compares with national objectives as well as previous years' results.

In 2017 Cotswold District Council reviewed the monitoring locations in the nitrogen dioxide survey network. Many years' worth of data in the locations being monitored, provided us with sufficient information to be assured that there air quality is good in most of the locations being monitored. We decided to continue monitoring at 4 locations, 3 within our AQMAs and 1 in Cirencester for continuity. We also set up 8 new monitoring locations, partly in response to requests of local residents represented by a pressure group known as "Save Our Cirencester", who wished to see more monitoring carried out around Cirencester itself. During 2018 we continued to monitor in the same locations. One location was discontinued mid-year because of consistently low levels and a new location was set up in Bourton-on-the-Water.

3.1.1 Non-Automatic Monitoring Sites

Cotswold District Council undertook non- automatic (passive) monitoring of NO_2 at 14 sites during 2018. Appendix A provides details of the sites. Maps showing the location of the monitoring sites are provided in Appendix D.

3.2 Individual Pollutants

3.2.1 Nitrogen Dioxide (NO_2)

The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. As there were at least 9 months data for all but 2 monitoring sites, annualisation was not required for those. However for those 2 sites where monitoring was part year annualisation was carried out to provide an estimated annual exposure. 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 in Appendix C.

A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years, for comparison with the air quality objective of 40µg/m^3. The full 2018 dataset of monthly mean NO_2 levels from the diffusion tube survey is provided in Appendix B.

Nitrogen dioxide levels remained high within Air Balloon roundabout AQMA, which is as expected given the significant volume of traffic on this strategic trunk route, but were lower than last years levels.

The annual average nitrogen dioxide level in Thames Street, Lechlade, continued to remain below 40 $\mu g/m^3$, set as the national objective level to protect health. Exhaust emissions from idling traffic queuing at the High Street junction traffic lights, cause elevated levels at this junction. The County Highways Department has altered the timing of the traffic light controls in an attempt to reduce congestion in Thames Street. Thames Street often suffers fog during inversion conditions, due to its proximity to the River Thames and dispersion of vehicle exhaust emissions is hampered by the relatively high buildings either side of the narrow road. Annual average nitrogen dioxide levels here are thought to be linked to the frequency of these meteorological conditions during the year. The Council will continue diffusion tube monitoring in the area.

The levels recorded during 2018 at our other roadside sites during 2018 were all slightly less than 2017 levels.

Most of the Cirencester monitoring locations experience relatively low annual average levels of NO_2 considering they are roadside locations. The highest results are found in Grove Lane at the junction with Spitalgate Lane, and in London Road opposite the Wagon and Horses. In the months where dispersion is hindered by poor meteorological conditions the levels are the highest as would be expected. The levels experienced at these two locations were slightly lower than last year.

The Berkeley Road and the Spratsgate Lane sites, around Chesterton Farm experience levels below 10 $\mu g/m^3$ which are generally expected in locations away from any sources. This can be considered as the “background” level in the Cotswolds. These sites are in the Chesterton Farm vicinity and are being monitored so we can see the change when the new residential development is built. All background site levels were recorded to be the same as last year.

Appendix A: Monitoring Results

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

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? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Burford Road, Cirencester (opposite 8) Roadside	Roadside	403124	202245	NO_2	N	N	N (15m)	2m	N
Burford Road, Cirencester (o/s 8) House	Roadside			NO_2	N	N	Y0	15	Y
Berkeley Road (Berkeley Rd/Somerford Road junction) Cirencester (Chesterton Farm)	Roadside	402439	200297	NO_2	N	N	y (1m)	1m	Y
Birdlip Air Balloon	Kerbside	393462	216111	NO_2	Y	N	y (3m)	2m	Y
Tetbury Road, Cirencester	Roadside	401064	201044	NO_2	N	N	y(7m)	3m	Y
Grove Road, Cirencester (o/s 62 Grove Lane j/w Spitalgate Lane)	Roadside	402305	202519	NO_2	N	N	y(7m)	1.9m	Y
Hammond Way, Cirencester (o/s Bathgate Place, nr Waitrose roundabout)	Kerbside	402039	201765	NO_2	N	N	Y(8.5m)	1.75m	Y
Lechlade – High St (o/s charity shop)	Kerbside	421374	199511	NO_2	N	N	y (1m)	1m	Y
Lechlade -Thames St (o/s 15)	Kerbside	421397	199489	NO_2	Y	N	Y (1.5m)	1.5m	Y
Lewis Lane, Cirencester (o/s 39)	Roadside	402480	201772	NO_2	N	N	Y (2m)	1m	Y
Cirencester – London Rd (opposite Wagon/Horses)	Kerbside	402783	201946	NO_2	N	N	y (3m)	4m	Y
Somerford Road, Cirencester (o/s 34)	Roadside	402241	201102	NO_2	N	N	y (3m)	1.5m	Y
Spratsgate Lane, Cirencester (Chesterton Farm)	Roadside	402394	199581	NO_2	N	N	y (>1m)	1m	Y
Coach Park Bourton-on-the-Water	Kerbside	417028	220781	NO_2	N	N	Y (15)	0	N

Table A.2 – Annual Mean Nitrogen Dioxide (NO_2) Diffusion Tubes Monitoring Results (2014 to 2018)

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**. The highest exceedance in each AQMA is highlighted in **red**

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2014* (Bias Adjustment Factor = .79)	2015* (Bias Adjustment Factor = 0.81)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)	2018 (Bias Adjustment Factor = 0.76)
T4/N@1S2	Lechlade –"Cottage No 2" Thames St (no15)	Y	36.07	38.7	**41.5**	36.2	30.5
T5/N@1S3	Lechlade High St	N	33.26	32.9	29.1	29.0	28.0
T8/N@1S11	Cirencester - London Rd (Waggon/Horses)	N	29.78	23.8	30.4	25.7	22.6
T11/N@1S1	Birdlip - Air Balloon	Y	**61.46**	**59.1**	**61.2**	**61.4**	**54.1**
N@1S12	Opp 8 Burford Road, roadside	N	-	-	-	23.2	15.6
N@1S13	8 Burford Road, house	N	-	-	-	17.8	15.2
N@1S6	Berkeley Road, background (Chesterton Farm)	N	-	-	-	9.4	9.4
N@1S4	Tetbury Road, Cirencester	N	-	-	-	24.6	21.8
N@1S8	62 Grove Road, Cirencester	N	-	-	-	34.8	29.8
N@1S9	Hammond Way, Cirencester	N	-	-	-	21.0	18.1
N@1S10	Lewis Lane, Cirencester	N	-	-	-	22.6	20.9
N@1S7	Somerford Road, Cirencester	N	-	-	-	17.6	14.5
N@1S5	Spratsgate Lane, Cirencester (Chesterton Farm)	N	-	-	-	9.6	9.5
N@27	Coach Park,Station Road,Bourton on Water	N	-	-	-	-	13.6

*Optional

Table A3 Further information about nitrogen dioxide diffusion tube monitoring in 2018

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Number of Months Data Capture 2019	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.76) 2018 (µg/m^3)
N@1S12	Burford Road, Cirencester (opposite no 8)	Roadside	N	N	11	N/A	Y	13.5
N@1S13	Burford Road, Cirencester (on house)	Roadside	N	N	4	Y	Y	15.2
N@1S6	Berkeley Road (Chesterton Farm)	Background	N	N	12	N/A	Y	9.4
N@1S1	Birdlip Cottages, Air Balloon roundabout	Kerbside	Y		12	N/A	Y	**49.8**
N@1S4	Tetbury Road, Cirencester	Roadside	N	N	12	N/A	Y	18.7
N@1S8	62 Grove Road, Cirencester	Roadside	N	N	12	N/A	Y	23.8
N@1S9	Hammond Way, Cirencester	Roadside	N	N	12	N/A	Y	15.8
N@1S3	Lechlade High Street (o/s charity shop)	Kerbside	N	N	11	N/A	Y	28.0
N@1S2	Lechlade 15 Thames Street	Kerbside	Y	N	12	N/A	Y	30.5
N@1S10	39 Lewis Lane, Cirencester	Roadside	N	N	12	N/A	Y	19.6
N@1S11	London Road, Cirencester (opp. Wagon + Horses)	Kerbside	N	N	10	N/A	Y	21.8
N@1S7	34 Somerford Road, Cirencester	Roadside	N	N	10	N/A	Y	14.1
N@1S5	Spratsgate Lane, (Chesterton Farm)	Roadside	N	N	12	N/A	N/a	9.5
N@27	Coach Park,Station Road,Bourton on Water	Kerbside	N		6	Y	Y	12.4

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2018

	NO_2 Mean Concentrations (µg/m^3)												Annual Mean	Annual mean bias adjusted	
AIR QUALITY DIFFUSION TUBE RESULTS -2018	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Unadjusted**	**BAF 0.76**	**Data collection %**
8 Burford Road, roadside	30.7	23.7	35.5	14.7	Missing	11	12.3	21.1	24.4	25.7	37.8	29.3	20.5	**15.6**	91.7
Berkeley Road, background (Chesterton Farm development)	12.7	13.8	15.2	8.1	15.8	11	9.8	8.7	9.8	13.6	14.6	15.0	12.3	**9.4**	100
Birdlip Air Balloon roundabout (AQMA)	77.8	59.8	82.2	68.0	74.0	61.9	72.3	66.6	78.1	71.2	72.8	76.5	71.2	**54.1**	100
Tetbury Road,Cirencester	30.4	28.1	29.6	30	28.7	26.3	26.2	21.2	27.9	32.7	33.9	29.1	28.7	**21.8**	100
Grove Road, Cirencester (62, near junction with Spitalgate Lane)	31.4	41.2	36.7	39.1	42.1	42.5	42.4	33.3	37.5	44.2	40.7	39.7	39.2	**29.8**	100
Hammond Way, Cirencester (near Waitrose roundabout)	28.3	29	28.9	21.7	21.2	16.1	19.6	19.1	20.4	26.3	28.1	27.3	23.8	**18.1**	100
Lechlade High Street (charity shop)	35.1	42.1	41.3	36.4	37.4	Missing	35.8	27.6	31.1	45.8	36.3	36.4	36.8	**28.0**	91.7
Lechlade, 15 Thames Street (AQMA)	36.1	41.9	44.2	40.9	40.9	35.1	46.9	39.4	39.9	38.5	39.6	39.5	40.2	**30.6**	100
39 Lewis Lane, Cirencester	30.2	28.7	35.7	17.9	24.3	22.6	25.2	23	27.5	30.1	40.5	23.9	27.5	**20.9**	100
London Road, Cirencester (Wagon & Horses)	Missing	33.5	36.9	29.3	23.9	Missing	14.2	24.1	28.8	33.3	33.5	40.3	29.8	**22.6**	83.3
34 Somerford Road, Cirencester	22.0	21.1	25.8	18.2	17	13.2	16.3	15.5	18.7	23.1	Missing	Missing	19.1	**14.5**	83.3
Spratsgate Lane, Chesterton Farm (near junction with Parkway)	15.4	12.6	17.6	12.4	11.2	9.1	8.5	8.6	8.8	15.9	15.2	15.3	12.6	**9.5**	100
Coach Park,Bourton on Water. (from May 2018)					15.8	15.0	15.3	11.7 92 months exposure		17.5	19.7	17.4	19.0	**13.6**	50
8 Burford Rd, on house	22.8	24	23.8	19.1									22.3	**15.2**	33.3

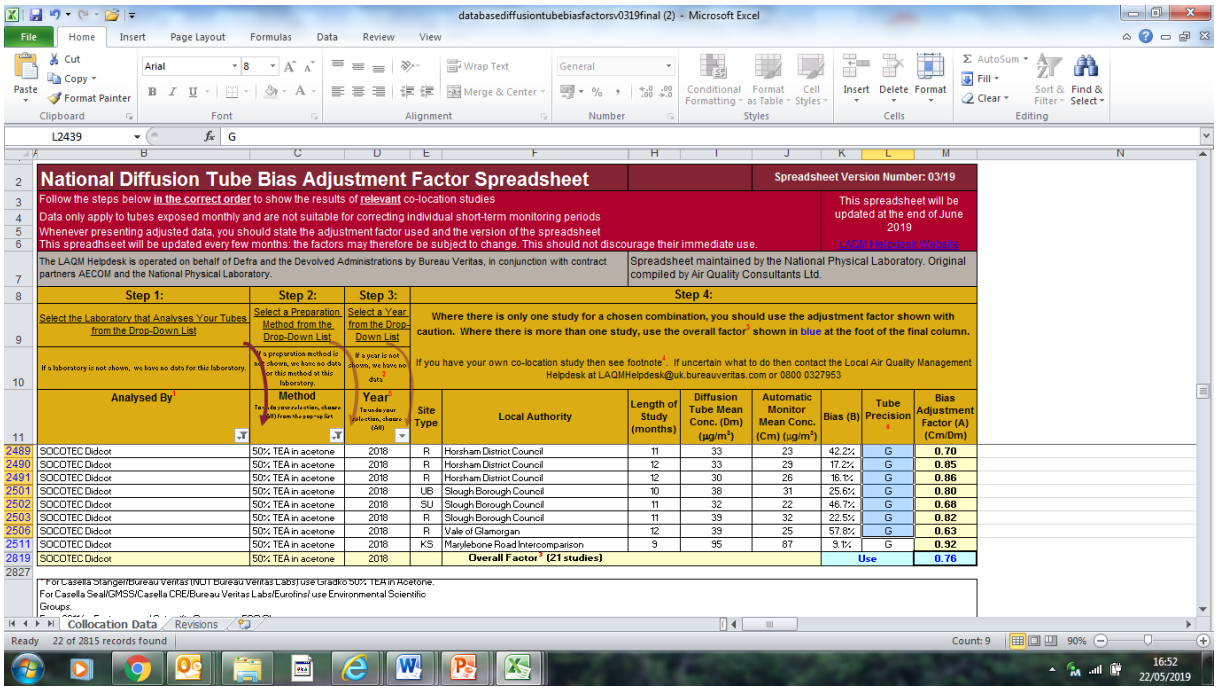
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Diffusion Tube Bias Adjustment Factors

The diffusion tubes (50% triethanolomine in acetone) were supplied and analysed by SOCOTEC testing facility, Didcot. The tubes at all locations have a monthly exposure period.

National bias adjustment factors have been extracted from the Defra database, available at:. http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

(see below) The factor used is 0.76 based on 21 studies and this was applied to all diffusion tube results.



National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/19

Follow the steps below in the correct order to show the results of relevant co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2019

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

Step 2: Select a Preparation Method from the Drop-Down List

Step 3: Select a Year from the Drop-Down List

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[2] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

	Analysed By[1]	Method	Year[3]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
2489	SOCOTEC Didcot	50% TEA in acetone	2018	R	Horsham District Council	11	33	23	42.2%	G	0.70
2490	SOCOTEC Didcot	50% TEA in acetone	2018	R	Horsham District Council	12	33	29	17.2%	G	0.85
2491	SOCOTEC Didcot	50% TEA in acetone	2018	R	Horsham District Council	12	30	26	16.1%	G	0.86
2501	SOCOTEC Didcot	50% TEA in acetone	2018	UB	Slough Borough Council	10	38	31	25.6%	G	0.80
2502	SOCOTEC Didcot	50% TEA in acetone	2018	SU	Slough Borough Council	11	32	22	46.7%	G	0.68
2503	SOCOTEC Didcot	50% TEA in acetone	2018	R	Slough Borough Council	11	39	32	22.5%	G	0.82
2506	SOCOTEC Didcot	50% TEA in acetone	2018	R	Vale of Glamorgan	12	39	25	57.8%	G	0.63
2511	SOCOTEC Didcot	50% TEA in acetone	2018	KS	Marylebone Road Intercomparison	9	95	87	9.1%	G	0.92
2819	SOCOTEC Didcot	50% TEA in acetone	2018		Overall Factor[3] (21 studies)				Use		0.76

For Casella Stanger/Bureau Veritas INDT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.
For Casella Seal/GMSS/Casella CRE/Bureau Veritas Labs/Eurofins/ use Environmental Scientific Groups.

Annualisation of data

Monitoring at 2 sites was carried out only part year as the decision was taken to discontinue at 8 Burford Road (house) and commence at a new site, the coach park Station Road, Bourton-on-the-Water. A measured mean concentration for the respective periods of exposure is available. However it will be necessary to estimate the annual mean for these 2 locations, for comparison with the annual target concentration.

The procedure involves the following steps:

1. Identification of two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network. The data capture for each of these sites should ideally be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles. If no background sites are available, and the site to be annualised is itself a Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites.

The nearest sites that have characteristics similar to the areas requiring normalisation are located in Swindon and Oxford (St Ebbes).

2. Obtain the annual means, ‘Am’, for the calendar year for these sites.

3. Work out the period means, ‘Pm’, for the period of interest, in this case Jan-April for 8 Burford Rd, May to December 2018 for the Coach Park.

4. Calculate the ratio, ‘R’, of the annual mean to the period mean (‘Am/Pm’) for each of the sites.

5. Calculate the average of these ratios, ‘Ra’. This is then the annualisation factor.

6. Multiply the measured period mean concentration ‘M’ by this annualisation factor Ra to give the estimate of the annual mean for 2018.

For the diffusion tube location in Burford Road, the best estimate of the annual mean in 2018 is 0.9 x 22.3g/m3 =20.0 ug/m3, as set out in the table below. For the Coach Park tube, the best estimate of the annual mean in 2018 (again using the table below) is 1.06 x 17.9g/m3 = 19.01 ug/m3.

Burford Road

Background Site	Annual Average Am	Period Mean Pm	Ratio Am/Pm
	Jan-Apr 2018	Jan-Apr 2018	
	20.0		
AURN St Ebbes Oxford	14.9	16.7	0.89
AURN Swindon	13.5	14.9	0.91
Annualisation Factor			0.90

Coach Park

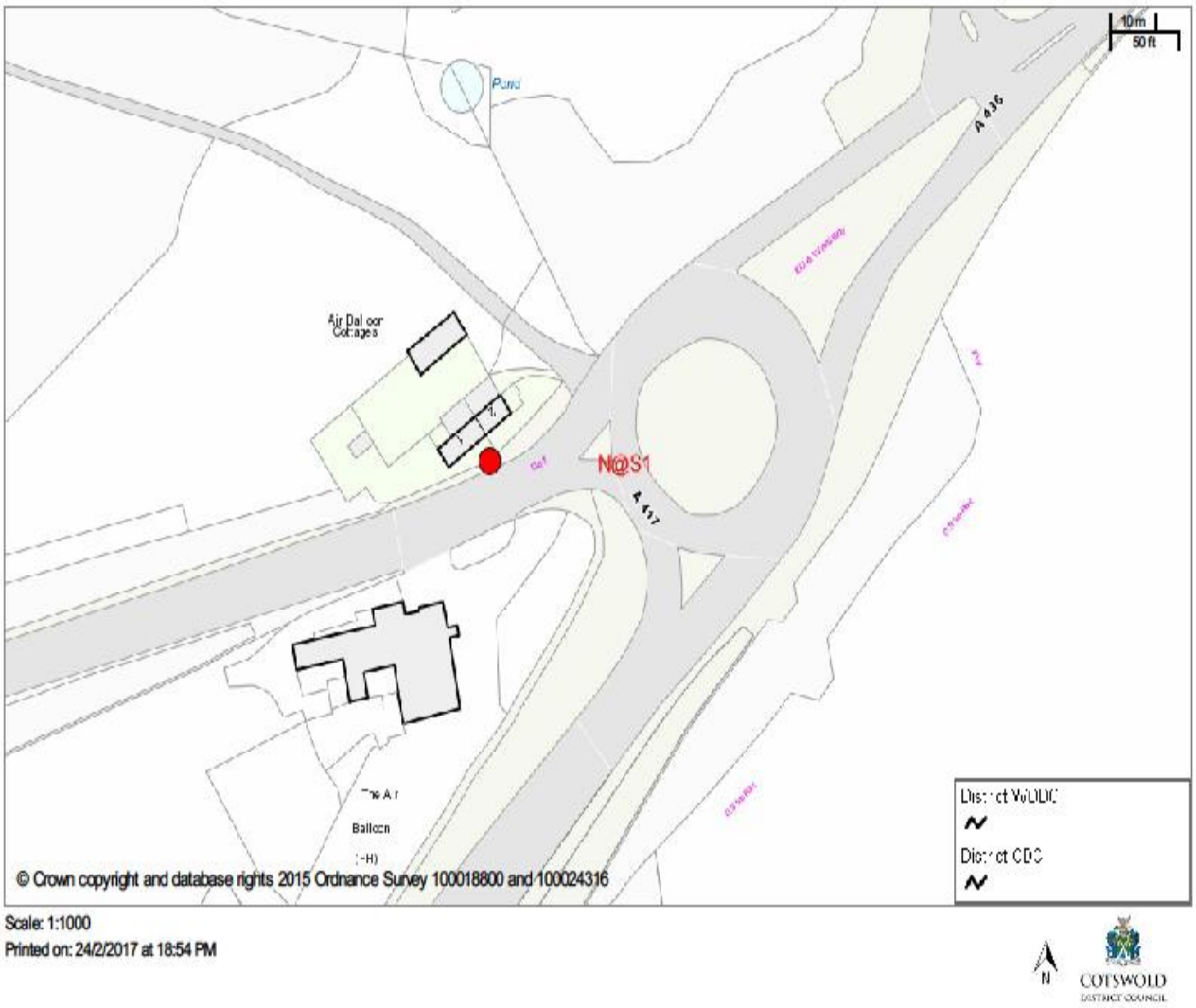
Background Site	Annual Average Am	Period Mean Pm	Ratio Am/Pm
	May-Dec 2018	May-Dec 2018	
	19.0		
AURN St Ebbes Oxford	14.9	13.9	1.07
AURN Swindon	13.5	12.8	1.05
Annualisation Factor			1.06

Distance Corrections

Corrections for distance have been made that allow for the distance the diffusion tubes are from the roadside. The data to feed into this calculation, that is distance of measurement/receptor from kerb, the mean NO2 are to be found in Table A1 and B1 respectively.

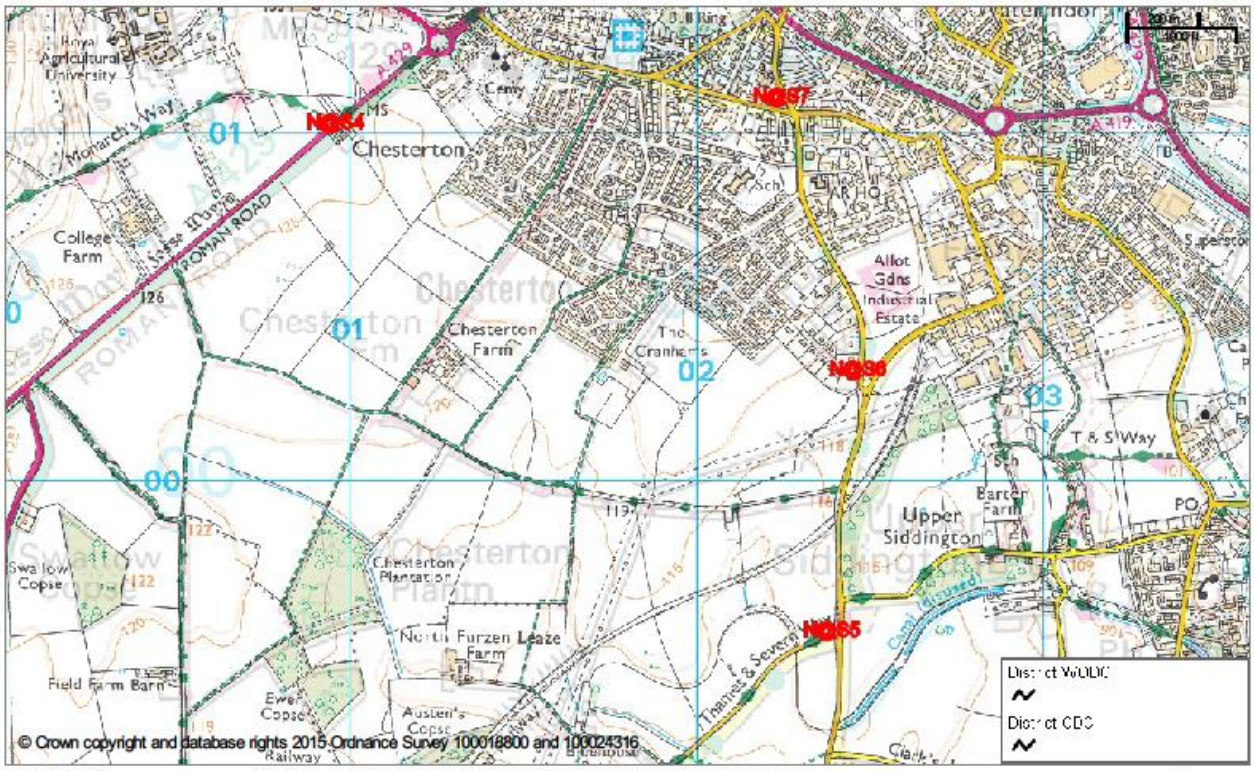
Appendix D: Map(s) of Monitoring Locations

Site N@1S1 Air Balloon Roundabout , Birdlip (AQMA)



Site N@1S2 Thames Street and Site N@1S3 High Street, Lechlade (AQMA)

Location of Sites N@1S4 – N@1S7



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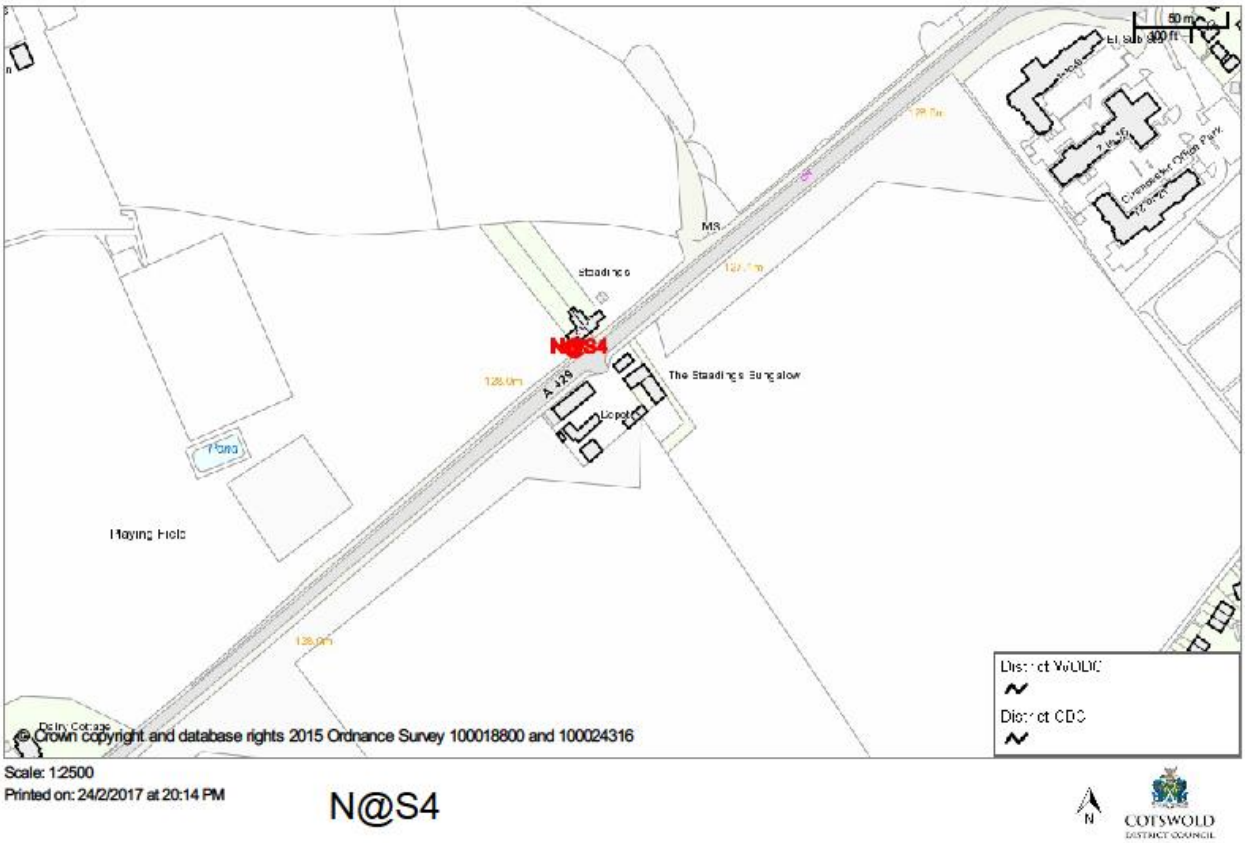
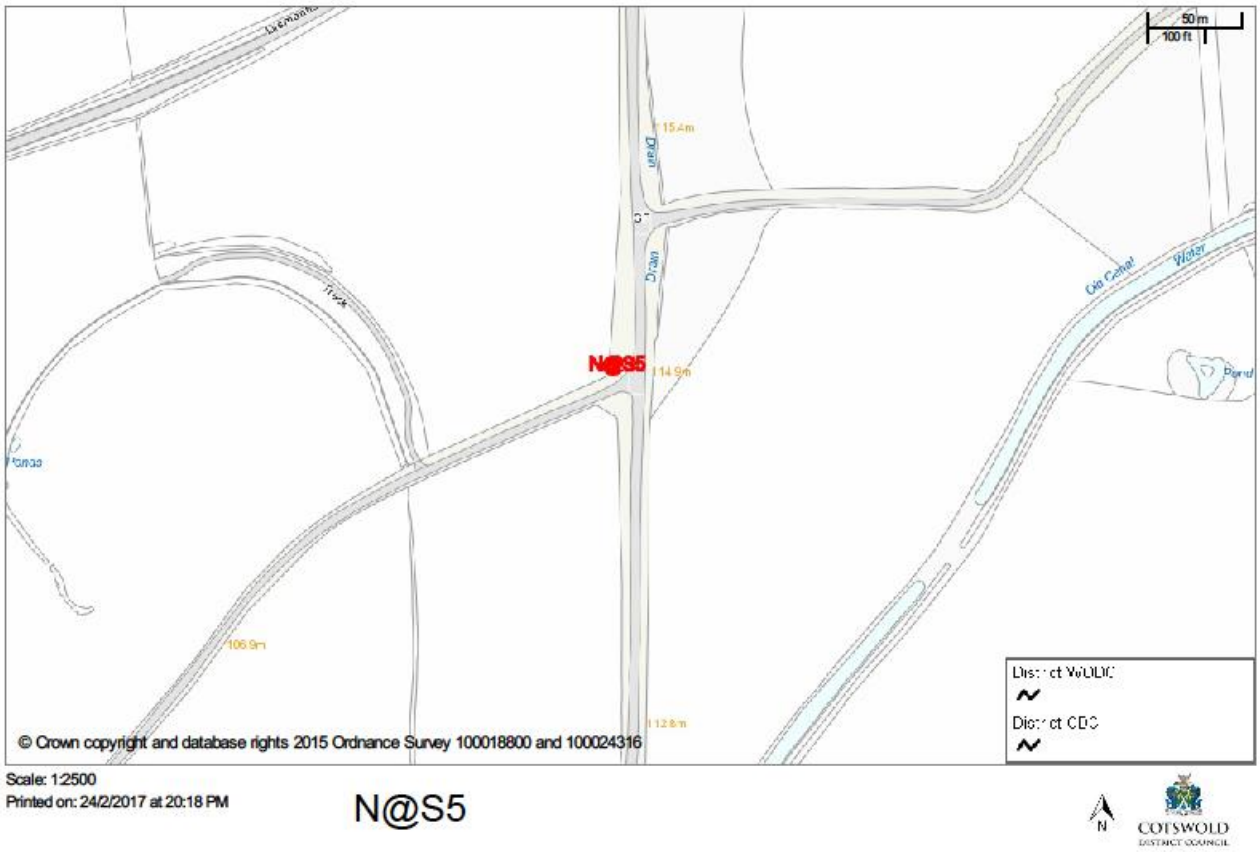
N@S4 - Tetbury Road on bus stop opposite Woodhouse Haulage
N@S5 - Spratsgate Lane near j/w Parkway (On telegraph pole)
N@S6 - Berkley Road j/w Somerford Road
N@S7 - 34 Somerford Road (Lampost)

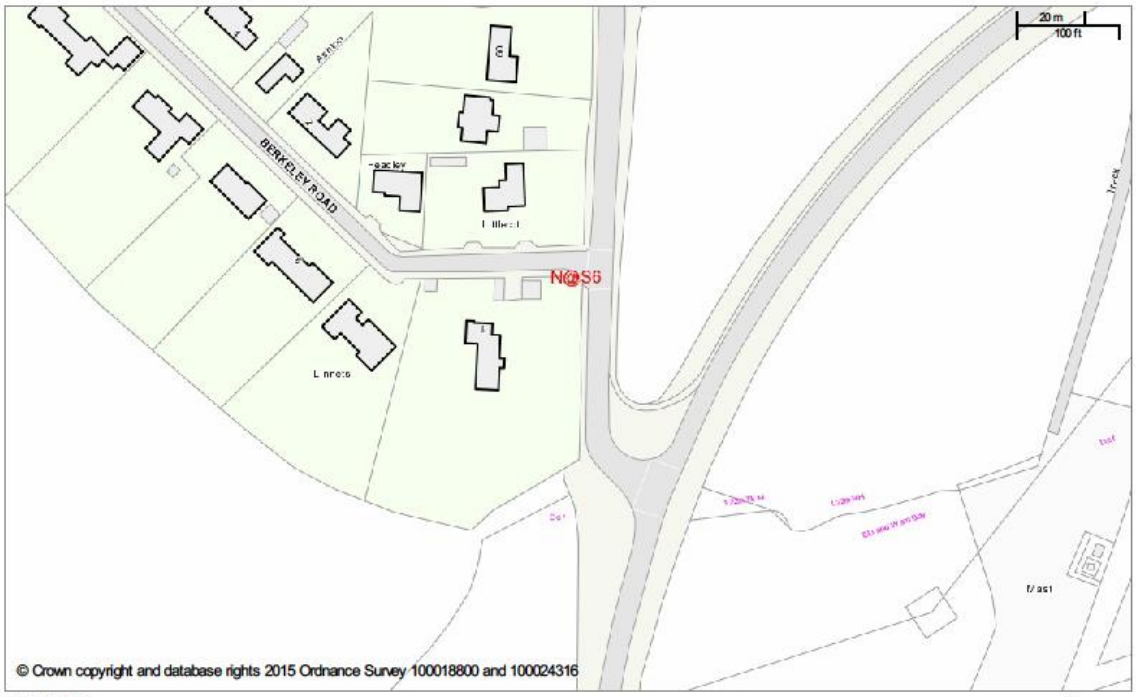
Site N@1S4 Tetbury Road, Cirencester



Site N@1S5 Spratsgate Lane, Cirencester (Chesterton Farm development)

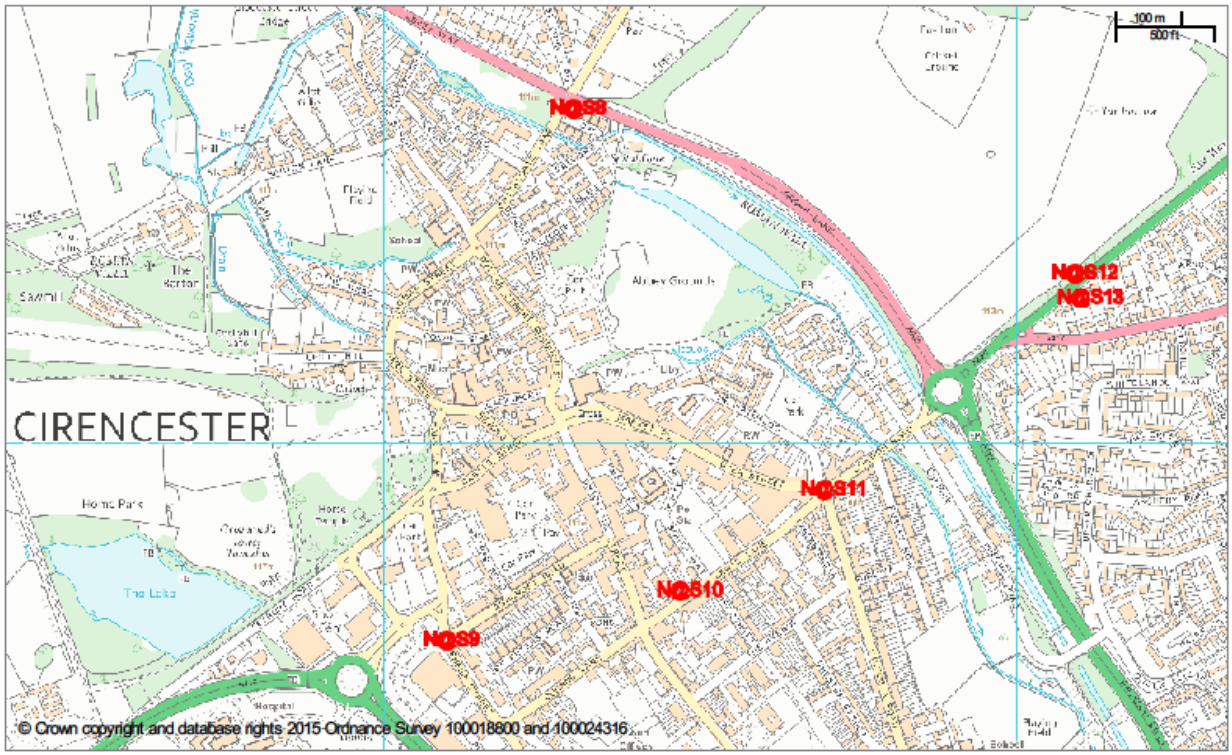


Site N@1S6 Berkeley Road, Cirencester (Chesterton Farm development)



Site N@1S7 Somerford Road, Cirencester

Overview of Sites N@1S8 – N@1S13



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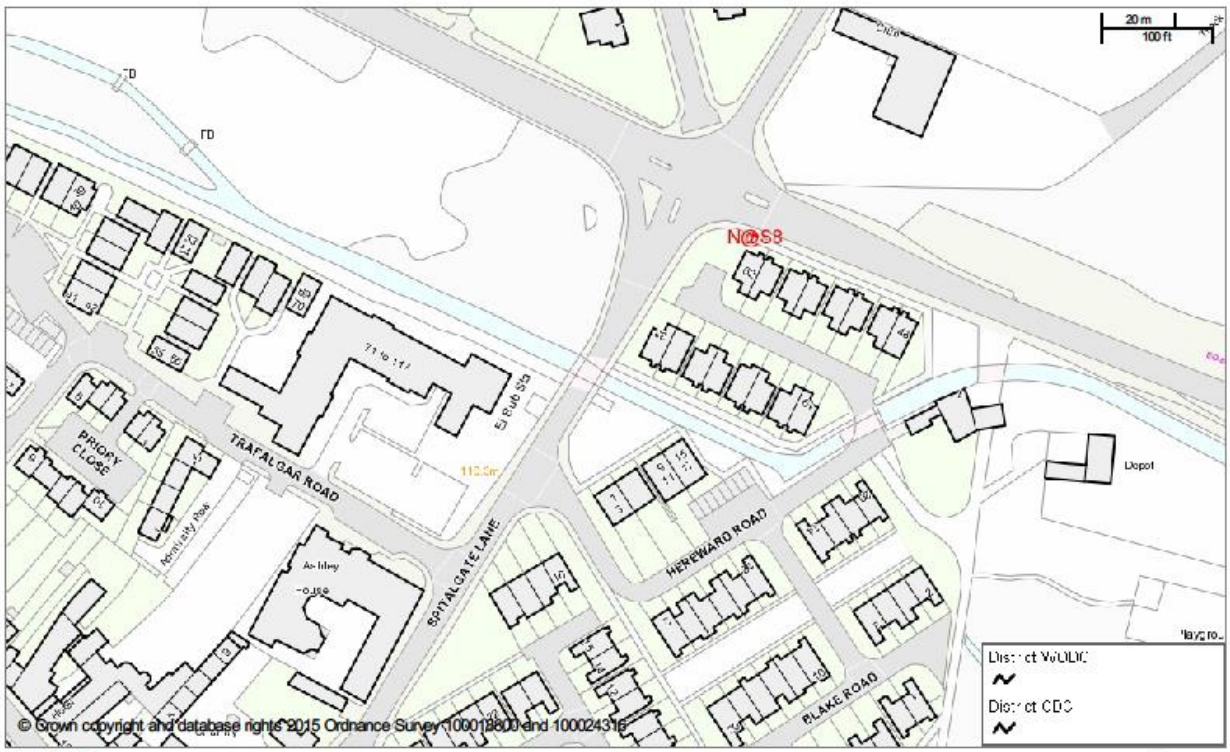
N@S8 - O/S 62 Grove Lane.
N@S9 - Hammond Way
N@S10 - O/S 39 Lewis Lane
N@S11 - London Road opp. Waggon & Horses
N@S12 & N@S13 - 8 Burford Road (House & lamp post opposite)

Site N@1S8 Grove Lane (Spitalgate), Cirencester



Site N@1S9 Hammond Way, Cirencester

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N@S9

Site N@1S10 Lewis Lane, Cirencester

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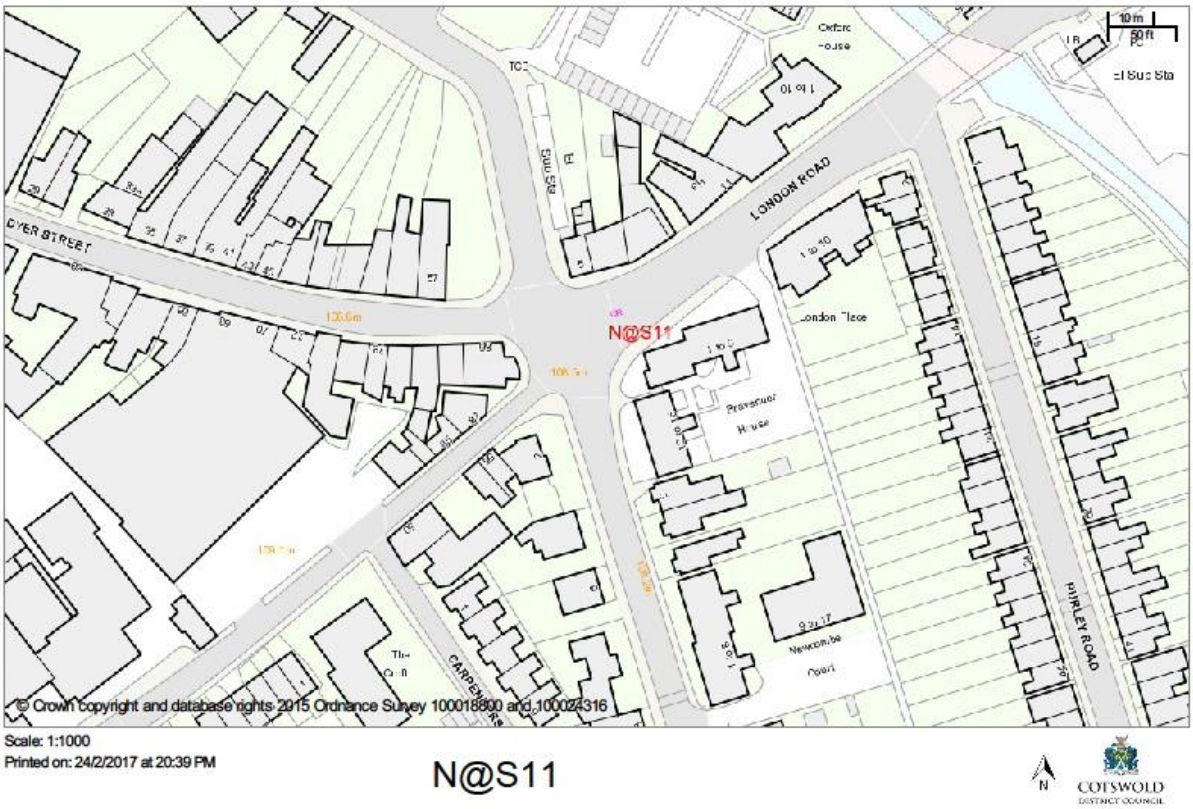
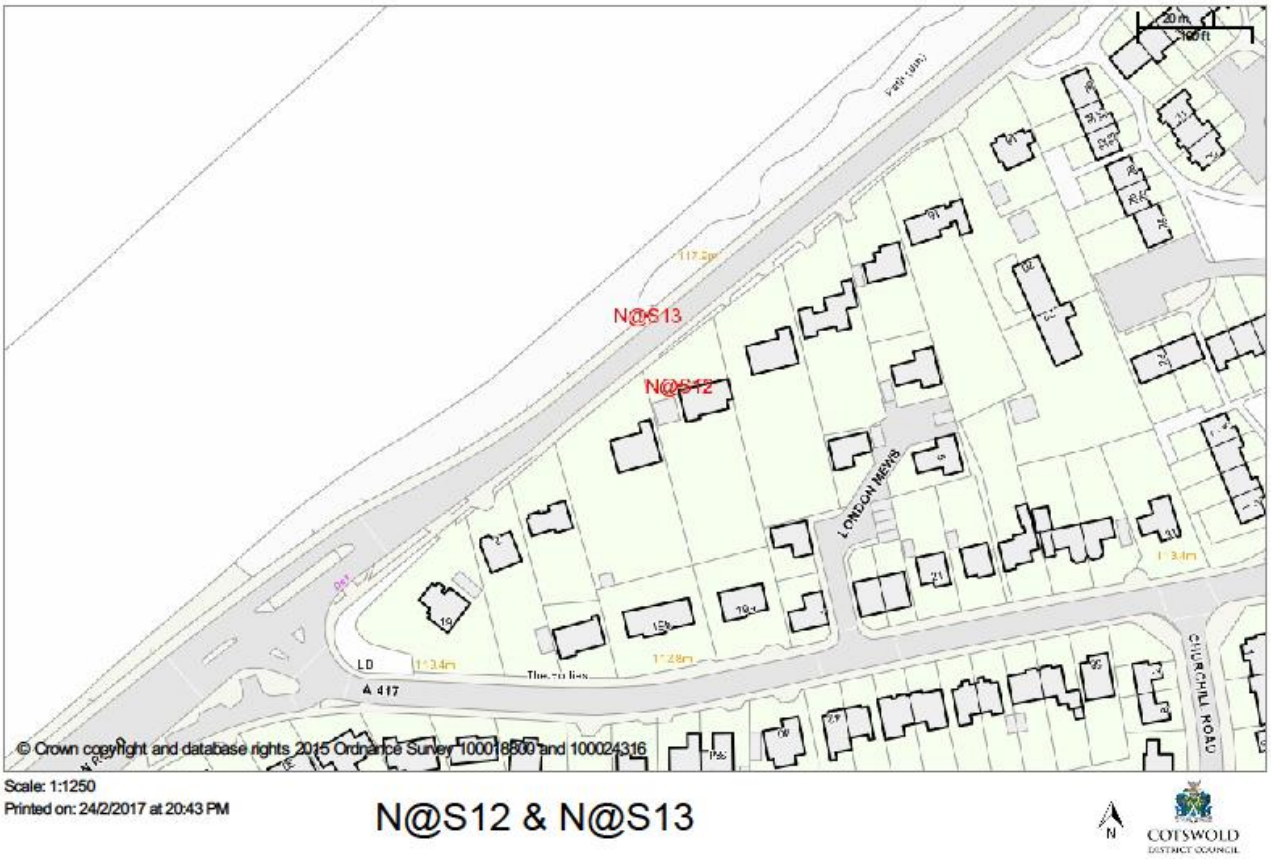
N@S10

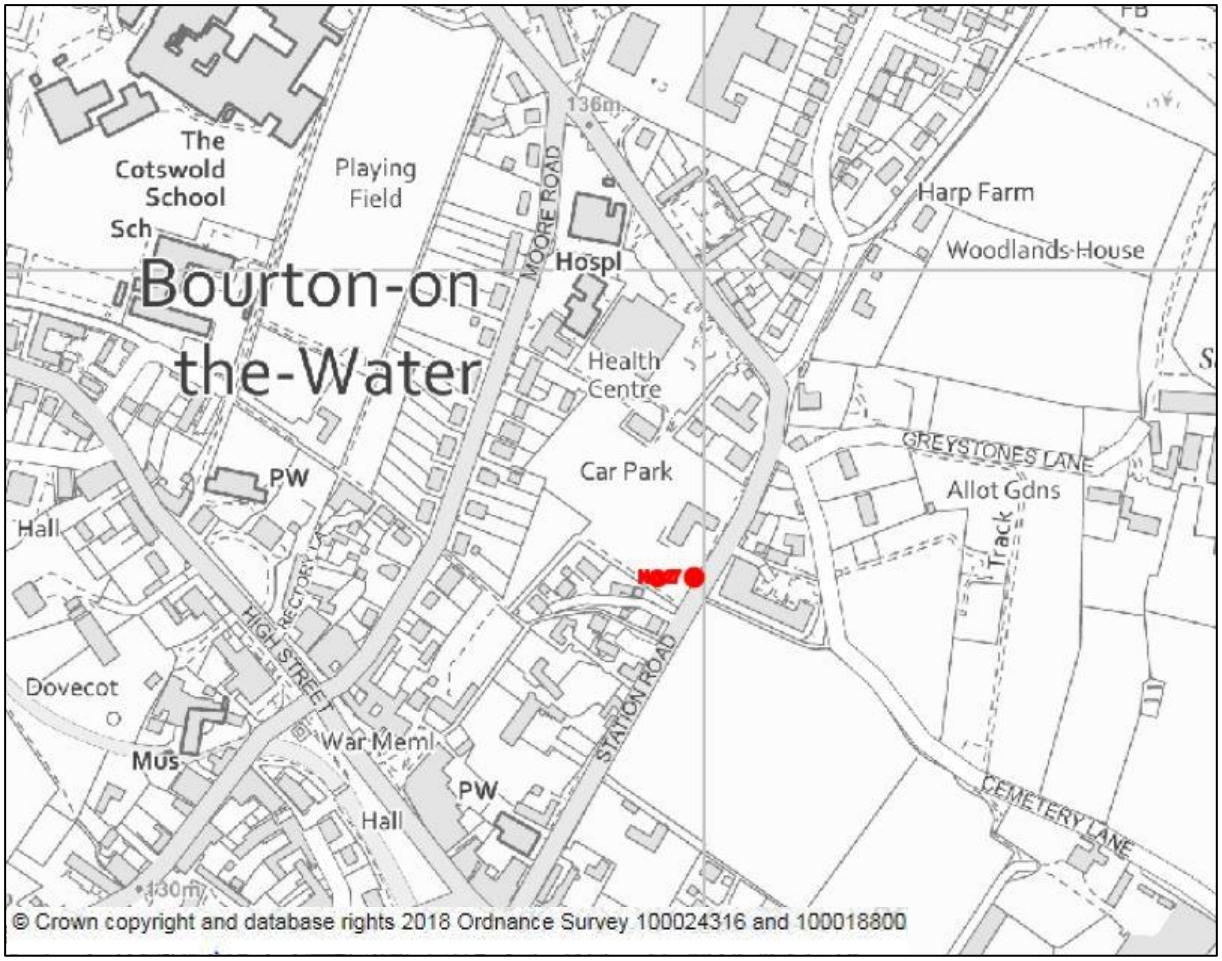
Site N@1S11 London Road, Cirencester



Sites N@1S12 and N@1S13 Burford Road, Cirencester



Site N@27 Coach Park, Bourton-on-the-Water



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
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/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	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
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