2017 Air Quality Annual Status Report (ASR) (for 2016)

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

June 2017

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Executive Summary: Air Quality in Our Area

Air Quality in the Borough of Swindon

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 (B.W. Wheeler & Y. Ben-Shlomo, 2010; S. Pye et al, 2006).

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion (Defra, May 2013).

The air quality in Swindon is, in general, good. To date, Swindon has no Air Quality Management Areas (AQMA) in place, but this will change in response to this report. This report identifies one area where Nitrogen Dioxide is persistently above European Union limit values; which means that Swindon Borough Council must now move to declare an Air Quality Management Area, and produce an Air Quality Action Plan within 18 months thereafter.

In common with many towns and cities, there are some parts of the town where air quality is less good. These areas, of which one currently breaches EU limit values, are generally associated with congested traffic routes, especially where houses are very close to the road, generally in the older areas of town. This forms what is known as a street 'canyon', and exhaust gases do not disperse well in such areas.

Nitrogen Dioxide is the pollutant of concern in Swindon, as it is across the UK, and it is not thought that levels of any of the other prescribed pollutants need to be formally considered at this time.

Our monitoring of air quality indicates that one area of concern within the Borough is the A4289, particularly on Kingshill Road. This road is very heavily trafficked, and in parts; concentrations of Nitrogen Dioxide are close to, or exceed, limits. The annual average of Nitrogen Dioxide (NO_2) for 2016 was 50.6 mg/m^3 (against a limit value of 40mg/m^3), on a portion of Kingshill Road.

Other areas with measured levels of Nitrogen Dioxide approaching limit levels include Rodbourne Road to the North of Bruce Street bridges (the B4006), the

Western end of Manchester Road close to the bus station, and the area around the former GWR museum in Faringdon Road. We maintain a watching brief on these locations, and all are subject to recent or proposed changes to infrastructure which are expected to have a positive effect on pollution levels.

Rodbourne Road has recently been affected by the Bruce Street Bridges redevelopment, both during the long construction period, and by the new traffic flow thereafter, and we wait to see what effect this has had on pollution levels over the next reporting period. We expect the planned redevelopment of the Bus Station on Manchester Road to have a positive effect on pollution in this part of Manchester Road. The ongoing electrification of the mainline railway line is also expected have a positive effect around the railway, which bisects the town centre, although Nitrogen Dioxide levels in the vicinity of the railway are not giving cause for concern.

Overall, no clear overall trend in Nitrogen Dioxide levels could be observed in Swindon. A number of sites experienced a slight worsening in pollution levels (GWR Museum, Kingshill Road, Manchester Road, Cricklade Road), and a number of sites experienced a slight improvement (Devizes Road, Clifton Street, Rodbourne Road). The number of major road and rail works in Swindon across the reporting period have affected traffic flows over relatively long periods however, and it is likely that this has affected average pollution measurements at some sites.

We have identified no new major sources of prescribed pollutants in Swindon.

Levels of Nitrogen Dioxide around major roads continue to respond to rising levels of traffic, and/or the constant evolution of the town's road network. Swindon has much major development either planned or in train, and levels of pollution will respond to these changes on a continuing basis. New development is designed to account for what is now known of the effects of heavy road traffic, and so we do not expect any new areas of concern to be identified however. There will be a continuing and growing pressure in areas already highlighted, as new development across Swindon inevitably leads to increased traffic in all areas, including those already identified as hotspots.

We continue to monitor air quality with regard to Nitrogen Dioxide in Swindon using a wide network of 26 diffusion tubes at 24 locations, a reference standard real time monitor, and also with some recently commissioned shorter term and real-time monitors, coupled with traffic flow monitoring hardware.

Actions to Improve Air Quality

Nitrogen Dioxide is principally a product of internal combustion engines, or of other burning of fossil fuels. Reducing impacts from this pollutant is currently principally dependant on influencing peoples travel choices and vehicle purchasing decisions. The drivers for this are inevitably national in nature, but Swindon runs a number of projects designed to influence the public in this way:

- Swindon Travel Choices; which seeks to enable people to make more sustainable choices for travel.
- Promoting low emission transport through the construction and/or upgrading of cycle ways, and the inception of Local Development Orders for alternative fuelling schemes in the Borough, such as electric vehicle charging points, or Hydrogen fuelling stations.
- A Cycle to work scheme available to all Council staff.
- The publication of Transport Vision 2026; which includes a number of vision outcomes to support sustainable transport.

More generally; the Council has pursued a programme of installing solar arrays on land which it owns, and air quality is an important factor in its Planning process for developments across the Borough.

The Local Plan 2026 also seeks to move Swindon to a more sustainable future. Theme 4 considers actions to minimise congestion, journey time, and therefore noise and air quality. Swindon's Planning Policy TR1*: Sustainable Transport Networks*, enshrines these principles and aims for all future development.

Conclusions and Priorities

The air quality trend is not clear in Swindon. The Borough is subject to constant change and development of its and others' infrastructure, and it is an area of very high housing growth. Although air quality has been relatively well controlled in the face of these pressures, it is clear that some discrete areas do not enjoy the good air quality that they should.

An area of persistent exceedance has been identified on the A4289 corridor, and this will now be taken forward for declaration as an Air Quality Management Area (AQMA). Although Nitrogen Dioxide concentrations along most of this route are

within limits, there are a number of areas where measured levels are persistently above them, or are marginal. On declaration of the AQMA, an Air Quality Action Plan will be developed to tackle the issue.

We will continue to use long term average measuring devices, and more recently commissioned shorter term devices, both traditional and novel, along with high resolution traffic monitoring, to understand where pressures may be growing, and where action may be needed to control threats to air quality from road traffic. Within the Air Quality Management Area, these devices will be used to inform the actions that may be required, and to monitor the results stemming from those actions.

Swindon now needs to accelerate and intensify its actions on improving air quality, and in particular; the effects from road traffic.

The number of petrol or diesel vehicles in use, their continuous growth in numbers, and the continuing use of those vehicles for short journeys which could be easily made on foot or bicycle, combined with the aggressive growth of the town will continue to exert constant upward pressure on local emissions. Improvements in emissions technology have only partially mitigated the relentless intensification of vehicle use to date nationwide, and this alone will not resolve air quality issues in Swindon.

Local Engagement and How to get involved

The Council encourages the reduction of private vehicle use, reducing the number of motor powered vehicles and sources of airborne emissions (oxides of nitrogen, particulate matter, VOC etc.), contributing to improvements in air quality in the area. Various Council initiatives promote healthy life choices by encouraging local residents to walk, cycle, or use public transport whenever possible.

One of the Council initiatives includes free guided bike rides around various areas of Swindon which introduces easy and comfortable routes connecting different locations, and safe and pleasant journeys around the Borough. Completing shorter journeys by cycle reduces the use of private motor powered vehicles and can positively affect local air quality. Further information may be found here: www.goskyride.com/swindon.

Some other measures and initiatives are listed below, described in section 2.2 and summarised in Table 2.2.

- The Council operates the Swindon Travel Choices website, which aims to help individuals plan journeys via walking, cycling or public transport. See this link: http://www.swindontravelchoices.co.uk/
- Promoting Low Emission Transport – The Council's Plan ("Vision for Swindon, How are we going to get there? Plan 2016-2020") has been published that sets out its vision for Swindon and the priorities it is trying to achieve for residents and the borough of Swindon. It gives details of the pledges made on how it will achieve the vision. Priority 1 of the Vision for Swindon commits the Council to "encourage the increased take-up of low-emission vehicles".
- The programme to construct solar arrays on Council-owned land. Priority 2 of the Council's "Vision for Swindon" is to "construct solar arrays on Council-owned land at Common Farm and Chapel Farm.
- The Council has a Cycle To Work Scheme to encourage its staff to use more sustainable forms of transport
  http://www.swindonbug.co.uk/cycle-to-work ,
  http://www.swindontravelchoices.co.uk/cycle.aspx,

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1 Local Air Quality Management

This report provides an overview of air quality in Swindon Borough Council during 2016. 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 Swindon 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.

The only pollutant of current concern in Swindon is that of Nitrogen Dioxide.

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 the objectives.

Swindon Borough Council has not declared any AQMAs to date. In the light of the monitoring data for 2016 however, we propose to declare a new AQMA (Table 2-1: Proposed Air Quality Management Areas) in Kingshill – Devizes Road area, the A4289 (see monitoring section).

For reference, a map of Swindon Borough Council's monitoring locations is available in Appendix D.

Table 2-1: Proposed Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description
AQMA Kingshill-Devizes Road	NO_2 annual mean	Swindon	Residential properties along Kingshill road and Devizes road. The AQMA will be declared in 2017 after the completion of ASR

☒ **Swindon Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in the Borough of Swindon

Defra's appraisal of last year's ASR concluded that the conclusions reached in the previous ASR are acceptable for all sources and pollutants.

Swindon Borough Council with its partners has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2 2: Progress on Measures to Improve Air Quality below.

Swindon Borough Council expects the following measures to be completed over the course of the next reporting year:

- Development of the Borough's solar power portfolio with the completion of schemes located on Borough-owned land
- Development of electric vehicle charging points

These will encourage the availability of alternative power supplies and use of alternatively powered vehicles, respectively, to reduce local dependence upon fossil fuels.

More detail on progress with the solar schemes can be found on the Public Power Solutions website (https://www.publicpowersolutions.co.uk/) which describes the various schemes completed to date.

Swindon Borough Council expects an additional solar scheme at Barnfield to be completed over the course of the next reporting year.

Electric vehicle charging points are available to encourage cleaner vehicle use. Various points are installed and available in and around Swindon (for locations see: https://www.zap-map.com/locations/swindon-charging-points/#)

In the light of the monitoring data for 2016, Swindon Borough Council will also take forward an Air Quality Management Area, and begin preparing an Air Quality Action Plan to reduce concentrations of Nitrogen Dioxide.

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
	Title	Select from the categories in blue box	Select from the subcategories in blue box		Date	Date				Date	
1	Swindon Travel Choices	Alternatives	Personalised Travel Planning	Swindon Borough Council		Ongoing		N/A		N/A	
2	Promoting Low Emission Transport	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging	Swindon Borough Council	2014-2015	Ongoing	Establishment of LDO and alternative fuel fuelling schemes	N/A	Hydrogen fuelling plant (established outside of LDO)		
					2016-2017	Ongoing	Construction of pedestrian-cycle route in Covingham (also to be used by future NEV residents)	N/A		To be completed spring 2017	
3	Programme to construct solar arrays on Council-owned land	Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	Swindon Borough Council		Chapel Farm in Blunsdon	In addition to existing solar-farm projects aggregated energy generation would be 167MW, which is 80% of 200MW production target	N/A		To be completed by 31.03.2017	The capacity - 5MW ground-mounted solar farm (equivalent of 1,200 homes electricity supply per year)
						Solar Farm on former landfill in Shaw	2.5MW	N/A			
4	Cycle To Work Scheme (SBC Staff)	Promoting Travel Alternatives	Promotion of cycling and walking	Swindon Borough Council in partnership with Cycle scheme		Oct 2014 - ongoing	Reduction in car journeys to/from Council workplaces	N/A			

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
5	Transport Vision 2026	Long Term Transport Strategy - Promoting Travel Alternatives	Promotion of public transport	Swindon and Wiltshire Local Enterprise Partnership	2014	ongoing	“Vision Outcomes” 1 to 9	N/A			Ref 7

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.

Swindon Borough Council has previously carried out indicative monitoring of PM2.5 at locations where levels were expected to be highest but has found levels to be low, and is not taking any specific measures to address PM2.5 at this time. Measures already in train, and those planned for the next reporting period will also act to limit production of fine particulate matter, especially that from vehicles.

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.

Swindon Borough Council set up an automatic (continuous) monitoring unit at Bath Road car park late in 2016 and the monitoring data gathered subsequently is not sufficient for detailed analysis in the report. Detailed analysis will be available for the 2017 report.

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

Swindon Borough Council undertook non- automatic (passive) monitoring of NO_2 at 24 sites during 2016. Table A.2 in Appendix A shows the details of these sites.

Maps showing the location of the monitoring sites are provided in Appendix D. 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 bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years against the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B. Data has been adjusted for periods variation as per para 7.188 of TG16.

Table 3 lists locations where bias adjusted concentrations of Nitrogen Dioxide exceeded Air Quality Objectives, however when these figures have been adjusted to estimate the concentration at the nearest receptor (normally a dwelling), in accordance with Technical Guidance LAQM.TG16, only two locations - at the façade of 102 Kingshill Road and 30 Devizes Road - are indicated as exceeding/close to exceeding the Nitrogen Dioxide objectives value. As a result, it is proposed to declare an AQMA (Air Quality Management Area) along the corridor stretching from the bottom of Kingshill to the Newport Street roundabout at Devizes Road.

It is significant that when Kingshill Road was closed during the first 2 weeks of July 2016 for emergency road repairs, the average concentration of Nitrogen Dioxide for that month was significantly reduced. This supports the Council's view that the elevated concentrations of Nitrogen Dioxide experienced here are primarily due to vehicular traffic.

Figures 1, 2, 3 and 4 of Appendix A show 5 and 3 year trends at locations where concentrations of Nitrogen Dioxide exceed, or are close to exceeding, the Air Quality Objectives listed in Appendix E. Figure 1 – Devizes Rd & 2 Kingshill Rd/Clifton St and Cheney Manor Rd (Rodbourne Rd) show an overall negative trend in concentration of Nitrogen Dioxide. Monitoring at Swindon 1 - GWR Museum, Swindon 12 - Manchester Rd and Swindon 16 - Cricklade Rd (Moonraker) indicate a positive trend in concentration of NO_2. It should be noted that for the last two locations, monitoring data are only available for 3 years. Readings at 102 Kingshill Road are available for 12 months of last year and are relatively high in comparison to the 3 months of representative data available for last year report.

Table 3-1: Locations where concentrations of Nitrogen Dioxide exceeded

Site ID	Bias adjusted mean	Concentration at the receptor, using bias adjusted annual concentration of NO2
Swindon 1 - GWR Museum	37.52	34.0
Swindon 12 - Manchester Rd	**43.42**	**43.0**
Swindon 14 - Kingshill Rd/Clifton St	**38.56**	26.8
Swindon 16 - Cricklade Rd (Moonraker)	**38.67**	35.6
Swindon 18 - 102 Kingshill Road	**51.15**	**50.6**

Site ID	Bias adjusted mean	Concentration at the receptor, using bias adjusted annual concentration of NO2
Swindon 23 - 37 Devizes Rd*	**42.27**	35.0
Swindon 23 - 37 Devizes Rd*	**42.49**	35.2
Swindon 23 - 37 Devizes Rd*	**41.15**	34.2
Swindon 24, 30 Devizes Road	**43.22**	**37.2**
Swindon 25 - 68 Cheney Manor Rd (Rodbourne Rd)	**41.58**	**37.2**

* Triplicate

No sites recorded levels of above 60 µg/m^3 and therefore none are likely to exceed the 1-hour objective level (200 µg/m^3).

3.2.2 Particulate Matter (PM_{10})

There are no concerns regarding concentrations of PM_{10}.

3.2.3 Particulate Matter ($PM_{2.5}$)

There are no concerns regarding concentrations of $PM_{2.5}$.

Appendix A: Monitoring Results

Table A. 1: Details of Automatic Monitoring Sites (futured)

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)
925100	Bath Road	Roadside	415,289.5	183,789.7	NOx	No	Chemiluminescent	18.4	4.5	2.5
1695150	Bath Road co-located	Roadside	415,289.5	183,789.7	NOx	No	AQMesh Pod	18.4	4.5	2.5
1696150	Eastbound lamp column-6	Roadside	414,707.3	183,806.3	NOx	No	AQMesh Pod	10	1.8	2.6

Notes:

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

(2) N/A if not applicable.

Table A. 2: Details of Non-Automatic Monitoring Sites 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)
S1	Swindon 1 - GWR Museum	Roadside	414629.34	184736.82	Nitrogen Dioxide	No	0.3	2.0	No	2.5
S2	Swindon 2 Bath Rd Car Park		415289.6	183789.81		No	18.4	5.3		2.6
S3	Swindon 4 - S4, 8 Okus Road		414758.67	183718.55		No	4.8	2.3		2.5
S4	Swindon 5 - 186 Kingshill Rd		414257.86	183972.1		No	2.3	2.0		2.6
S5	Swindon 6 - Chalet School, Queens Drive		416088.78	184906.88		No	0	7.5		2.8
S6	Swindon 8 - 102 Bath Road		414925.19	183741.49		No	7.1	3.0		2.7
S7	Swindon 9 - 31 Sandgate		417714.18	186315.55		No	3.4	12.6		1.3
S8	Swindon 11 - Devizes Rd, Bridal shop		415531.43	183666.32		No	0.3	4.8		2.8
S9	Swindon 12 - Manchester Rd		415156.96	185100.84		No	0.5	2.6		2.8
S10	Swindon 13 - Meadow Way Badbury		419347.33	180974.53		No	4.3	48.0		1.8

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)
S11	Swindon 14 - Kingshill Rd/Clifton St		414733.29	183782.89	Nitrogen Dioxide	No	31.1 (12.4 across the road)	1.3		2.9
S12	Swindon 15 - Westcott Place		414075.8	184040.99	Nitrogen Dioxide	No	12.8	1.2		2.8
S13	Swindon 16 - Cricklade Rd (Moonraker)		415677.18	187335.48	Nitrogen Dioxide	No	2.2	3.5		2.9
S14	Swindon 17 - Bruce St Bridges		413797.07	185505.47	Nitrogen Dioxide	No	0.3	5.3 (to Bruce St and 21.1 to the roundabout)		2.9
S15	Swindon 18 - 102 Kingshill Road		414698.37	183800.27		No	0	1.3		2.5
S16	Swindon 19 - 86 Clifton Road		414755.79	183788.58		No	11.0	8.3 (Kingshill and 1.3 to Clifton)		2.6
S17	Swindon 20 - A420 South Marston		419437.78	186764.67		No	27.5	12.5		2.7
S18	Swindon 21 - 63 Kingshill Rd		414552.28	183884.71		No	6.0	2.0		2.8
S19	Swindon 22 - 38 Farriers Close	Railway side	416145.9	185666.9	Nitrogen Dioxide	No	7.0	1.9		1.6
S20	Swindon 23 - 37 Devizes Rd	Road side	415547	183552.03	Nitrogen	No	13	1.8		2.4

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)
					Dioxide					
S21	Swindon 23 - 37 Devizes Rd		415547	183552.03	Nitrogen Dioxide	No	13	1.8		2.4
S22	Swindon 23 - 37 Devizes Rd		415547	183552.03		No	13	1.8		2.4
S23	Swindon 24, 30 Devizes Road		415554.74	183494.78		No	3.4	2		2.4
S24	Swindon 25 - 68 Cheney Manor Rd (Rodbourne Rd)		415,532	183,666	Nitrogen Dioxide	No	2.6	2.4		3.2
S25	Swindon 26 - Tadpole Lane		411973.26	189625.23		No	15.7	0.7		2.3
S26	Swindon 27 - 66 Ermin St		417398.65	187353.88		No	0.7	1.9		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. 3: Annual Mean NO2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
Swindon 1 - GWR Museum	Roadside	DT	100	100	35.95	36.43	37.19	35.16	37.52
Swindon 2 Bath Rd Car Park	Roadside	DT	100	100	26.16	24.20	25.39	25.45	23.93
Swindon 4 - S4, 8 Okus Road	Roadside	DT	100	100	22.36	25.37	26.73	19.59	24.26
Swindon 5 - 186 Kingshill Rd	Roadside	DT	100	100	32.17	36.22	31.11	28.44	30.58
Swindon 6 - Chalet School, Queens Drive	Roadside	DT	100	100	29.27	32.44	32.87	32.09	31.82
Swindon 8 - 102 Bath Road	Roadside	DT	100	100	25.99	25.43	26.91	35.21	33.91
Swindon 9 - 31 Sandgate	Roadside	DT	100	100	21.6	22.79	21.68	18.00	24.70
Swindon 11 - Devizes Rd, Bridal shop	Roadside	DT	100	100	17.11	16.69	25.68	24.78	32.70
Swindon 12 - Manchester Rd	Roadside	DT	100	100	38.46	**41.77**	**39.33**	37.39	**43.42**
Swindon 13 - Meadow Way Badbury	Roadside	DT	100	100	29.77	29.37	31.05	30.35	30.09
Swindon 14 - Kingshill Rd/Clifton St	Roadside	DT	100	100	**41.38**	**44.79**	**47.36**	**41.25**	**38.56**
Swindon 15 - Westcott Place	Roadside	DT	100	100	31.44	31.43	32.25	30.21	33.57
Swindon 16 - Cricklade Rd (Moonraker)	Roadside	DT	100	100	31.44	32.25	36.16	35.77	**38.67**
Swindon 17 - Bruce St Bridges	Roadside	DT	100	100	25.88	26.12	28.17	25.43	26.60
Swindon 18 - 101 Kingshill Road	Roadside	DT	100	100	**42.14**	**45.85**	**46.37**	**47.99**	**51.15**
Swindon 19 - 86 Clifton Road	Roadside	DT	100	100	**41.67**	**45.38**	**47.26**	28.03	30.47
Swindon 20 - A420 South Marston	Roadside	DT	100	100	22.74	19.36	27.32	23.79	26.29
Swindon 21 - 63 Kingshill Rd	Roadside	DT	100	100	31.46	32.18	34.78	30.06	33.22

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
Swindon 22 - 38 Farriers Close	Railway side	DT	100	100	23.06	32.40	24.37	22.38	20.64
Swindon 23 - 37 Devizes Rd	Roadside	DT	100	100	**44.61**	**46.67**	**45.57**	**44.37**	**42.27**
Swindon 23 - 37 Devizes Rd	Roadside	DT	100	100	**45.36**	**45.61**	**47.56**	**46.66**	**42.49**
Swindon 23 - 37 Devizes Rd	Roadside	DT	100	100	**45.45**	**44.75**	**44.91**	**45.61**	**41.15**
Swindon 24, 30 Devizes Road	Roadside	DT	100	100	25.38	27.40	28.44	**43.35**	**43.22**
Swindon 25 - 68 Cheney Manor Rd (Rodbourne Rd)	Roadside	DT	100	100	**42.49**	**44.79**	**42.35**	36.47	**41.58**
Swindon 26 - Tadpole Lane	Roadside	DT	100	100	17.88	18.64	17.66	15.30	15.53
Swindon 27 - 66 Ermin St	Roadside	DT	100	100	26.6	30.49	31.20	29.38	28.74

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **If applicable, all data has been distance corrected for relevant exposure**

Notes:

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

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

(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.

Site relocated from Bath Road Car Park

Site relocated from Bath Road Car Park

Site relocated from Kingshill Rd/Clifton St

Site relocated from South Street

Site relocated from Bus Station

Site relocated from 422 Cricklade Road

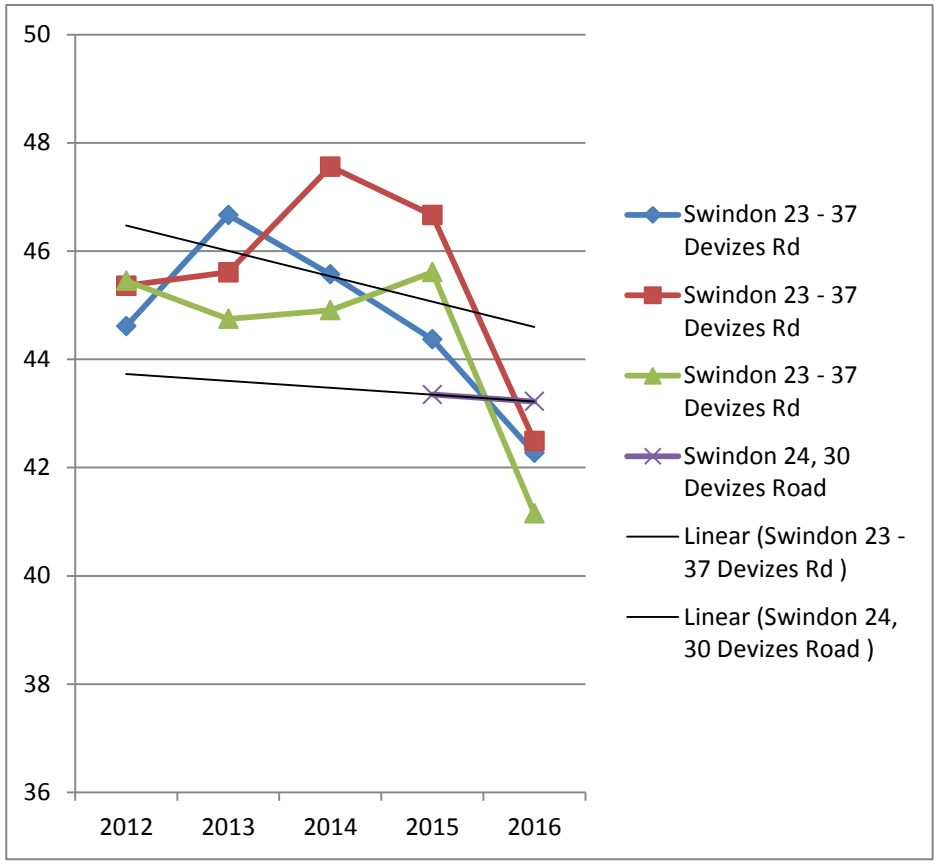

Figure 1: Trends in Annual Mean Nitrogen Dioxide Concentrations at Devizes Road (2 locations)

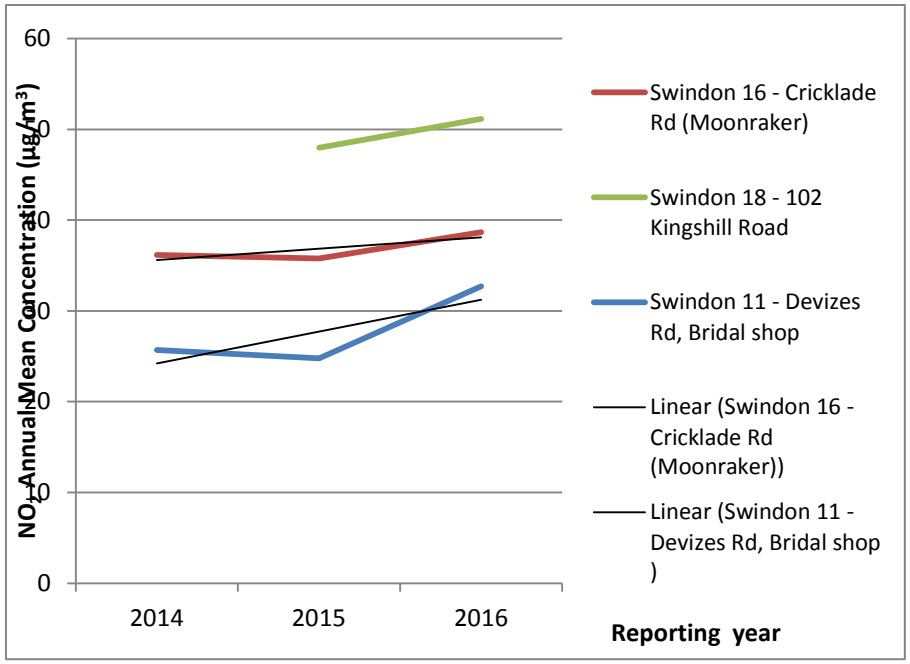

Figure 2: Trends in Annual Mean Nitrogen Dioxide Concentrations at Swindon 16 - Cricklade Rd (Moonraker), Swindon 18 – 102 kingshill Rd & Swindon 11 0Devizes Rd, Bridal shop

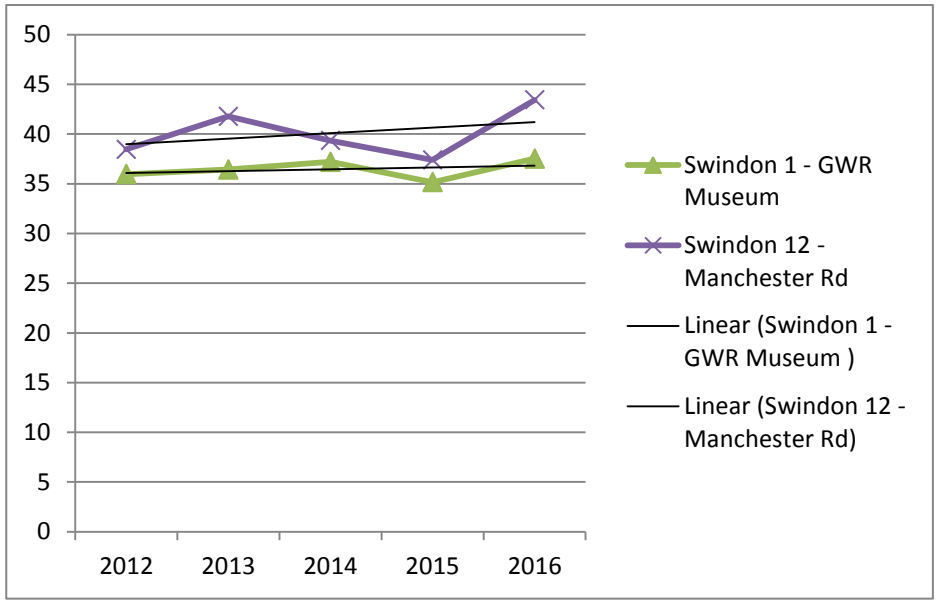

Figure 3: Trends in Annual Mean Nitrogen Dioxide Concentrations at Swindon 1 - GWR Museum and Swindon 12 - Manchester Rd

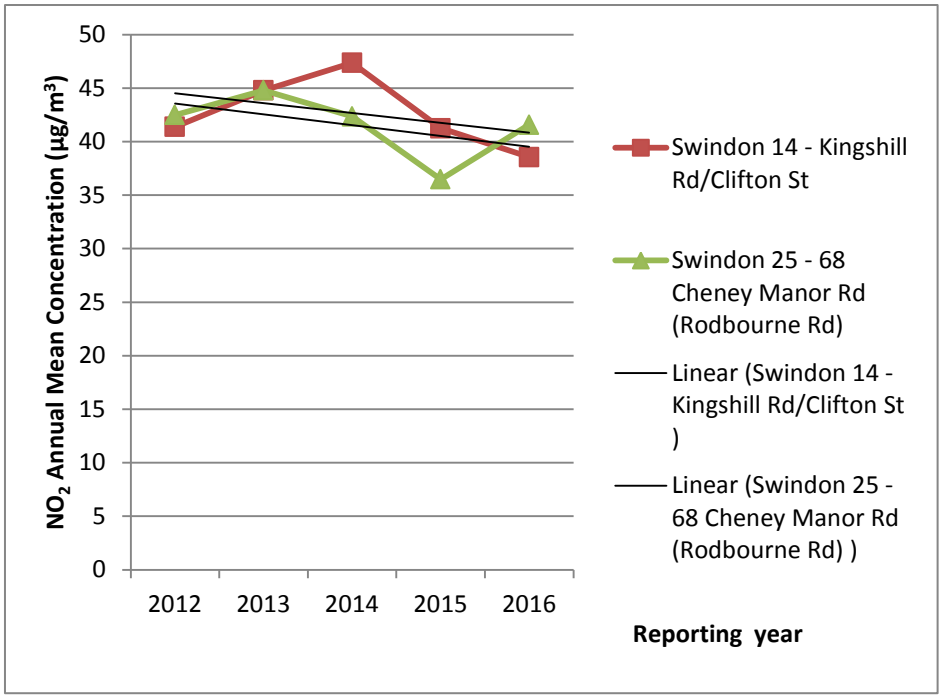

Figure 4: Trends in Annual Mean Nitrogen Dioxide Concentrations at Swindon 14 - Kingshill Rd/Clifton St and Swindon 25 - 68 Cheney Manor Rd

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B. 1: NO2 Monthly Diffusion Tube Results - 2016

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Swindon 1 - GWR Museum	52.6	34.3	51.1	46.8	40.2	39.6	40.1	38.6	45.8	62	58.3	56.4	47.15	37.52	**37.0**
Swindon 2 Bath Rd Car Park	31.3	34.1	32.2	32.1	24.9	19.6	21.6	25.5	29.2	40	45.4	38.2	31.18	23.93	23.6
Swindon 4 - S4, 8 Okus Road	30.4	35.6	26.1	34	25.6	15	16	18.6	26.3	40.8	37.9	34.4	28.39	24.26	23.9
Swindon 5 - 186 Kingshill Rd	33.3	38.7	45.3	31.9	30.9	21.4	27.4	36.9	36.2	54.2	56.3	56.4	39.08	30.58	28.5
Swindon 6 - Chalet School, Queens Drive	47.2	38.5	44.3	29.8	30	34.8	42.7	35.8	32.3	44.8	52.3	51.2	40.31	31.82	31.8
Swindon 8 - 102 Bath Road	50.1	48.8	40.8	46.9	41	34.4	13.3	38.6	43.2	55.6	67.4	52.2	44.36	33.91	28.7
Swindon 9 - 31 Sandgate	29.4	29	11.7	27.3	21.8	17.8	22.1	20.1	26.6	34.4	39.1	37.2	26.38	24.70	24.2
Swindon 11 - Devizes Rd, Bridal shop	37.9	35.4	36.8	35		20.5	50.2	28.4	32	44.9	46.3	45.9	37.6	27.50	27.4
Swindon 12 - Manchester Rd	41.8	103.4	57.1	64.1	54.7	39.1	39.4	42.9	47.9	62.2	69.5	62.8	57.08	**43.42**	**37.6**
Swindon 13 - Meadow Way Badbury	43.9	37.2	41.3	34.3	26	35.9	35.3	35.3	33.8	35.6	41.7	30	35.86	30.09	28.3
Swindon 14 - Kingshill Rd/Clifton St	54	51.5	54.3	51.1	46.5	26.7	38.2	52.4	57	47.6	70.6	65.4	51.28	**38.56**	33.3
Swindon 15 - Westcott Place	40.5	43.9	38.8	47	37	31.3	30.9	36.8	44.6	44.8	60.3	56.8	42.73	33.57	26.2
Swindon 16 - Cricklade Rd (Moonraker)	51.4	55.4	47.2	55.8	47.8	34.4	31.7	40.3	51.1	35.6	63.3	54.2	47.35	**38.67**	36.1

Site ID	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 (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Swindon 17 - Bruce St Bridges	30.5	29.1	29.8	35.7	27.1	18.7	17.4	22.2	33.1	43.2	45.7	39.2	30.98	26.60	26.5
Swindon 18 - 102 Kingshill Road	69.5	68.7	64.6	67.5	55.1	37.1	52.4	67.5	62.3	86.8	79	98.4	67.41	51.15	**50.6**
Swindon 19 - 86 Clifton Road	35.4	39.4	34.1	40	35.3	24.9	30.8	36.7	37	36.6	50.2	51.6	37.67	30.47	26.4
Swindon 20 - A420 South Marston	31.9	40.7	32.2	37.6	28.2	24.1	26.4	22.9	0.8	83.9	46.4	42.8	34.83	26.29	24.1
Swindon 21 - 63 Kingshill Rd	39.6	50.2	42.5	47.4	40.9	19.2	27.8	34.5	44.9	61.3	53.5	58.6	43.37	33.22	27.5
Swindon 22 - 38 Farriers Close	34.4	33.3	27.9	26.9	20.7	20	22.1	22.9	26.9	39.7	40.6	35.8	29.27	20.64	20.4
Swindon 23 - 37 Devizes Rd	63.5	55.1	63.3	58.6	45.3	56.1	54.8	54.1	51.5	71.7	70	55.3	58.28	**42.27**	**36.3**
Swindon 23 - 37 Devizes Rd	68.2	59.6	63.4	54.8	48.8	54.1	54.3	53.6	50.3	73	67.9	73.7	60.14	**42.49**	**36.5**
Swindon 23 - 37 Devizes Rd	63.4	56.1	68	51.5	49.2	61.4	54.3	48.1	45.8	67.9	62.4	74.2	58.53	**41.15**	35.6
Swindon 24, 30 Devizes Road	60.1	62	57.3	57.1	51.7	48.9	49.3	47.9	50.1	66.3	78.8	70.3	58.32	**43.22**	**38.4**
Swindon 25 - 68 Cheney Manor Rd (Rodbourne Rd)	44.9	52.7	57.3	63.2	60.2	40.7	31.6	50.9	62.8	79	90.6	63.7	58.13	**41.58**	**37.6**
Swindon 26 - Tadpole Lane	17.9	25.6	21.3	20.7	18.3	14.3	15	17.4	17.9	33.2	37	35.6	22.85	15.53	12.5
Swindon 27 - 66 Ermin St	38.7	42.1	33.7	44.5	31.4	33.4	28.8	35.2	40.6	51.9	57.3	45.3	40.24	28.74	27.9

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

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

(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 Tube Bias Adjustment Factors

The nitrogen dioxide diffusion tube data has been adjusted using factors generated by the National Bias Adjustment Factor Database (Version Number 09/16) which is available on the LAQM Helpdesk Website (https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html).

Swindon Borough Council's nitrogen dioxide diffusion tubes were supplied and analysed by ESG Group, Didcot and use 50% TEA in acetone.

The bias adjustment factor used 0.79

Discussion of Choice of Factor to Use

No co-location study was performed by Swindon Borough Council, therefore National bias adjustment factors based on 29 studies for ESG Didcot for 2015 were used.

PM Monitoring Adjustment

No adjustments have been made to PM monitoring results as data only indicative.

QA/QC of Diffusion Tube Monitoring

Environmental Scientifics Group has advised the following.

- The manufacture and analysis of NO_2 diffusion tubes is covered by our UKAS accreditation
- The method meets the requirements laid out in DEFRA's "Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance."
- The laboratory has taken part in the WASP proficiency scheme since its inception, and carries the highest ranking of 'Satisfactory' for all rounds on the DEFRA LAQM summaries since the adoption of the harmonised method in 2009.
- In 2016, 7500+ internal quality control samples were analysed in conjunction with the diffusion tubes, achieving an analytical repeatability of 2.0% (at 95% confidence).

Please note that the WASP proficiency scheme has now been replaced with the IR PT scheme - new international PT scheme for laboratories involved in air quality analysis.

Additional monitoring

Two AQ Mesh monitors for the continuous real-time monitoring of Nitrogen Dioxide were installed at Kingshill on Monday 5th December, one on streetlight No6 opposite 101 Kingshill and the other on the front facia of 105 Kingshill. The serial numbers were 1696150 and 1697150 respectively.

A further AQMesh monitor was installed on the fixed Chemiluminescent monitor (Bath Road car park) to verify the validity of data. Using the data from these monitoring devices we intend to look at the short-term trends and correlation between NO2 concentration, wind speed and traffic, which would assist in developing possible strategy to reduce the emission levels.

Chemiluminescent (continuous) monitor at Bath Road car park restarted its monitoring from early December 2016.

Appendix D: Map(s) of Monitoring Locations and AQMAs

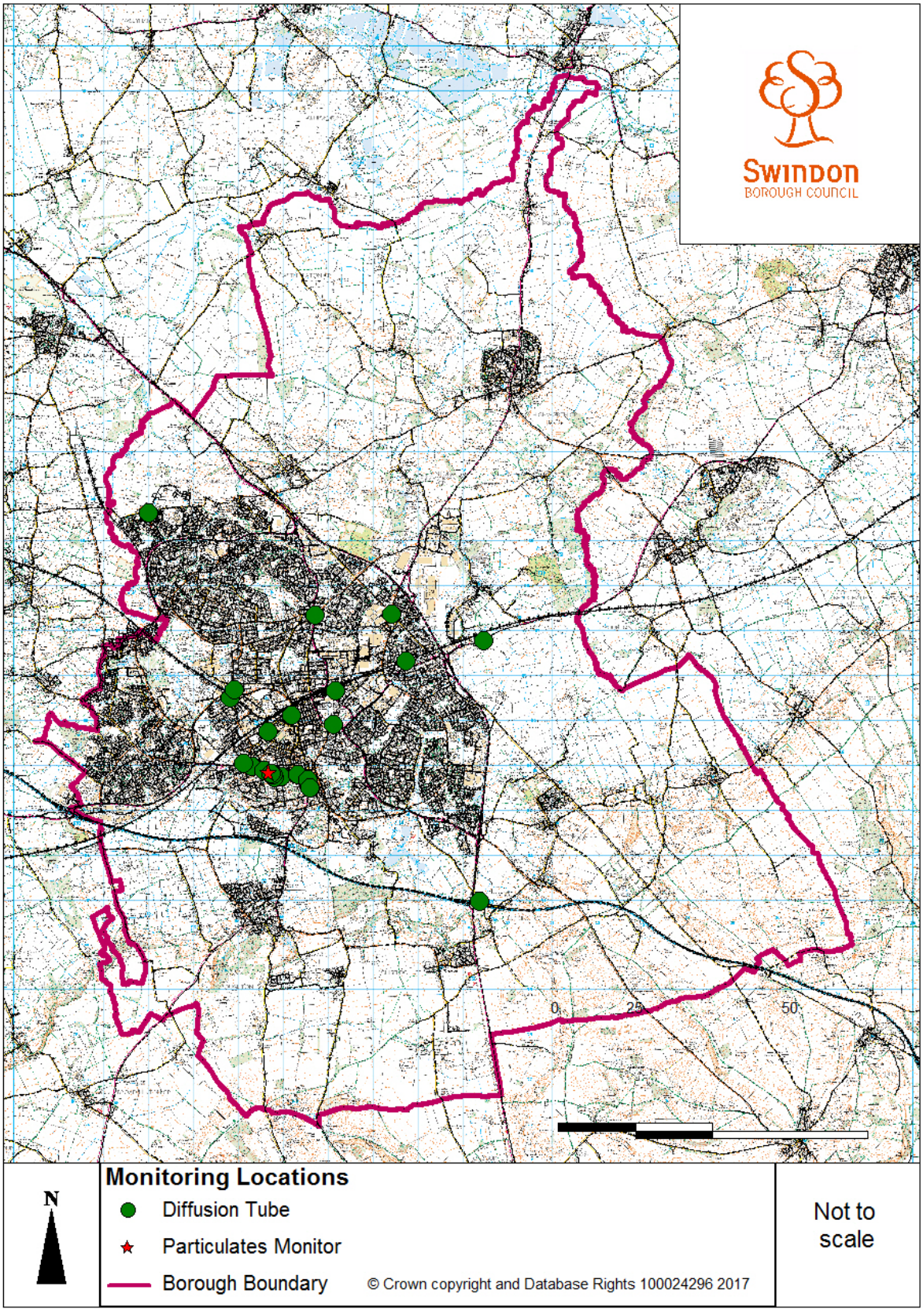

Figure 5: Monitoring locations around the Borough

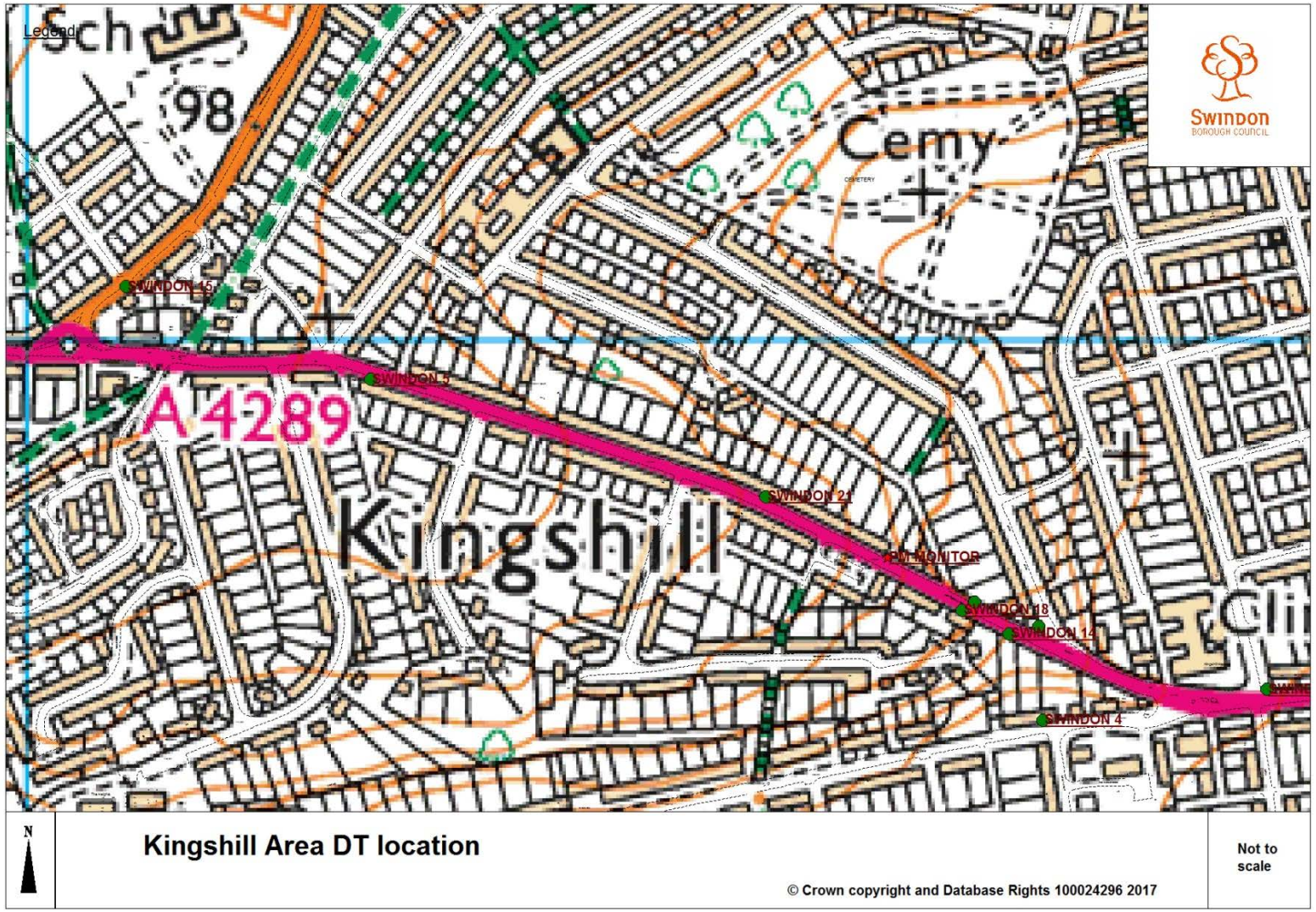

Figure 6: Location of diffusion tubes along Kingshill Road area

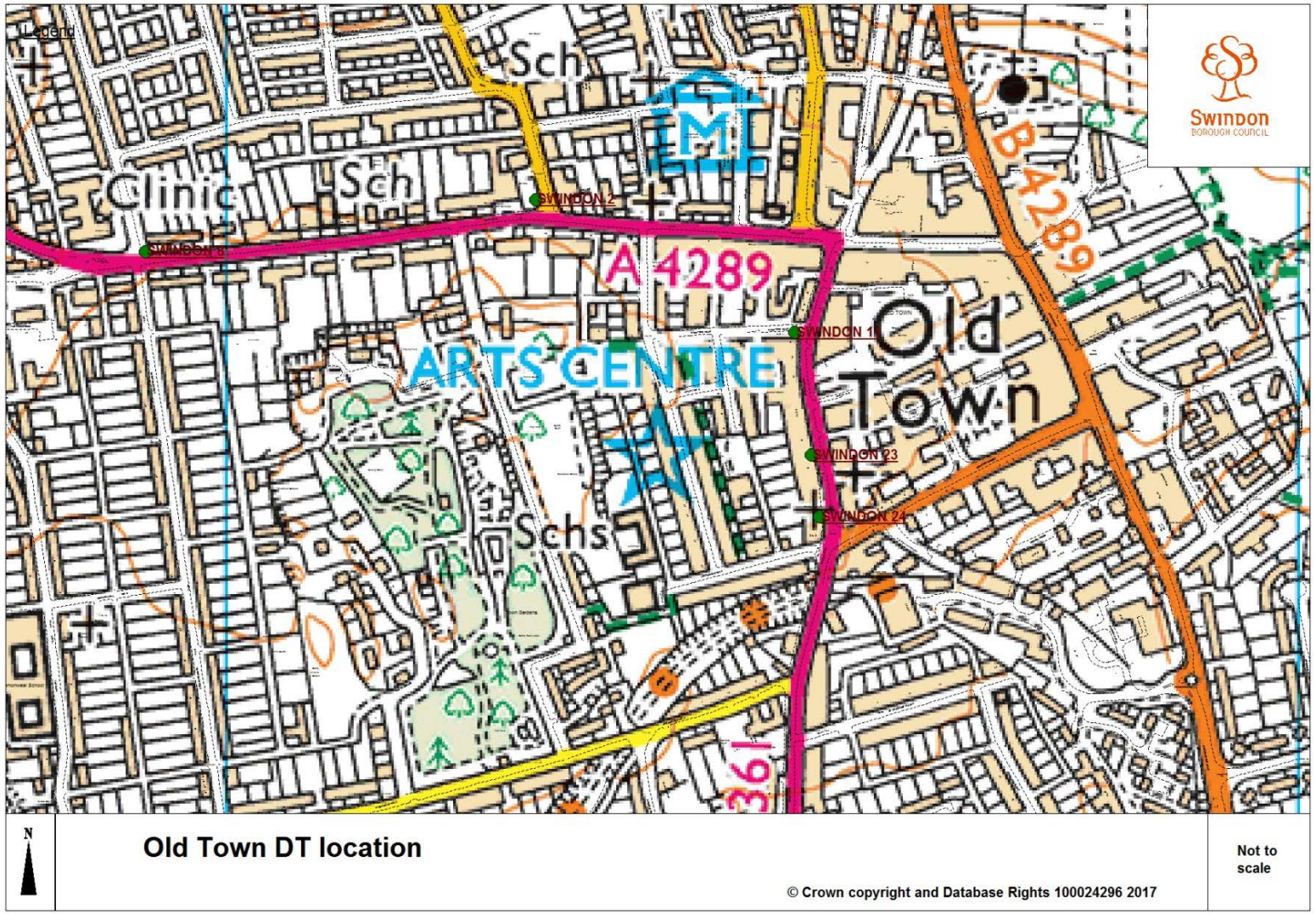

Figure 7: Location of Diffusion Tubes around Old Town area (proposed AQMA corridor)

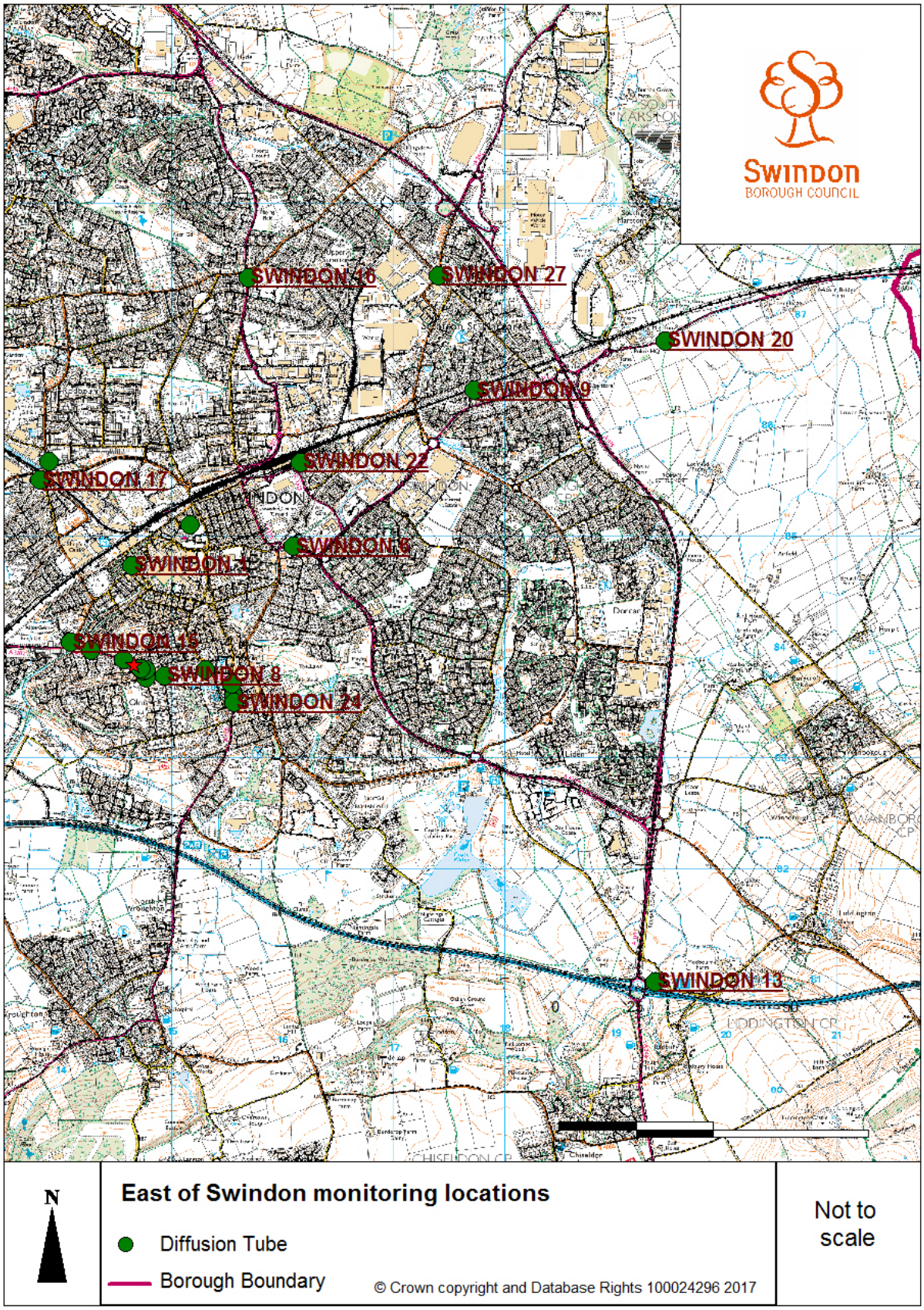

Figure 8: Location of Diffusion Tubes in Eastern part of Swindon

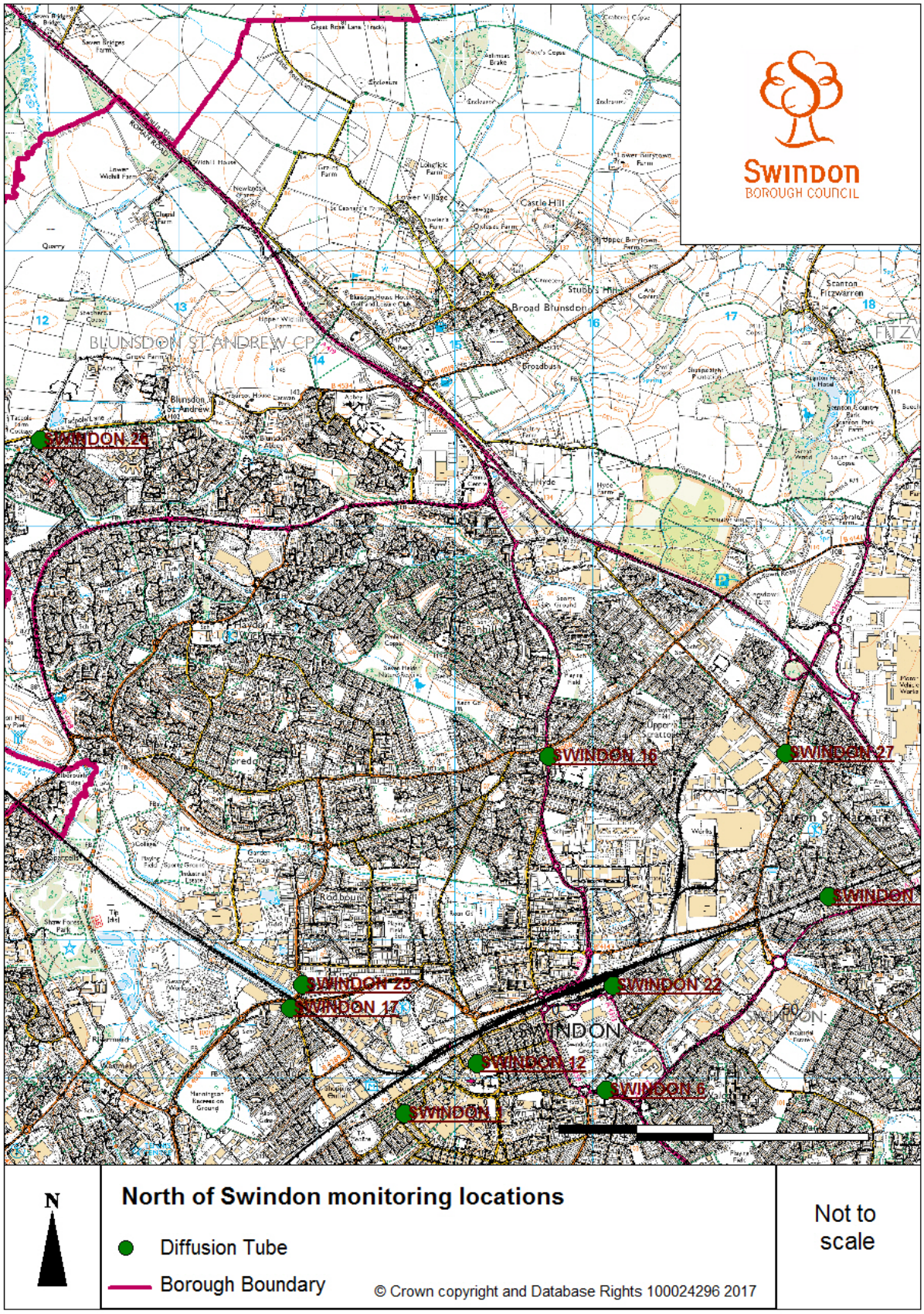

Figure 9: Location of Diffusion Tubes in Northern part of Swindon

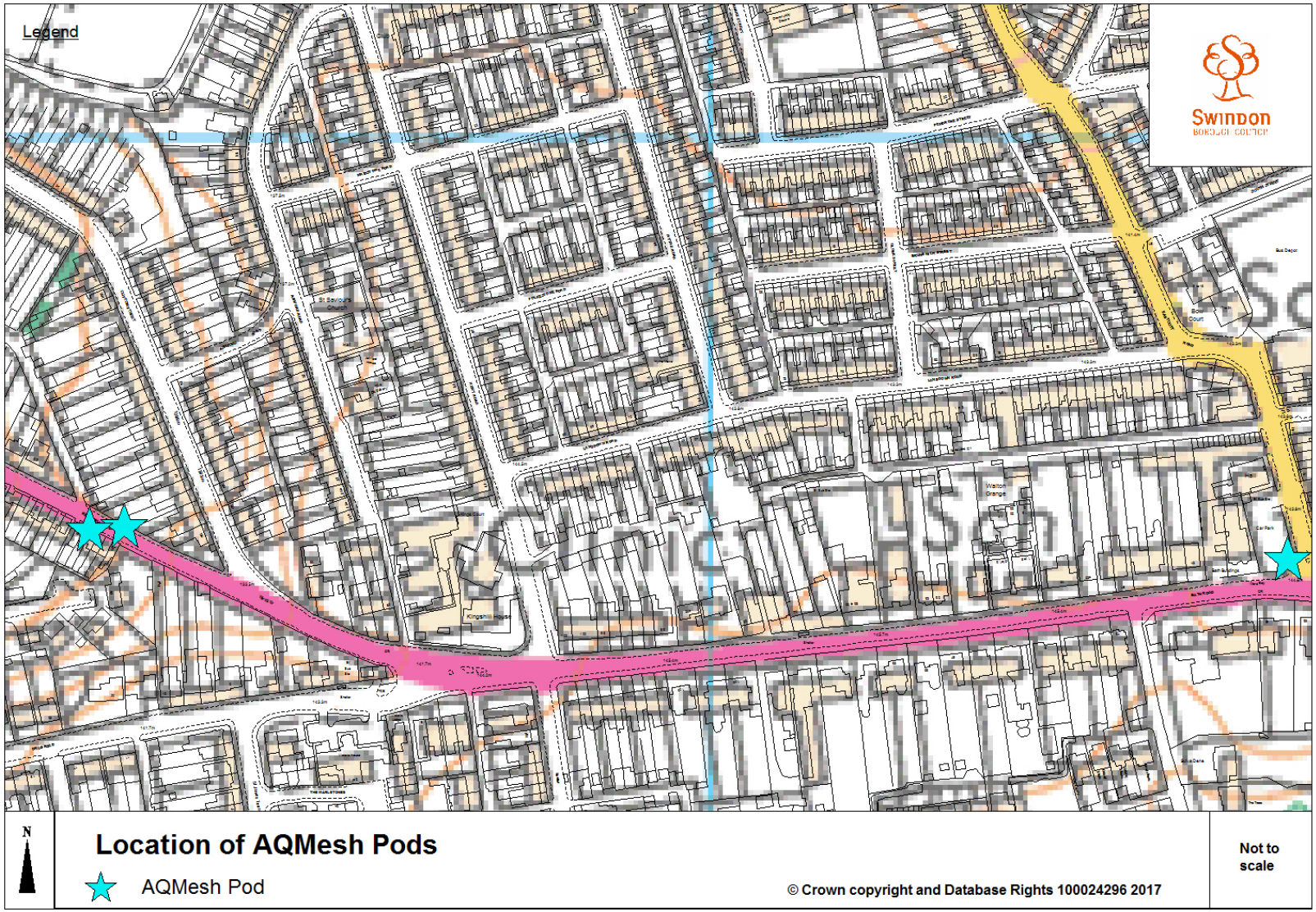

Figure 10: Location of AQMesh Pods (Kingshill/Bath Road)

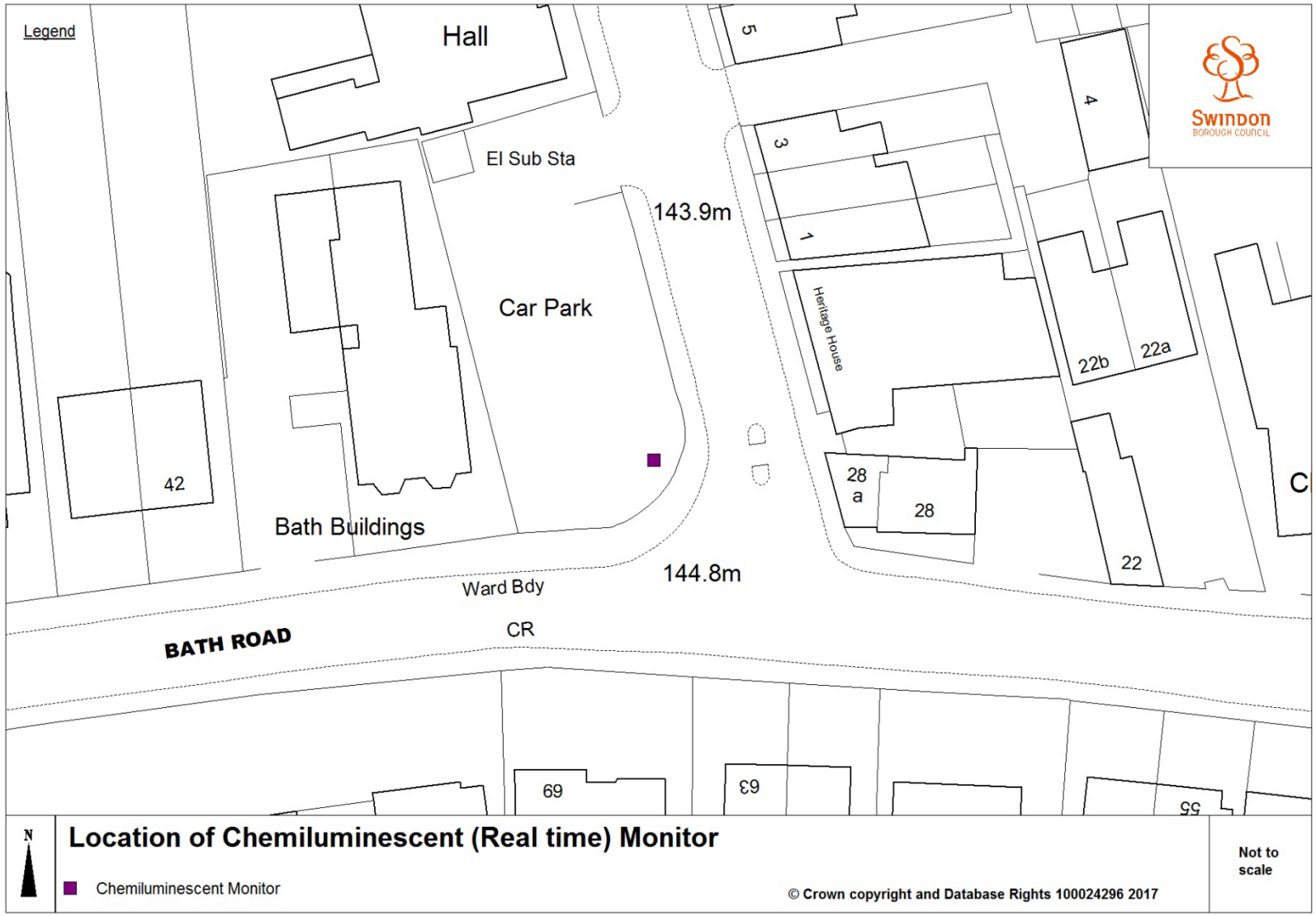

Figure 11: Location of Chemiluminescent (Real time) Monitor

Appendix E: Summary of Air Quality Objectives in England

Table E. 1: Air Quality Objectives in England

Pollutant	Air Quality Objective[1]	
	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

[1] 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
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
SBC	Swindon Borough Council

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4. DEFRA (2016) Local Air Quality Management Technical Guidance, (LAQM .TG (16 LAQM Helpdesk accessible from http://laqm.defra.gov.uk/technical-guidance/

5. National Diffusion Tube Bias Adjustment Factor Spread Sheet accessible from http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

6. Defra Background Maps https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

7. Defra Nitrogen Dioxide fall off with distance calculator http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html
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