



# WORTHING BOROUGH 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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## Executive Summary: Air Quality in Our Area

### Air Quality in Worthing Borough

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<sup>1,2</sup>.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

This report covers monitoring and actions taken during 2018. There is currently one Air Quality Management Area (AQMA) within the Worthing Borough: Worthing AQMA No.2 on the A27/A24 in Worthing, declared for exceeding the annual mean objective for Nitrogen Dioxide (NO<sub>2</sub>) of 40µg/m<sup>3</sup>.

Worthing Borough Council undertook automatic (continuous) monitoring of Nitrogen Dioxide (NO<sub>2</sub>) and Particulate Matter PM<sub>2.5</sub> at an AURN affiliated site at Grove Lodge Worthing (A27) during 2018. Non- automatic (passive) monitoring of NO<sub>2</sub> also took place at 34 sites across the Borough.

Results from 2018 again show a mixed picture of NO<sub>2</sub> across the Borough, however only two sites exceeded the annual mean objective for NO<sub>2</sub>. The continuous monitoring site at Grove Lodge recorded a small increase in the ratified annual mean from 35.8µg/m<sup>3</sup> in 2017 to 37µg/m<sup>3</sup> in 2018.

Of the 36 diffusion tubes used in 2018 (at 34 sites), 21 showed a reduction ranging from 0.4µg/m<sup>3</sup> to 8.8µg/m<sup>3</sup>, whilst 12 showed an increase ranging from 0.2µg/m<sup>3</sup> to 8.6µg/m<sup>3</sup>.

The two sites showing an exceedance of the annual mean objective for NO<sub>2</sub> were tube sites at Grove Lodge Cottages and two tubes co-located with the continuous monitor. Both sites are close to the Grove Lodge roundabout on the A27 within the

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

AQMA. The Grove Lodge Cottages site is adjacent to a residential property on the westbound carriageway. The annual mean decreased by  $8\mu\text{g m}^{-3}$  from 2017 levels and is the lowest recorded at this site for 5 years. When predicted back to the residential facade to represent relevant exposure as required by Defra (and using standard prediction methods and tools published by Defra) the level decreases slightly to  $59.2\mu\text{g m}^{-3}$ . However despite this, this site has continued to exceed the annual mean objective for a number of years and is the reason why the AQMA is still being considered for re-declaration of exceedance of the hourly mean objective. Guidance suggests any site exceeding  $60\mu\text{g m}^{-3}$  risks exceeding the 1-hour mean objective for  $\text{NO}_2$  of  $200\mu\text{g m}^{-3}$ . The Council plans to carry out a period of consultation during 2019 with a view to amending the AQMA for exceedance of the 1-hour mean.

Interestingly there were no exceedances of the one hour mean objective recorded by the continuous analyser on the opposite carriageway to the Grove Lodge Cottages site.

Site N24 on the Upper Brighton road within the AQMA (close to Lyons Farm on the A27) recorded the largest increase from  $25.9\mu\text{g m}^{-3}$  in 2017 to  $34.5\mu\text{g m}^{-3}$ . This is a facade mounted tube and so is representative of relevant exposure. At this stage we are not sure why this site registered such a large increase.

Of the new sites added in 2018 Site N61 Broadwater Street West gave a level of  $36.8\mu\text{g m}^{-3}$ . This is a kerbside location and when predicted back to the closest relevant receptor levels fall off to  $28\mu\text{g m}^{-3}$ .

2018 was the first full year of  $\text{PM}_{2.5}$  monitoring in Worthing. The ratified measured level was  $10\mu\text{g m}^{-3}$ , comfortably within the EU Limit Value of  $25\mu\text{g m}^{-3}$ . We will be in a position to comment on annual mean trends once we have another year's results.

The Worthing air quality action plan 2015 (AQAP) relies on partnership work with Highways England and West Sussex County Council to deliver actions to improve traffic flows, encourage behaviour change and therefore improve air quality. We continue to engage with both through an air quality working group which meets through the year. Highways England also have a national Designated Funds budget for air quality, part of which may be able to be used to assist with additional air quality

assessments or for potential mitigation measures. We continue to engage with them to seek access to this fund.

More information is available on our website at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#page-content>

## **Actions to Improve Air Quality**

Worthing Borough Council took forward a number of measures during 2018 in pursuit of improved air quality. These included working in partnership with WSCC to produce a new joint air quality plan for the County, '*Breathing Better*', which aims to improve air quality working in partnership with the County Council; producing a revised staff travel action plan in late 2018, in association with Sustrans; embarking on work with Sustrans to draft a Local Cycling and Walking Infrastructure Plan, due for consultation during 2019; participating in a Sussex-air Defra funded schools intervention programme involving some of the Worthing primary schools; continued use of the Sussex Air Quality Emissions Mitigation Planning Guidance to obtain air quality mitigation from major developments; and working with Sussex- air to successfully bid for Defra Air Quality Grant funding for a project focussed on burning of fuels and particulate emissions during 2019.

In addition, our strategic focus and ambitions on Public Health and wellbeing (in our Public Health Policy) are enabling us to work in collaborative ways across our communities to improve health and wellbeing and promote and encourage sustainable and healthy places, for example we have just launched a Beat the Streets project to encourage whole communities to walk and cycle in more sustainable ways.

## **Conclusions and Priorities**

Specific priority actions for 2019 include consultation on re-declaring the existing Worthing AQMA No.2 to include exceedance of the hourly mean for NO<sub>2</sub>; conclusion of the Defra grant-funded school and business anti-idling/behaviour change project through Sussex-air including analysis of the outcomes and lessons learned; commencement of the Sussex-air Defra grant funded 'Clean Burn' project in Worthing; production of a Local Cycling and Walking Infrastructure Plan; a Public

Health information campaign, led by West Sussex County Council, via the West Sussex Inter Authority Air Quality Group; replacement of Council fleet vehicles with ULEV versions on a case by case basis, in line with our 'Platforms for Places' commitments; continue to explore the provision of electric vehicle charge points – public charge points and private in new developments; provision of a Worthing Car Club; additional anti-idling signs at level crossings in Worthing; continue to pursue the low emission mitigation approach to new developments by working in partnership with highway authorities.

There are a number of large developments planned for Worthing, particularly in the town centre. There are also large developments planned for the adjacent Adur District which could impact upon Worthing. Balancing the demand for development with the need to improve (or not worsen) air quality will bring challenges. It is important to state that these developments also bring opportunities to improve infrastructure, especially for walking, cycling and public transport and thus limit the impacts on the existing AQMA and avoid creating new hotspots. Planned developments are discussed in Section 2 of this report.

Identifying suitable sites and sufficient funding for the installation of electric vehicle charge points continues to be challenging and we will continue to explore funding opportunities as and when they arise.

Finally we plan to review the Worthing Action Plan in 2020.

## **Local Engagement and How to get Involved**

We engage with interested parties in the Borough, including community groups, elected members, transport planners, planning policy and development control. We are active members of the Sussex Air Quality Partnership (Sussex-air). The Partnership provides assistance to members and information to the public via their web-site with air quality data, news updates, educational resources, links and other services such as air Alert. See <http://www.sussex-air.net/> for more information.

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important to state that these developments also bring opportunities to improve infrastructure, especially for walking, cycling and public transport and thus limit the impacts on the existing AQMA and avoid creating new hotspots. Planned developments are discussed in Section 2 of this report.

The Council is always interested in hearing from residents who may have innovative ideas to reduce traffic congestion/air pollution in and around the Borough. You may contact us using our online form at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#have-your-say>.

Road vehicles produce over 50 per cent of the emissions of nitrogen oxides in the UK.

Before using your car, ask yourself:

- could I walk or cycle instead of taking the car?
- could I take a bus or train?
- are the levels of air pollution high today? (See our website for forecasts: <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/air-quality-monitoring/#airalert>)
- Using quieter streets when you're on a bike or on foot can lower your exposure to air pollution by up to 20%.

If you must drive:

- drive smoothly and don't rev your engine unnecessarily. You'll save fuel, and your engine will also pollute less;
- maintain your car. Keep the engine properly tuned and the tyres at the right pressure; and
- turn off your engine when your car is stationary for prolonged periods, particularly at main junctions and level crossings. By not idling your engine you'll help to make the air cleaner for you, other drivers, pedestrians and cyclists.

At home

- Buy water-based or low-solvent paints, varnishes, glues and wood preservatives.
- Half of all deliveries to workplaces are personal parcels for staff. By using pick-up points in corner shops or lockers in train stations you can help to reduce pollution from delivery vehicles.
- Open fires and wood-burning stoves have risen in popularity over recent years. This means we now see more smoke from chimneys, which has a negative effect on air quality. This can result in elevated particulate emissions and cause breathing problems, asthma attacks and contribute to other health conditions. Fuels such as wood and coal are permitted as long as the smoke from their combustion does not cause a statutory nuisance to neighbouring properties. However the use of inappropriate fuel can cause problems with local air quality.

The leaflet at the link below provides information and advice for those that use wood burning stoves or open fires, to reduce environmental and health impacts. By following its advice you can help to minimise the effect of your burning: <https://www.adur-worthing.gov.uk/media/media,149513,en.pdf>

- Try to avoid lighting bonfires. If you must have a bonfire only burn dry material and never burn household waste, particularly plastic, rubber, foam or paint. Levels of pollution can be quite high on bonfire night and other events/festivals with bonfires, and sensitive people, including people with respiratory conditions, may notice some effects. However exposure can be considerably reduced by remaining indoors and keeping windows closed. Further information is available on our website - <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/bonfires-and-smoke/>.

Information on Air Quality, including reports and monitoring results, is available on our website at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/>. Information is also available at <http://www.sussex-air.net/>.



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# 1 Local Air Quality Management

This report provides an overview of air quality in Worthing Borough Council 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 Worthing 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 **Error! Reference source not found.** in Appendix E.

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA)s are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMA)s declared by Worthing 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 <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#local-aqma>. There is also a full list of nationally declared AQMA's at <https://uk-air.defra.gov.uk/aqma/list>. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMA)s, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

We propose to amend Worthing AQMA No.2 to include exceedance of the Hourly Mean for NO<sub>2</sub> (see monitoring section).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan		
						At Declaration	Now	Name	Date of Publication	Link
Worthing Borough Council AQMA No. 2	Declared 13/07/2010, Amended 15/12/2014	NO2 Annual Mean	Worthing	Crockhurst Hill Offington Corner Roundabout, Warren Road, Grove Lodge Roundabout, Upper Brighton Road up to and including the Downlands Retail Centre, and Lyons Way	YES	71.5 µg/m3	59.2 µg/m3	Worthing Air Quality Action Plan	November 2015	<a href="https://www.adur-worthing.gov.uk/media/138133/en.pdf">https://www.adur-worthing.gov.uk/media/138133,en.pdf</a>

☒ Worthing 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 Worthing

Defra's appraisal of last year's ASR concluded:

1. *"The current report notes the consultation by Highways England in relation to potential works to relieve congestion on the A27 between Worthing and Lancing. We note the potential significance of measures to address congestion for improving air quality within the AQMA."*
2. *"Any proposed congestion relief scheme for the A27, affecting the AQMA should be subject to a detailed traffic emissions and air quality assessment within the feasibility assessment."*
3. *"It appears that the measures within the current action plan are unlikely to deliver emissions reductions, leading to achieving the air quality objectives in the near future."*
4. *"The further development of options for congestion relief on the A27, and outcome of the HE consultation for the A27 should be presented as part of the regular updating of action plan measures within future ASR reports. ASR's are expected to monitor the progress with developing measures, particularly those measures expected to have most influence of regulating traffic emissions in key areas."*

The ASR updates progress on action plan measures and has done so each year.

5. *"There needs to be a clear understanding of the level of emissions reductions from traffic on the A27 required to meet the air quality objectives, in order to inform consideration of future options. If this has not been calculated to date, the local authority should endeavour to do so and provide this figure to the Transport Authority."*

This will be explored in consultation with Highways England.

6. *“The single point of exceedance at Grove Lodge, has been repeated for the last five years, and continues to breach the hourly mean objective by exceeding 60ug/m<sup>3</sup>; and “The Council should now take steps towards declaring the AQMA for exceedance of the hourly mean objective for nitrogen dioxide. This appears to remain as an outstanding action, and should be followed up in future reporting.”*

This is a priority action for completion in 2019.

7. *“In our previous assessment, we noted: It was also reported in the previous reports that, “Examination of the area surrounding Grove Lodge Roundabout, suggests there may be additional locations of relevant exposure close to the roundabout, which should also be investigated if this has not already taken place”. Consideration should be still given to locations of relevant exposure surrounding Grove Lodge for the purposes of establishing an area where the hourly mean objective may apply.”*

We have monitored at various locations in and around Grove Lodge for many years and this is the only point where diffusion tube monitoring suggests the hourly mean may be exceeded. Furthermore our continuous monitoring on the opposite side of the road has recorded no hourly mean exceedances.

8. *“We would therefore like to draw the Council’s attention to the steps required to develop an effective action plan, which is documented in detail, within Chapter 2 of Defra Technical Guidance publication LAQM TG(16)”; and “We would wish to emphasise the protocols for developing action plan measures, as these generally fall into several distinctive (and linked) stages, including knowledge of:*
- The baseline air quality across the district, with identification of pollution hotspots*
  - Detailed source apportionment, highlighting main contributory sources to pollution in hotspot locations.*

- *The level of emissions reductions required to achieve the AQ objectives, on a street by street basis, linked to pollution hotspots, and main sources of pollution*
- *Operational traffic management controls, to understand what traffic management options may be considered to provide the required level of emissions reductions”; “Feasibility assessment of implementing proposed measures, including a cost-benefit assessment, as a basis of prioritising measures in the action plan”; and “AQAP measures should be assessed as being able to meet the air quality objectives within specified timescales.”*

As previously stated we are seeking assistance from Highways England to further develop and implement the Action Plan. The road is a Highways England controlled trunk route so both Worthing Borough Council and West Sussex County Council can only have a limited influence here.

9. *“The latest monitoring, including trends over the last five years tends to suggest that there are not significant improvements in air quality, confirming the need to review the effectiveness of measures within the action plan to deliver the air quality objectives.”* Noted.
10. *“The Council should consider a detailed review of the current action plan, as there is little evidence that pollution levels are significantly improving within monitoring locations representative of pollution hotspots. We recommend a review using the latest guidance from Defra on Action Planning, to include a source apportionment, calculation of required levels of emissions reductions, and development of a package of measures that are capable of delivering the emissions reductions that will contribute towards meeting the air quality objectives. The new Action Plan will need to include measures to address AQMA7 at Borough Green. [Ref:Chapter 2 Action Plans: LAQM TG(16)].”*



The Worthing Borough Council Action Plan is scheduled for a full review in 2020.

11. *“Monitoring again, should be targeted to ensure pollution hotspots are correctly identified, focussing on locations of relevant exposure, and continued to be used as an indicator in relation to action plan assessment.”*

This is noted and is an action we already undertake as it is best practice.

Worthing Borough Council has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Key completed measures are:

- At the West Sussex Joint Leaders’ Board in November 2017, the County Council and District and Borough Councils agreed to develop a joint approach to action. A new joint air quality plan, ‘*Breathing Better*’ ([https://www.westsussex.gov.uk/media/12062/air\\_quality\\_plan.pdf](https://www.westsussex.gov.uk/media/12062/air_quality_plan.pdf)) was developed in partnership with WSCC and the Districts and Boroughs. An ‘Inter-Authority Member Group’ has been established to oversee Governance of the plan and future developments. It first met on 22nd October 2018. Activity in 2018 included development of a public information campaign, review of the scoring mechanism for Traffic Regulation Orders and infrastructure schemes and feasibility study of adding air quality monitoring to on-street pay and display machines.
- Sussex-air was successful in securing Defra Air Quality funding in 2018 for a schools intervention programme. The project which commenced in April 2018 and continues into 2019, aims to provide an intensive and targeted intervention with 25 primary schools and 25 businesses in and around AQMAs across Sussex. The project employs Sustrans to deliver a six week programme in primary schools. The project aims to raise awareness of air quality issues with smaller groups of pupils who then present their findings to

the wider school community. A Sustrans Air Quality officer is embedded locally, engaging with new schools and those already working with Sustrans to investigate the local air quality. This includes looking at the many factors that affect it and how active and sustainable travel can reduce air pollution. Living Streets are partners in this project, running one day anti-idling events outside the schools to tie in with the Sustrans work. At the time of writing Worthing primary schools participating were Bramber Primary School, Thomas A Becket Infant School and Thomas A Becket Junior School. Local business partners engaged in the business intervention have yet to be confirmed. A final report is expected in the Summer of 2019 and the outcomes will be reported in the next Annual Status Report.

- The Council published a revised staff travel action plan in late 2018, with the transport charity, Sustrans having been commissioned to deliver the Plan. The key objectives of the Plan are to: (1) review current staff and councillor patterns for commuting and business travel, and identify barriers to travelling more sustainably; (2) reduce the environmental impacts of commuting and business travel associated with Adur & Worthing Councils' services and operations; (3) support the health and wellbeing of staff; (4) identify options to support staff given anticipated reductions in available on-site car parking at Worthing Civic Site as a result of the planned new Health Hub on part of the existing staff car park. In summer 2018 we undertook a staff travel survey completed by 1 in 2 staff and 1 in 3 councillors on how they travel to work and travel for business. This has now been analysed and incorporated into the Travel Action Plan. We are now working towards delivering the recommendations outlined in the plan - one of which is discounted travel via the *Easit* scheme.
- The Sussex Air partnership was successful in a bid to the Defra Air Quality Grant fund for a project focussed on burning of fuels for heat and particulate emissions. 'Clean Burn Sussex' will run across East and West Sussex and Brighton & Hove. It will include work to raise awareness of the health and environmental impact of burning solid fuels such as wood and coal and encourage people to choose cleaner, more efficient fuels. It will also look to

assist those households whose only source of heating is wood or coal and try to source funding to switch to less polluting alternatives.

- We continued to use the Sussex Air Quality Emissions Mitigation Planning Guidance as part of the planning process. All ‘major’ planning applications are required to follow the guidance and produce an *Emissions Mitigation Assessment*, looking at transport emissions from a proposed development and determining the level (cost) of mitigation required to help reduce (offset) the potential effect on health and/or the local environment. The approach is quite novel and Sussex authorities are attempting to push for this approach as the norm. We have negotiated with developers to ensure appropriate mitigation is provided. The guidance is signposted within the emerging Worthing Local Plan. We have been successful in negotiating significant sums of money via s.106 planning agreements to help fund on site mitigation at developments around the Borough, for example West Durrington. We also continued to work with planning colleagues at both District and County level to ensure air quality is highlighted during pre-application discussions with developers, with the aim of incorporating appropriate mitigation into the design of schemes.
- Sussex-air (with a representative from Adur & Worthing Councils on the project team) continued revising the Sussex Air Quality & Emissions Mitigation Guidance for Planning, with the intention of publishing it in the first half of 2019.
- Worthing Borough Council embarked on work with Sustrans to draft a Local Cycling and Walking Infrastructure Plan. The draft is due for consultation in 2019.
- No decision had been made by Highways England following their 2017 public consultation on a “*proposal to improve the A27 junctions at Worthing and Lancing.*”
- West Sussex County Council commenced a review of their Parking Standards, to include provision for electric vehicles. The final version is due in 2019;

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

- Re-declaration of the existing Worthing AQMA No.2 to include provision for exceedance of the hourly mean for NO<sub>2</sub>. The declaration will be preceded by a period of consultation during 2019;
- Production of a Local Cycling and Walking Infrastructure Plan. This aims to identify new and improved walking and cycling routes and infrastructure in Worthing that align with key Council policies and programmes and support local economic growth, improvements to health and well-being and the environment, together with the engagement of key local stakeholders;
- Completion of the Sussex-air schools intervention programme in Worthing – a final report will summarise the project, the outcomes and lessons learned;
- Deliver the Sussex-air Defra grant funded 'Clean Burn' project in Worthing;
- Publication of revised West Sussex County Council Parking Standards, promoting electric vehicle charge point provision;
- Publication of a revised Sussex Air Quality Planning Guidance, updated to assist with local development control and enhance the air quality emissions mitigation section of the Guidance;
- A Public Health information campaign, led by West Sussex County Council, via the West Sussex Inter Authority Air Quality Group;
- Provision of a Worthing Car Club, initially for the Town Centre, to reduce single car ownership and facilitate new developments with no parking;
- Provision of additional anti-idling signs at level crossings in Worthing, to try and persuade vehicle drivers to switch off whilst waiting;
- Evaluation of the West Sussex County Council trial of electric vehicle pool cars for staff.

Worthing Borough Council's priorities for the coming year are

- Consultation on re-declaring the existing Worthing AQMA No.2 to include exceedance of the hourly mean for NO<sub>2</sub>;
- Production of a Local Cycling and Walking Infrastructure Plan for Worthing;
- Completion of the Sussex-air schools intervention programme – analysing the outcomes and lessons learned;
- Replacement of Council fleet vehicles with ULEV versions on a case by case basis, in line with our 'Platforms for Places' commitments;
- A Public Health information campaign, led by West Sussex County Council, via the West Sussex Inter Authority Air Quality Group;
- Continue to explore the provision of electric vehicle charge points – public charge points and private in new developments;
- Provision of a Worthing Car Club;
- Provision of additional anti-idling signs (where necessary) at level crossings in Worthing;
- Continue to pursue the low emission mitigation approach to new developments by using the (revised) Sussex Air Quality Emissions Mitigation Guidance and work in partnership with highway authorities;
- A better, closer working relationship with Highways England, who are responsible for the A27;

The principal challenges and barriers to implementation that Worthing Borough Council anticipates facing are

- There remains development pressure in the Worthing area. A large number of major developments have either been granted permission or are planned for the Borough, most being in or close to the Town Centre. Balancing the demand for development with the need to improve (and certainly not worsen) air quality brings challenges. These developments also bring opportunities to improve infrastructure, especially for walking and cycling, and thus limit the impacts on the existing AQMA and avoid creating new hotspots.

The only allocated site of any significant scale in Worthing is the West Durrington Development - 700 dwellings approved (of which approximately

two thirds have now been completed). Phase 2, for a further 240 dwellings, has been approved subject to the signing of a Legal Agreement.

The draft Worthing Local Plan published for consultation at the end of 2018 included the following allocations:

- A1 - Caravan Club - 75 dwellings
- A2 - Land West of Fulbeck Ave - 50+ dwellings
- A3 - Land at Upper Brighton Rd - 123 dwellings
- A4 - Decoy Farm - employment uses
- A5 - Teville Gate - 300 dwellings and mixed uses
- A6 - Union Place - 128 dwellings and mixed uses
- A7 - Grafton - 113 dwellings and commercial uses
- A8 – Worthing Civic Centre Car Park - 64 dwellings and a health hub.

Site A3 at Upper Brighton Rd is in close proximity to the AQMA - as are Omission Site 2 - Land North of Beeches Ave and Omission Site 3 - Worthing Utd FC.

- Failure by Highways England to deliver an effective plan for the A27. Improvements to the road provide the biggest opportunity to bring about pollutant reductions, however there is also a risk that any improvements may attract more vehicles, meaning any potential gains are wiped out;
- The business anti-idling project has found recruiting businesses problematic, with a distinct lack of engagement. This is primarily as a result of the withdrawal of appropriate and relevant grants and business support programmes to enable improvements;
- Providing sufficient resources (financial and personnel) in order to progress and deliver effective air quality measures;
- Identifying suitable sites for the installation of electric vehicle charge points continues to be problematic. The sites need to be close to a sufficient electricity supply, sited to ensure they are likely to be frequently used (i.e. in the correct place) and be in a safe and secure setting;

- Identifying sufficient funding to install electric vehicle charge points. Sound business cases must be put forward before any commitments are made by elected Members;
- The provision of additional low emission vehicles into the Council's pool car fleet will depend on funding and suitable vehicles being available. At present electric vehicles are not part of the fleet due to the lack of ev charge points at Council sites.
- Engagement with Highways England has been rather erratic in recent years, so our aim continues to be to ensure we work more closely with them in order to deliver the Action Plan. This does rely on Highways England engaging with us.

Progress on the following measures has been slower than expected due to:

- A27 Highway Improvements relies on Highways England and the final decision on the way forward has still not been published. Improvements to the A27 present the largest opportunity for emission reduction;
- LEZ/CAZ feasibility – This is linked to the aforementioned improvements. As this is a Highways England road such schemes would require Highways England approval/funding; enforcement is also an issue. There are currently no plans to look into these schemes in the foreseeable future and as such this action will be reviewed in 2020/21;
- Cut Engine Cut pollution signs – we are targeting queuing traffic exiting Lyons Farm. This is a WSCC road so we have had some limited discussions with them, however concerns over effectiveness and street clutter continue;
- The provision of additional low emission vehicles into the Council's pool car fleet has been delayed due to the lack of EV charge points at Council sites. We are seeking to address this;
- The EV cars in the WSCC pool car fleet are proving popular with staff. Analysis of their cost effectiveness against the conventional fleet cars is slightly delayed due to issues with tracking data.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Worthing Borough Council anticipates that further additional measures

not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of Worthing Borough Council AQMA No.2. The Air Quality Action Plan is scheduled for review in 2021/21 when the existing measures will be completely reviewed and amended and new measures included where necessary.



Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	A27 Highway Improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Highways England. Funding: Highways England	2015	2021/22	Reduction in levels of NO2	High	Consultation by Highways England on one option ("to improve the A27 junctions at Worthing and Lancing") took place during Summer 2017. A decision about the A27 Worthing-Lancing to Arundel has not been announced yet.	Unknown	Still awaiting outcome from Highways England. Estimated completion date now unknown. No AQ assessment was included, so any AQ benefits remain unquantified by HE.
2	Cut Engine, Cut Pollution Signs	Traffic Management	Anti-idling enforcement	HE/WSCC: Funding HE/WSCC/WBC	2016-18	2018 on	Local AQ monitoring/reduction in NO2	Low/Med	Consideration of A27 AQMA signs on hold pending HE consultation outcome. Any signs only likely on exit road from Lyons Farm. Additional signs being erected at level crossings in Worthing.	Unknown	Sussex-air funded additional signs at level crossings. For A27 and feeder roads Highway 'clutter' is a concern. Est. completion date for A27 now unknown.
3	LEZ/CAZ Feasibility	Promoting Low Emission Transport	Low Emission Zone (LEZ)	HE/WBC/WSCC Funding: HE	2016	2017 onwards	Reduction in older Euro class HGV's/LGV's and buses within the AQMA	High	Yet to progress. Outcome of A27 consultation delaying further discussion	Unknown	As a HE road any CAZ/LEZ is an issue. There are many variables here - issues with displacement of vehicles onto surrounding local roads, Finance, Enforcement -meaning this is not a current priority. Review in

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											2020.
4	Embed Air Quality Emissions Mitigation Planning Guidance for Sussex into the planning process/planning policies	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WBC/WSCC. Funding: WBC/WSCC	2014	2015 on	LE mitigation secured in developments	Low	Guidance signposted within the draft Worthing Local Plan. Discussions ongoing to ensure Guidance and appropriate mitigation is flagged as a requirement at an early stage. Emission mitigation assessments being pursued with developers to ensure meaningful mitigation obtained. Walking and cycling initiatives and eV charge points secured at West Durrington and smaller developments.	2019	Focus on minimising number of trips made by cars, provision of appropriate and meaningful mitigation and installation of EV charge points
6	EV vehicles and infrastructure	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	WBC/WSCC Funding HE/WSCC/WBC	2016/18	2017-20	Number of charge points provided	Low/Med	WSCC developing ULEV strategy, expected by the end 2019/20. Discussions continue with developers as part of AQ mitigation packages. Local authorities are in dialogue with bus operators to consider funding opportunities as and when they arise.	2025	Focus is to increase the number of eV's. WSCC ULEV strategy expected by the end of the financial year 2019/20. Discussions continued successfully with developers as part of AQ mitigation packages.
7	Worthing Car Club	Alternatives to private vehicle use	Car Clubs	WBC/ADC. Funding: Developer contributions/WBC	2015-19	2019 on	Number of people using the service/Number of vehicles available	Low	Use of Adur & Worthing staff pool cars ruled out. Discussions due 2019 to facilitate car club provision.	2020	V. small reduction in AQMA, however larger reductions can be anticipated elsewhere (e.g. town centre).

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8	Public transport improvement	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	WSCC Funding: WSCC	Ongoing	Ongoing	Journey time and passenger number improvements	Low	Through the current Worthing Town Centre Public Realm Improvements design work, Worthing Road Space Audit and Worthing Area Sustainable Transport Package Feasibility Studies work, it is expected that improvements in access to/from public transport gateways will be developed in Worthing. Bus operators in West Sussex are considering low emission fuel technologies in their fleets and local authorities are in dialogue with operators as plans develop, including consideration of any future funding opportunities	Ongoing	Subject to appropriate funding being made available.
9	WBC AND WSCC Staff Travel Planning	Promoting Travel Alternatives	Workplace Travel Planning	WBC/ADC/WSCC. Funding: WBC/ADC/WSCC	2018/19	2019 on	Staff travel surveys reduced commuting and business travel by car	Low	Adur & Worthing EASIT scheme for staff and local businesses was launched in December 2018. WSCC EASIT scheme already exists. Staff car allowances under review , further hybrids added to pool car fleet.	2019/20	Focus on reducing staff car journeys for work and promoting sustainable travel for trips to and from work including alternatives to car travel.
10	Improve Emissions from Council's Vehicle fleet	Promoting Low Emission Transport	Company Vehicle Procurement	WBC/ADC/WSCC Funding: WBC/WSCC	2015	2016 on	No. of vehicles replaced with better Euro standard models	Low	Fleet replacement programme ongoing, with the preference now being ULEV's. Hybrids added to pool car fleet.	Ongoing	Council to demonstrate leadership. Low reduction within AQMA

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11	Increase availability of AQ information in relation to impacts on Public Health	Public Information	Via the Internet	WBC Funding: WBC	2015	Ongoing	Reduction in levels of NO2/No. of hits on AQ pages	Low	AQ information updated on WBC and WSCC websites. WSCC promotional material	Ongoing	Measure success of AQAP/levels in AQMA. Assist with PM2.5 strategy
12	Embedding AQ in Adur & Worthing Public Health Plan	Policy Guidance and Development Control	Other policy	WBC Funding: WBC	2015	2016/17	Inclusion in each revision of public Health Plan	Low	Air Quality Action Plans included within newly revised Adur & Worthing Public Health Plan.	Ongoing	Ensure AQAP is given added weight and priority.
13	Promotion of Air Alert	Public Information	Via the Internet	WBC Funding: WSCC/WBC	2014	Ongoing	Annual increase in subscriber numbers	Low	Liaison with West Sussex County Council Public Health & Sustainability teams who have supported the promotion of air Alert - www.airalert.info - through financial backing and supporting publicity in West Sussex.	Ongoing	Attempt to reduce cat journeys/increase walking and cycling particularly through the AQMA, promotion of air Alert service.
14	Re-assess traffic light sequencing in AQMA	Traffic Management	UTC, Congestion management, traffic reduction	HE/WSCC Funding: HE/WSCC	Ongoing	Ongoing	Reduction in levels of NO2	Low	Ongoing optimisation by HE/WSCC.	Ongoing	
15	Safe Cycling and Walking Routes	Transport Planning and Infrastructure	Cycle network	WSCC/HE Funding: HE/WSCC	Ongoing	Ongoing	Length of new cycle routes provided	Low	Design work is taking place on a number of cycle route improvements in and around Worthing under the West Sussex Walking & Cycling Strategy.. Additional improvements to walking and cycling routes are being explored through the Local Cycling and Walking Infrastructure	Ongoing	There already exist cycle paths segregated from pedestrians in and around Grove Lodge.

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									Plan, due in 2019 and the development of the Worthing Area Sustainable Transport Package Study during 2019/20.		
16	Travel plans for significant/major developments	Promoting Travel Alternatives	Other	WSCC/WBC	2015	Ongoing	Number of plans delivered	Low	Discussions ongoing with developers for forthcoming 'major' developments in Worthing.	Ongoing	Forthcoming Worthing Local Plan may add weight to need for travel plans and appropriate mitigation.
17	Car Sharing	Alternatives to private vehicle use	Car & lift sharing schemes	WSCC Funding: WSCC	2015	2015/16	Website hits/journeys planned/Number of registrants/take-up of initiatives	Low	Car share website now westsussexcarshare.com	Ongoing	Focus on promoting sustainable travel/car reductions
19	Cycling & Walking promotion	Promoting Travel Alternatives	Promotion of cycling	WSCC/Worthing BC Funding: WSCC/developer contributions	2015	Ongoing	Automatic cycle counters and travel surveys	Low	The "Walk To" programme led by Living Streets continues to work with a number of Primary and Secondary schools across Worthing providing an outreach project officer to work with pupils to encourage them to walk to school. Funding to continue through the Department for Transport Access Fund to 2019/20. Sussex-air schools project work with Sustrans and Living Streets assists the walk/cycle to school theme.	Ongoing	Focus on reducing traffic congestion and promoting sustainable travel for trips to and from work. Subject to available funding .

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20	WSCC staff travel planning	Promoting Travel Alternatives	Workplace Travel Planning	WSCC Funding: WSCC	2014	Ongoing		Low	Pool cars provided for casual user staff including EV's.	Ongoing	Renault Zoe's added in 2018.
21	School Travel Plans	Promoting Travel Alternatives	School Travel Plans	WSCC Funding: WSCC	Ongoing	Ongoing		Low	Schools are directed to Modeshift Stars for assistance with travel planning, which is an online nationally recognised travel planning tool.	Ongoing	Focus on promoting sustainable travel amongst young people and reducing peak time car traffic. WSCC Bikeability has been engaging with primary and secondary schools across Worthing to offer cycle training.
22	Business Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	WBC Funding: Funding: WBC/WSCC	2017	2018 on	No. of plans devised/revise d	Low	Sussex-air business intervention project was seeking businesses in and around the AQMA. Update due in 2020.	Ongoing	Sussex-air project final report due 2020
23	Worthing College Travel Plan Review	Promoting Travel Alternatives	School Travel Plans	WBC/WSCC Funding: Worthing College	2015/16	2016/17	Reduction in use of private cars for trips to/from College/Increase in use of alternative modes of travel.	Low/Med	Review completed 2018.	Ongoing	
24	HGV/LGV assessment	Transport Planning and Infrastructure	Route Mgt plans/Strategic routing for HGV's	WBC Funding: WBC/WSCC	2016/17	2018-20	Data on Euro Classes	Low	Defra AQ grant funded Sussex-air project for business fleet advice, may include some HGV/LGV's.	2020/21	Sussex-air project final report due 2020
25	Ecostars for Local Fleet Operators	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	WBC Funding: WBC	2016/17	2018/19	Increase in new euro Class vehicles	Low/Med	Defra AQ grant funded Sussex-air project for business fleet advice including signposting Ecostars.	2020/21	The EcoStars scheme remains an aspiration, but is subject to identification of suitable funding streams.
26	Increase and improve availability of WBC Air Quality Monitoring	Public Information	Via the Internet	WBC Funding: WBC	2015	2015-18	Reduction in levels of NO2/No. of hits on AQ pages	Low	Link to UK Air for Grove Lodge AURN monitoring; Diffusion tube results placed on website after Bias correction factors made available.	Ongoing	Further revision and consolidation of webpages planned for 2019.

	results										
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## 2.3 PM<sub>2.5</sub> – 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<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Work carried out by Public Health England as part of the Public Health Outcomes Framework (PHOF) shows that the mortality associated with particulate air pollution within Worthing Borough Council is 4.3 %.

Figure 2-1 shows that the mortality calculated for Worthing Borough Council is less than that calculated for south east England (4.9 %) and England (5.1 %) as a whole.

**Figure 2-1 Fraction of mortality attributed to particulate air pollution in Worthing Borough Council**



Worthing Borough Council is currently developing its approach to address PM<sub>2.5</sub> in partnership with West Sussex Public Health and other local authority officers through Sussex-air. We have developed the Clean Burn campaign, funded through the Sussex-air Defra funding, in an attempt to reduce particulate emissions from domestic burning. The project runs through 2019 into 2020 and we hope to encourage best practice in relation to burning.

The Council has considered the declaration of Smoke Control Areas, however there are considerable barriers to this, most notably issues with enforcement relating to non-compliant stoves and fireplaces existing at the time of any declaration. This would also require political and public support. We will update guidance on our website relating to domestic burning as part of the Clean Burn campaign.



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Adur & Worthing Councils monitor levels of PM<sub>2.5</sub> through the AURN affiliated continuous monitoring station at Grove Lodge, Worthing (A27), which will help to show us the extent of any PM<sub>2.5</sub> issue in the area. The annual mean for PM<sub>2.5</sub> in 2018 was 10µgm<sup>-3</sup>.

## 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.

Worthing Borough Council undertook automatic (continuous) monitoring at one site during 2018. Table A.1 in Appendix A shows the details of the site. The site is AURN affiliated.

NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at <https://uk-air.defra.gov.uk/>.

Maps showing the location of the monitoring sites 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.

It is important to mention here that the national air quality objectives apply to sites where there is 'relevant exposure'. These are the facades of residential premises, schools etc. and do not cover scenarios such as passing pedestrians. Therefore measured levels are often predicted back to represent the nearest relevant exposure as required by Defra (and using standard prediction methods and tools published by Defra).

#### 3.1.2 Non-Automatic Monitoring Sites

Worthing Borough Council undertook non- automatic (passive) monitoring of NO<sub>2</sub> at 34 sites using 36 tubes during 2018. Table A.2 in Appendix A shows the details of the sites.

Three sites were added for 2018 -

N60 Ham Road/Lyndhurst Road close to a traffic light controlled junction, N61 Cricketers Parade to take account of recent -residential conversions; and N62 Steyne Gardens, added for a year at the request of a local resident concerned about levels in and around Steyne Gardens.

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

Scalable maps are also available at <https://www.adur-worthing.gov.uk/maps/general-map/> (tick the Air Quality Management Areas box to the left side of the map).

Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

## **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<sub>2</sub>)**

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year.

Results from 2018 again show a mixed picture of NO<sub>2</sub> across the Borough. The continuous monitoring site at Grove Lodge recorded a slight increase in the ratified annual mean from 35.8µg/m<sup>3</sup> in 2017 to 37µg/m<sup>3</sup> in 2018.

Of the 36 diffusion tubes used in 2018 21 showed a reduction ranging from 0.4 to 8.8µg/m<sup>3</sup>, whilst 12 showed an increase ranging from 0.2µg/m<sup>3</sup> to 8.6µg/m<sup>3</sup>.

This year just two sites showed an exceedance of the annual mean objective for NO<sub>2</sub> - tube site N30A Grove Lodge Cottages and N44B & C - all within the Grove

Lodge AQMA. Site N30A regularly exceeds the annual mean objective and is the reason for the AQMA being considered for re-declaration of exceedance of the hourly mean objective.

### **Automatic Continuous monitoring**

Fig A1.1 shows the annual average NO<sub>2</sub> since 2014, measured at the automatic monitoring site located on the A27 at Grove Lodge. This is a strategic trunk route through Worthing and traffic speeds tend to be low for prolonged periods during the day. NO<sub>2</sub> peaked at 51.4µgm<sup>-3</sup> in 2014, decreased to 37.4µgm<sup>-3</sup> in 2015, increased again in 2016 to 48µgm<sup>-3</sup> and decreased significantly to 35.8µgm<sup>-3</sup> in 2017. In 2018 concentrations increased slightly to 37µg/m<sup>3</sup>. When the level measured at the roadside monitor WT2 is predicted back to the nearest relevant receptor (a residential facade), the level reduces to 25.4µg m<sup>-3</sup>, well below the 40µg m<sup>-3</sup> objective.

The hourly mean objective of 200µg m<sup>-3</sup> was not exceeded at any time during 2018.

It has been suggested that the Worthing College site adjacent to the AQMA, which opened in Autumn 2013, may have led to the large increase recorded in 2014. However the measured annual mean fluctuations since 2014 appear to counter this view.

As stated in last year's ASR, a change in the Highways England traffic data database in 2015 means we cannot compare data collated prior to 2015 with data collated since. In last year's ASR we stated we would review traffic data in this ASR. Traffic data has now been obtained from Highways England covering 2016 - 2018 for both carriageways of the A27 near Grove Lodge (see Figure 3-1 below). Whilst there has been a relatively large drop in eastbound traffic since 2016, westbound traffic volumes have remained stable. However for 2018 the volume of traffic on both carriageways was very similar. Therefore whilst a small drop in traffic volumes has been recorded this is unlikely to be of sufficient magnitude to be the reason for the fall in measured levels. We would hope that the actions listed in Section 2 are assisting the fall in measured levels, alongside the national trend towards a cleaner vehicle fleet. It is also likely that increased awareness of air quality is resulting in more people changing their behaviour – cycling and walking,

eco-friendly driving, etc. It is also possible that some local traffic is avoiding the AQMA as it suffers from severe congestion during many parts of the day, including weekends.

**Figure 3-1 – Annual Average Daily Traffic (AADT) Flows, A27 Worthing**

NTIS Link ID	NTIS Link Location Name	AADT 2016	AADT 2017	Difference 2016-17	AADT 2018	Difference 2017-18
103024103	A27 westbound between A2025 and A24 near Worthing (east)	15,334	14,511	-823	14,994	483
125021201	A27 eastbound between A24 near Worthing (east) and A2025	18,454	15,849	-2,605	15,527	-322

### Diffusion tubes

Of the 36 monitoring tubes used during 2018 (at 34 different sites) 21 showed a reduction from 2017 levels – sites 4N, 6N, N5, N8 N18A, N21, N22, N25, N28, N29, N30A, N35, N43, N44A, N44C, N45, N53, N54, N56, N57, N58 - the reductions ranging from  $0.4\mu\text{g}/\text{m}^3$  at sites 4N (an urban background site at Heene Way) and N44C (one of the tubes co-located with the continuous analyser at Grove Lodge) to  $8.8\mu\text{g}/\text{m}^3$ .

12 tubes showed an increase – 5N, N10, N11, N24, N27, N31, N39, N42, N44B, N48, N52, N55 - ranging from  $0.2\mu\text{g}/\text{m}^3$  at site N11 (an urban background site at Dawes Close) to  $8.6\mu\text{g}/\text{m}^3$  at N24 (a roadside site at 152 Upper Brighton Road, within the AQMA).

The full 2018 dataset of monthly mean values is provided in Appendix B.

Three tubes at two locations measured exceedances of the annual mean objective, all within the AQMA and close to the Grove Lodge roundabout on the A27. The highest level of  $60.1\mu\text{g m}^{-3}$  was again measured at N30A Grove Lodge Cottages adjacent to the westbound carriageway of the A27. Interestingly this is a decrease of just over  $8\mu\text{g m}^{-3}$  from 2017 levels and is the lowest recorded level in 5 years. This monitoring site is just over 2 metres from a residential façade so the level only decreases slightly when predicted back (to  $59.2\mu\text{g m}^{-3}$ ).

Guidance suggests any site exceeding  $60\mu\text{g m}^{-3}$  risks exceeding the 1-hour mean objective of  $200\mu\text{g m}^{-3}$ . This site has exceeded  $60\mu\text{g m}^{-3}$  for many years Figure A.1.3 shows the 5 year trend. Feedback from Defra's appraisal of previous ASR's

advises the Council to consider amending the existing AQMA to incorporate exceedance of the 1-hour mean objective for NO<sub>2</sub>. This is planned for 2019, with a period of consultation prior to declaration.

Once again the continuous analyser on the opposite carriageway has recorded no exceedances of the one hour mean objective.

Tubes N44B and N44C also recorded exceedances of the annual mean, recording levels of 41.6µgm<sup>-3</sup> and 40.8µgm<sup>-3</sup> respectively. These are collocated with the continuous analyser at the roadside and when predicted back to the nearest residential facades the levels fall to 27.6µgm<sup>-3</sup> and 27.2µgm<sup>-3</sup> respectively.

We have 14 tubes within the AQMA. All but two of these recorded levels below the annual mean objective and 11 recorded decreases on 2017 levels. Two tubes recording exceedances were collocated with the continuous analyser. Interestingly two of the three collocated tubes showed a decrease in levels from 2017, whilst one showed an increase, demonstrating the uncertainty associated with diffusion tubes.

Site N24 within the AQMA close to Lyons Farm on the A27 recorded the largest increase of 8.6µgm<sup>-3</sup> from 25.9µgm<sup>-3</sup> in 2017 to 34.5µgm<sup>-3</sup>. This is a facade mounted tube at 152 Upper Brighton Road so relevant exposure is represented by this figure. At this stage we have no idea why the increase is so large.

Site 6N Gainsborough Avenue showed a reduction again in 2018. In 2016 this roadside site exceeded the annual mean objective (40.7µg m<sup>-3</sup>). This year it fell to 35.1µgm<sup>-3</sup>. When predicted back to the closest receptor this level falls to 26.2µg m<sup>-3</sup>, comfortably below the annual mean objective. A 5 year trend graph is included in Figure A.1.6

Previous monitoring at Downlands Parade (site N29), close to the Lyons Farm junction on the A27, showed exceedances of the annual mean at residential receptors. Levels have been decreasing over recent years, with the recorded level decreasing by almost 9µg m<sup>-3</sup> to 23.6µgm<sup>-3</sup> last year, comfortably below the annual mean objective.

Site N57 Lyndhurst Road near the former gas holder station was identified in our 2013 Further Assessment as being a potential site of exceedance. The result here in 2018 was 25µg m<sup>-3</sup>, a drop of almost 3µg m<sup>-3</sup> and well below the annual mean

objective. We shall continue to monitor for any changes as a number of major developments are planned for the area.

Of the new sites added in 2018 Site N61 Broadwater Street West produced a level of  $36.8\mu\text{g m}^{-3}$ . This is a kerbside monitoring location and when predicted back to the closest relevant receptor just 4m away, levels fall off to  $28\mu\text{g m}^{-3}$ .

Fall-off calculations of  $\text{NO}_2$  concentration with distance from kerbside are shown in Appendix C.

Figures A.1.1 to A.1.6 in Appendix A show 5 year trends in  $\text{NO}_2$  concentration at the continuous monitoring site WT2 and diffusion tube sites N30A, N44, N29, and 6N.

### **3.2.2 Particulate Matter ( $\text{PM}_{2.5}$ )**

**Table A.** in Appendix A presents the ratified and adjusted monitored PM<sub>2.5</sub> annual mean concentrations for last year. This is the first full year of PM<sub>2.5</sub> monitoring at this location. The recorded and ratified level was 10µg m<sup>-3</sup>. This is comfortably within the EU Limit Value of 25µg/m<sup>3</sup> and the second target level of 25µg/m<sup>3</sup>. It also meets the World Health Organisation (WHO) annual mean guideline limit is 10µg/m<sup>3</sup>.

We will be in a position to comment further once we have more than a year's results.

.



## 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) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
WT2	Grove Lodge	Roadside	514184	104963	NO2; PM2.5	YES	Chemiluminescence	18.3	2.9	1.8

**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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
4N	Heene Way (UK02)	Urban Background	513609	102557	NO2	NO	5.5	1.5	NO	1.5
5N	Cleveland Road (UK01)	Urban Background	512702	105560	NO2	NO	6.3	2.0	NO	2.0
6N	Gainsborough Avenue (UK06)	Roadside	515190	105122	NO2	NO	11.4	2.0	NO	2.0
N1C	High Street East	Urban Centre	515114	102670	NO2	NO	0.0	3.3	NO	2.0
N5	First Avenue	Roadside	514495	105020	NO2	NO	15.3	2.4	NO	1.5
N8	Littlehampton Road	Roadside	513236	104651	NO2	NO	14.1	1.5	NO	3.5
N11	Dawes Close	Urban Background	515812	103309	NO2	NO	8.2	1.4	NO	1.5
N18A	Kinnall Court, Upper Brighton Road	Suburban	515315	105141	NO2	NO	0.0	12.0	NO	2.0
N21	Greenwood Cottage, A27	Roadside	509777	105696	NO2	NO	7.3	2.6	NO	3.0
N22	Falmer Close, C-Dust monitor	Urban Background	511010	102226	NO2	NO	14.6	2.2	NO	1.5
N24	152 Upper Brighton Road	Roadside	515151	105109	NO2	NO	0.0	8.0	NO	2.0
N25	Warren Court House	Suburban	513846	105184	NO2	NO	0.0	19.3	NO	2.0
N27	Tarring Road, Crossing	Roadside	513380	103352	NO2	NO	0.0	3.2	NO	2.5
N28	Chapel Road/Teville Road	Roadside	514740	103173	NO2	NO	1.4	3.2	NO	2.5
N29	Downlands Parade	Roadside	515014	105099	NO2	NO	0.0	7.3	NO	4.0
N30A	Grove Lodge Cottages	Roadside	514183	104948	NO2	YES	0.2	2.2	NO	2.5
N31	South Farm Road, roundabout	Kerbside	514317	103329	NO2	NO	4.0	0.9	NO	2.5

N35	30 Upper Brighton Road House	Roadside	514266	104961	NO2	YES	0.0	11.5	NO	2.0
N39	SW of roundabout at Grove Lodge	Roadside	514088	104907	NO2	YES	44.0	2.5	NO	4.0
N42	Norfolk House	Roadside	514742	103234	NO2	NO	0.0	3.6	NO	2.0
N43	23 Upper Brighton Road	Suburban	514199	104982	NO2	YES	0.0	19.2	NO	2.0
N44A	NOx Analyser 21 Upper Brighton Road	Roadside	514184	104963	NO2	YES	18.3	2.9	YES	2.0
N44B	NOx Analyser 21 Upper Brighton Road	Roadside	514184	104963	NO2	YES	18.3	2.9	YES	2.0
N44C	NOx Analyser 21 Upper Brighton Road	Roadside	514184	104963	NO2	YES	18.3	2.9	YES	2.0
N45	11 Hill Barn Lane	Suburban	514126	105063	NO2	YES	0.0	13.0	NO	2.0
N48	Shaftesbury Avenue	Roadside	512080	103361	NO2	NO	12.5	2.2	NO	2.0
N52	Newland Road	Kerbside	514973	103335	NO2	NO	4.5	0.3	NO	2.0
N53	Offington Corner	Roadside	513278	105623	NO2	YES	18.6	6.0	NO	2.0
N54	The Aquarena	Roadside	515593	102707	NO2	NO	10.0	3.7	NO	3.0
N55	Varey Road / Fulbeck Avenue	Suburban	510766	104875	NO2	NO	66.0	3.2	NO	3.0
N56	Titnore Way	Suburban	510318	104506	NO2	NO	11.2	1.2	NO	3.0
N57	Lyndhurst Road	Roadside	515114	102975	NO2	NO	0.0	3.5	NO	2.5
N58	Yeoman Road	Kerbside	510931	104026	NO2	NO	18.9	2.3	NO	3.0
N60	Ham Road / Lyndhurst Road	Roadside	516177	103227	NO2	NO	3.1	2.7	NO	2.5
N61	Broadwater Street West	Roadside	514501	104549	NO2	NO	4	0.5	NO	2.0
N62	Steyne Gardens	Kerbside	515201	102500	NO2	NO	4.7	0.8	NO	2.0

**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 NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2018 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2014	2015	2016	2017	2018
WT2	Roadside	Automatic	95	95	<b>51.1</b>	37.4	<b>48.0</b>	35.8	37.0
4N	Urban Background	Diffusion Tube	100	100	13.0	11.0	13.8	14.5	14.1
5N	Urban Background	Diffusion Tube	100	100	15.1	13.4	16.0	15.9	16.9
6N	Roadside	Diffusion Tube	100	100	36.5	38.0	<b>40.7</b>	38.1	35.1
N1C	Urban Centre	Diffusion Tube	100	100	29.8	27.5	30.3	26.8	28.5
N5	Roadside	Diffusion Tube	100	81	30.8	28.8	30.2	31.0	25.6
N8	Roadside	Diffusion Tube	100	100	27.2	28.2	30.0	30.7	29.6
N11	Urban Background	Diffusion Tube	100	92	14.2	12.7	15.5	15.6	15.7
N18A	Suburban	Diffusion Tube	100	100	23.8	21.6	25.3	24.5	23.9
N21	Roadside	Diffusion Tube	100	100	33.0	28.9	34.1	17.2	13.5
N22	Urban Background	Diffusion Tube	100	100	12.0	10.4	13.3	13.3	12.8
N24	Roadside	Diffusion Tube	100	75	25.1	22.4	25.8	25.9	34.5
N25	Suburban	Diffusion Tube	100	100	22.1	20.7	22.2	20.7	20.3
N27	Roadside	Diffusion Tube	100	85	24.4	21.6	25.7	24.7	26.2
N28	Roadside	Diffusion Tube	100	91	36.9	25.7	21.5	36.0	33.4
N29	Roadside	Diffusion Tube	100	83	<b>40.3</b>	33.5	34.6	32.4	23.6
N30A	Roadside	Diffusion Tube	100	100	<b>71.7</b>	<b>66.1</b>	<b>64.1</b>	<b>68.2</b>	<b>60.1</b>
N31	Kerbside	Diffusion Tube	100	100	30.3	24.3	27.5	26.8	27.1
N35	Roadside	Diffusion Tube	100	83	30.4	29.9	28.6	28.5	26.2
N39	Roadside	Diffusion Tube	100	100	32.8	31.1	33.5	32.0	32.7
N42	Roadside	Diffusion Tube	100	90	27.6	24.2	25.9	25.1	26.6

N43	Suburban	Diffusion Tube	100	100	23.7	21.2	<b>23.1</b>	23.1	22.3
N44A	Roadside	Diffusion Tube	100	93	<b>42.2</b>	39.2	<b>42.0</b>	<b>40.5</b>	39.8
N44B	Roadside	Diffusion Tube	100	100	<b>41.9</b>	<b>40.3</b>	<b>41.5</b>	<b>40.3</b>	<b>41.6</b>
N44C	Roadside	Diffusion Tube	100	100	<b>41.7</b>	39.8	<b>41.6</b>	<b>41.2</b>	<b>40.8</b>
N45	Suburban	Diffusion Tube	100	100	18.4	16.0	17.2	17.2	16.2
N48	Roadside	Diffusion Tube	100	100	27.6	25.6	30.1	27.0	27.7
N52	Kerbside	Diffusion Tube	100	100	23.7	21.8	24.9	24.8	26.4
N53	Roadside	Diffusion Tube	100	100	32.5	29.0	32.1	34.9	33.9
N54	Roadside	Diffusion Tube	100	75	N/A	22.4	26.0	24.6	22.8
N55	Suburban	Diffusion Tube	100	100	N/A	N/A	15.0	14.8	16.3
N56	Suburban	Diffusion Tube	100	100	N/A	N/A	25.2	25.6	25.3
N57	Roadside	Diffusion Tube	100	100	N/A	N/A	27.6	27.6	25.0
N58	Kerbside	Diffusion Tube	100	83	N/A	N/A	22.8	25.1	24.0
N60	Roadside	Diffusion Tube	100	91	N/A	N/A	N/A	N/A	24.3
N61	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	N/A	36.8
N62	Kerbside	Diffusion Tube	100	77	N/A	N/A	N/A	N/A	23.7

☒ Diffusion tube data has been bias corrected

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

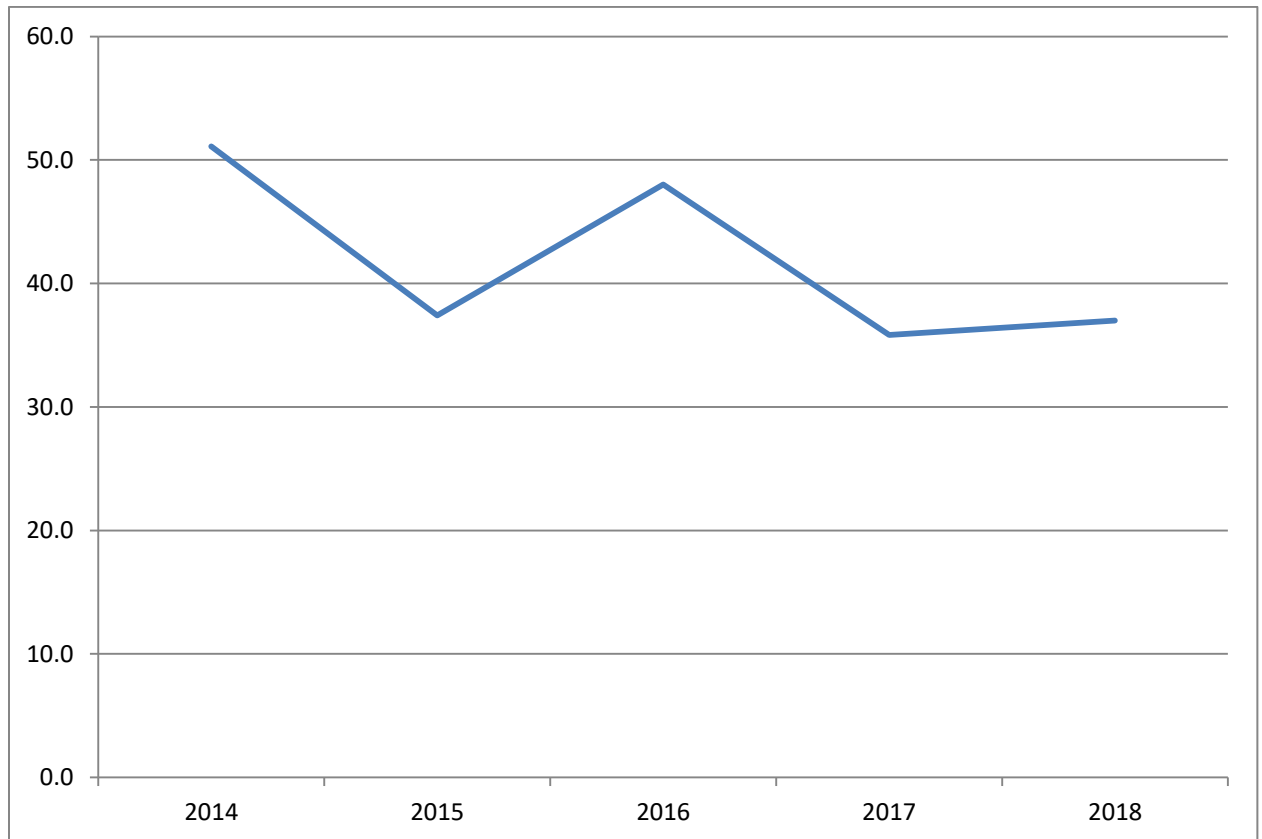
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

**Figure A.1 – Trends in Annual Mean NO<sub>2</sub> Concentrations 2014-18**

**Figure A.1.1 – Site WT2 Automatic Continuous Analyser (Roadside)**



**Figure A.1.2 – Site N44 Average of 3 co-located tubes**

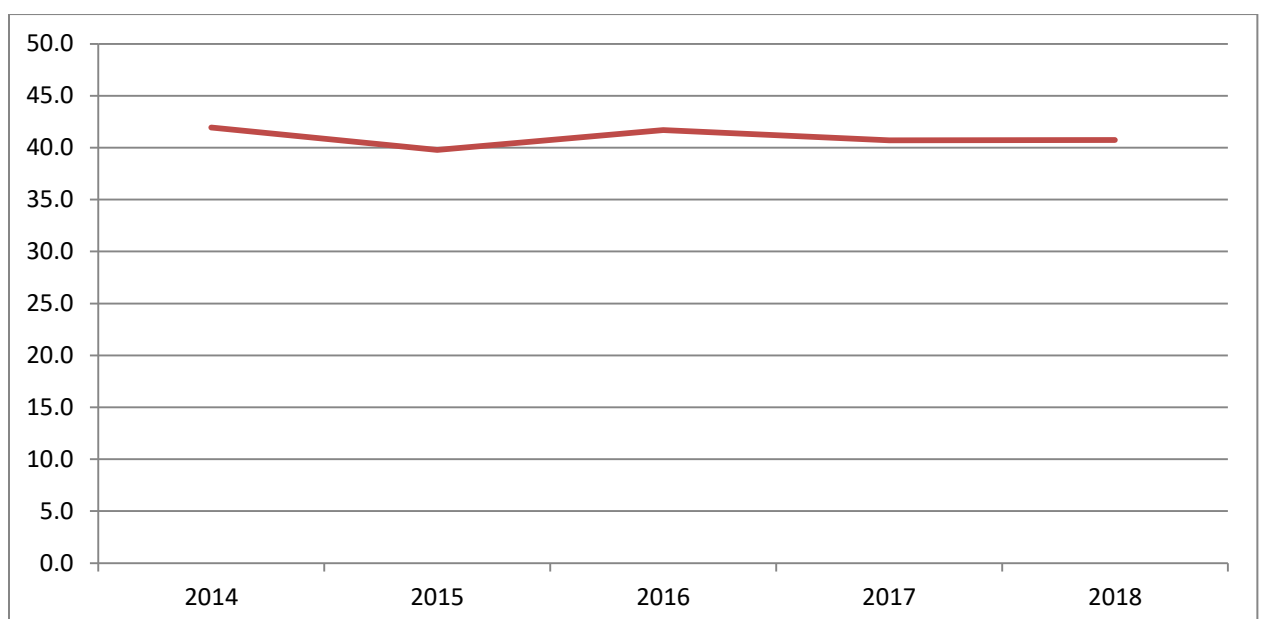


Figure A.1.3 – Site N30A Grove Lodge Cottages

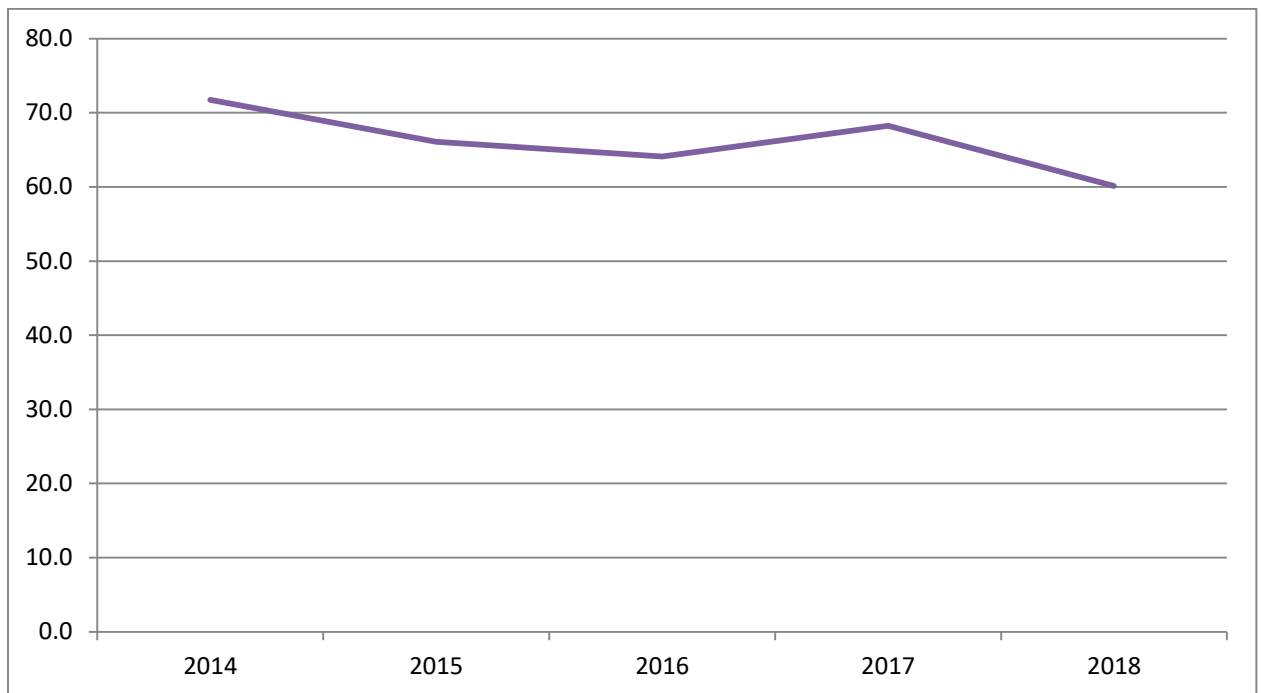


Figure A.1.4 – Site N29 Downlands Parade

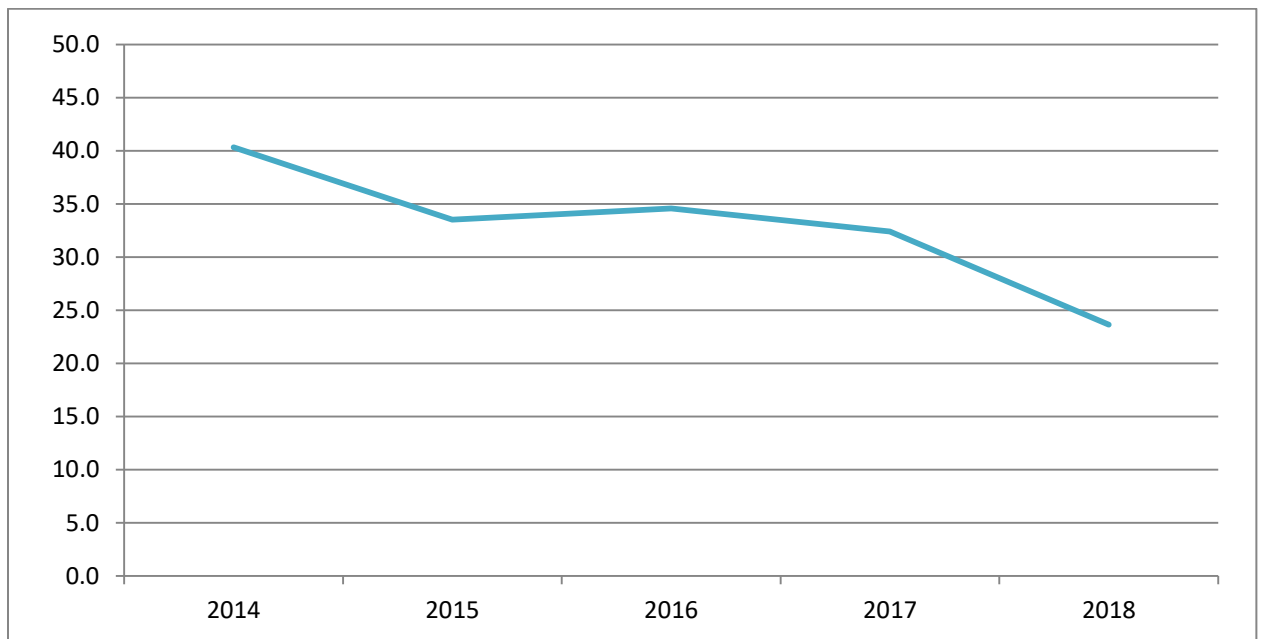


Figure A.1.5 – Site 6N Gainsborough Avenue

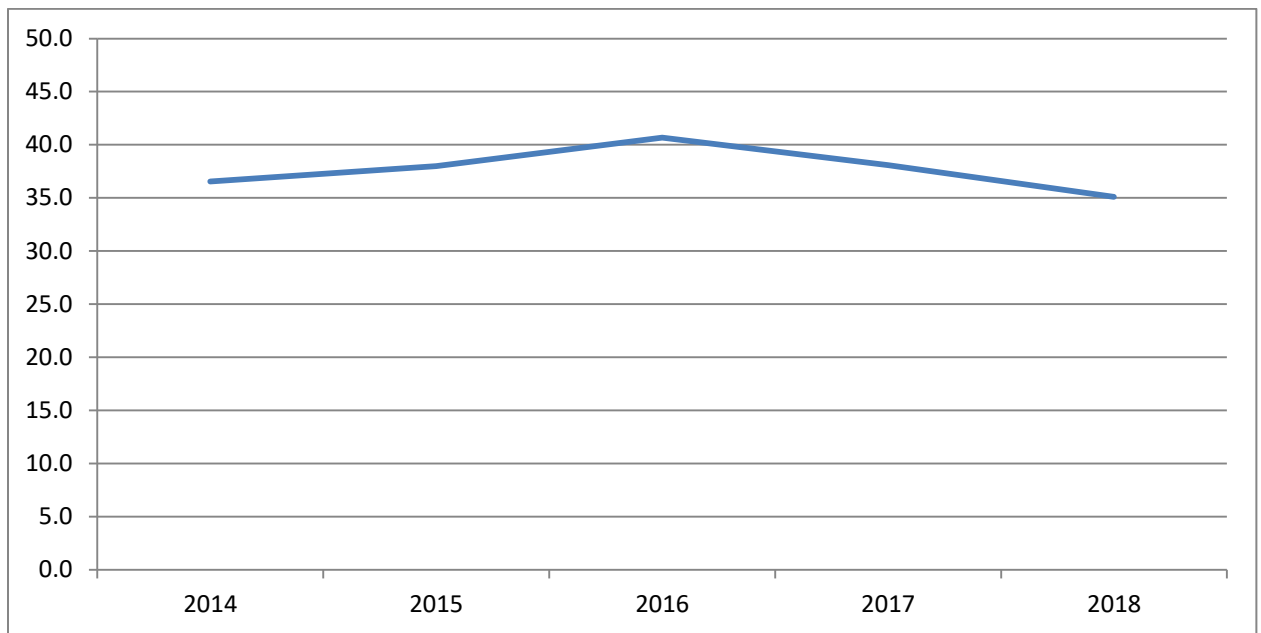
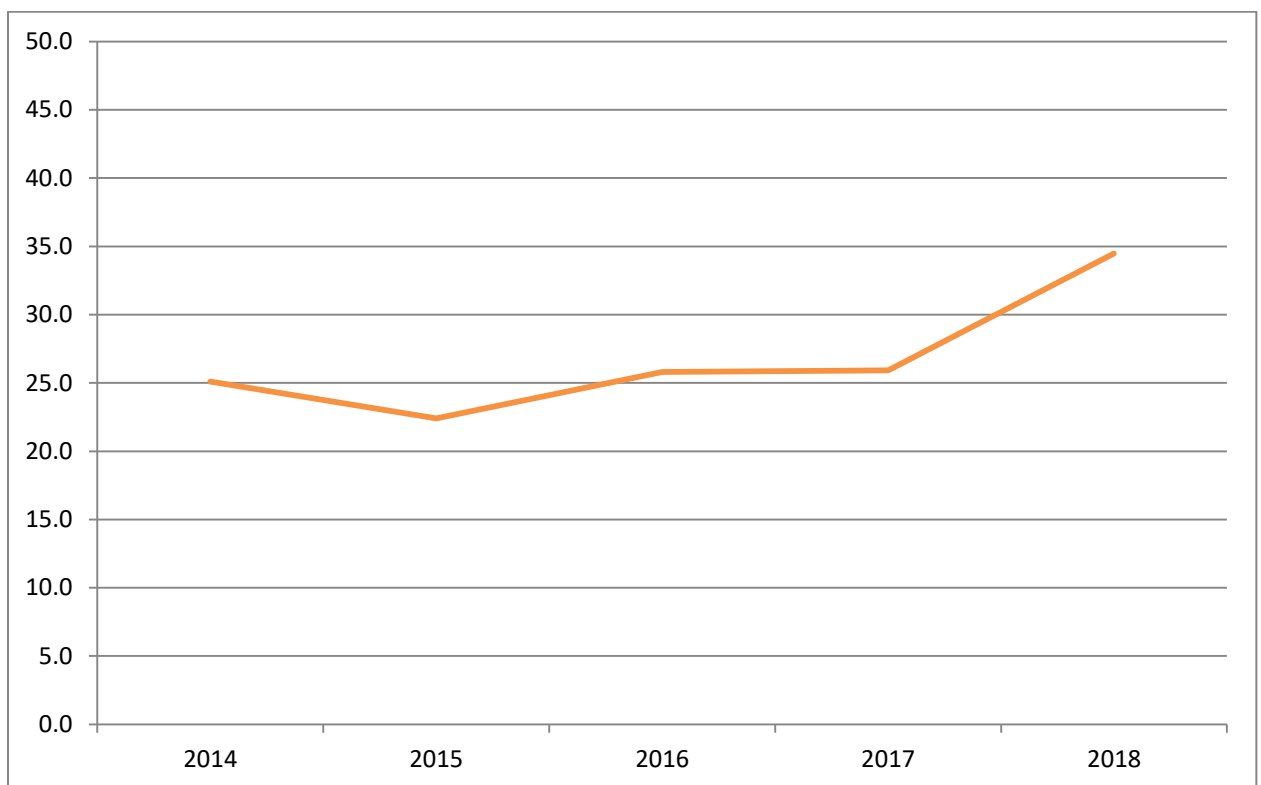


Figure A.1.6 – Site N24 152 Upper Brighton Road





**Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2018 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
					2014	2015	2016	2017	2018
WT2	Roadside	Automatic	95	95	14	2	10	0	0

**Notes:**

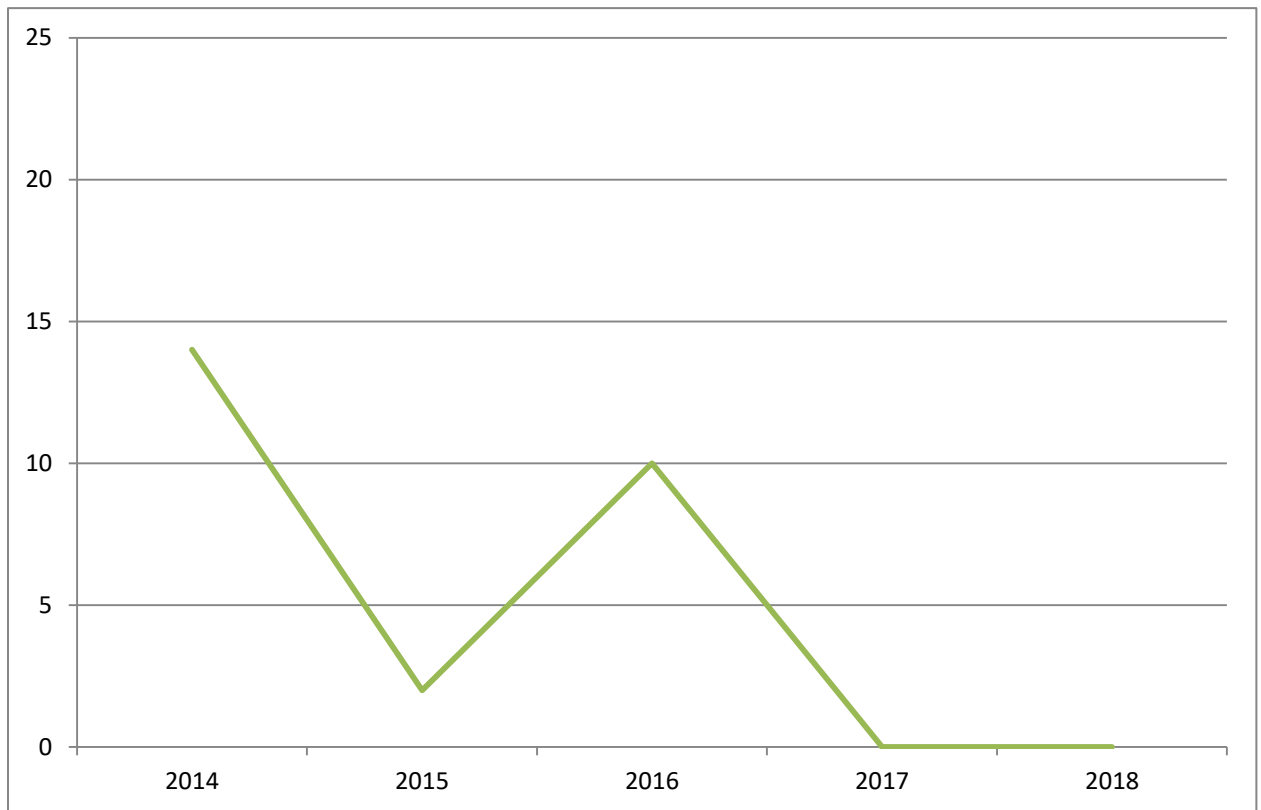
Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

(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 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

Figure A.4.1 – Trends in Number of NO<sub>2</sub> 1-Hour Means > 200µg/m<sup>3</sup>



**Table A.5 – PM<sub>2.5</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2018 (%) <sup>(2)</sup>	PM <sub>2.5</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
				2014	2015	2016	2017	2018
WT2	Roadside	75	75	N/A	N/A	N/A	N/A	10

**Notes:**

(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) All means have been “annualised” as per Boxes 7.9 and 7.10 in 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 2018

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2018

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.92) and Annualised <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
4N	18.8	19.7	17.7	13.7	14.5	10.8	12.1	11.0	11.7	18.0	17.1	18.9	15.3	14.1	13.3
5N	21.7	21.3	20.7	18.5	17.9	14.3	13.4	13.3	14.3	21.5	22.4	21.1	18.4	16.9	15.3
6N	42.2	42.1	46.4	36.6	49.1	42.2	37.2	15.5	35.2	46.4	38.1	26.6	38.1	35.1	26.2
N1C	24.1	27.4	36.2	32.4	36.5	29.5	36.9	29.7	28.5	32.2	29.1	28.8	30.9	28.5	26.8
N5	37.8	26.5	38.6	-	28.1	26.9	33.4	34.7	30.6	27.5	-	20.1	27.8	25.6	18.4
N8	39.8	36.0	34.3	34.7	30.8	29.8	36.5	28.8	23.2	35.1	35.8	21.9	32.2	29.6	22.5
N11	20.7	18.9	-	17.3	15.6	11.9	14.1	13.0	15.5	19.8	20.6	20.9	17.1	15.7	15.1
N18A	26.4	31.6	25.1	24.1	27.8	20.6	23.1	24.8	25.8	32.1	22.6	27.4	25.9	23.9	24.2
N21	15.6	18.1	18.0	15.0	13.6	11.1	12.2	11.2	11.5	17.6	17.9	14.5	14.7	13.5	13.2
N22	16.8	18.7	17.1	12.9	14.0	10.2	10.1	9.9	10.4	14.1	16.2	16.8	13.9	12.8	11.9
N24	-	30.3	41.0	-	29.4	-	47.2	36.8	31.2	40.3	43.2	37.9	37.5	34.5	35.6
N25	22.3	21.6	25.3	22.9	19.4	17.1	22.0	19.9	19.9	23.4	24.5	26.6	22.1	20.3	19.3
N27	-	-	33.6	29.9	36.1	23.6	25.3	23.1	22.4	31.7	29.6	29.3	28.5	26.2	25.5
N28	40.4	33.5	37.3	34.6	35.4	28.7	39.7	35.3	38.0	40.1	-	36.4	36.3	33.4	29.5
N29	27.2	-	27.7	24.4	-	21.3	25.6	25.1	19.5	29.8	27.2	29.1	25.7	23.6	23.3

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N30A	<b><u>61.1</u></b>	<b><u>52.2</u></b>	<b><u>64.0</u></b>	<b><u>67.7</u></b>	<b><u>66.7</u></b>	<b><u>57.6</u></b>	<b><u>92.7</u></b>	<b><u>65.6</u></b>	<b><u>68.4</u></b>	<b><u>65.8</u></b>	<b><u>58.3</u></b>	<b><u>64.0</u></b>	<b><u>65.3</u></b>	<b><u>60.1</u></b>	<b><u>59.2</u></b>
N31	30.0	30.7	33.0	30.5	29.5	22.3	34.7	27.4	23.3	30.2	31.6	30.5	29.5	27.1	25.0
N35	28.6	26.8	31.1	29.6	26.7	21.8	32.4	28.0	30.2	-	-	29.3	28.4	26.2	26.3
N39	33.3	35.1	39.9	32.0	<b>42.8</b>	29.5	37.2	29.6	34.5	<b>41.4</b>	33.2	37.7	35.5	32.7	21.8
N42	27.2	28.2	33.8	-	31.9	27.1	30.7	23.9	23.4	32.5	31.7	28.1	28.9	26.6	24.8
N43	26.5	23.7	26.7	23.8	24.6	21.5	22.7	23.7	22.5	24.1	25.1	26.0	24.2	22.3	22.5
N44A	37.1	36.6	<b>43.9</b>	<b>47.1</b>	<b>54.0</b>	39.7	<b>46.8</b>	<b>46.8</b>	-	<b>45.3</b>	38.6	<b>40.4</b>	<b>43.3</b>	39.8	26.8
N44B	39.9	<b>40.0</b>	<b>47.1</b>	<b>45.3</b>	<b>52.3</b>	<b>42.0</b>	<b>52.5</b>	<b>44.7</b>	<b>47.6</b>	<b>46.0</b>	<b>41.0</b>	<b>44.1</b>	<b>45.2</b>	<b>41.6</b>	27.6
N44C	39.5	39.3	<b>44.8</b>	<b>44.6</b>	<b>51.8</b>	39.6	<b>52.3</b>	<b>46.2</b>	<b>43.3</b>	<b>45.5</b>	<b>40.6</b>	<b>45.1</b>	<b>44.4</b>	<b>40.8</b>	27.2
N45	21.3	16.1	20.1	18.6	13.6	13.4	17.6	15.4	17.4	18.3	20.8	19.4	17.7	16.2	16.3
N48	29.2	30.6	34.4	32.0	28.6	23.4	33.6	25.5	27.4	32.9	34.3	28.9	30.1	27.7	16.7
N52	29.9	31.1	28.7	27.1	27.1	23.5	31.3	26.0	25.0	32.4	27.3	34.5	28.7	26.4	21.6
N53	<b>41.0</b>	29.8	39.6	<b>40.5</b>	31.6	30.5	<b>48.5</b>	<b>40.9</b>	36.6	32.8	35.7	34.6	36.8	33.9	23.4
N54	27.6	25.8	-	22.5	26.6	23.4	27.6	-	17.3	-	25.5	26.5	24.7	22.8	20.0
N55	18.8	18.6	20.1	18.2	18.6	13.8	17.8	13.9	15.2	17.7	21.9	18.2	17.7	16.3	11.7
N56	25.6	23.4	29.9	29.7	22.3	23.8	37.2	27.2	26.1	28.5	29.9	26.3	27.5	25.3	17.8
N57	32.6	33.0	28.4	28.7	23.2	15.2	17.6	24.0	25.9	32.1	32.0	33.4	27.2	25.0	25.0
N58	28.6	32.6	22.3	28.4	22.2	21.4	28.2	21.2	24.9	-	-	31.7	26.1	24.0	14.9
N60	28.5	31.6	31.7	27.3		20.4	19.2	21.4	25.0	29.7	29.5	26.2	26.4	24.3	22.2
N61	35.4	39.1	<b>40.8</b>	<b>44.8</b>	37.3	33.7	<b>50.2</b>	38.1	34.2	<b>44.8</b>	<b>43.7</b>	37.9	<b>40.0</b>	36.8	28.0
N62	-	-	-	32.3	38.0	29.8	2.1	26.0	21.1	31.2	24.3	26.8	25.7	23.7	19.1

☒ National bias adjustment factor used

☒ Where applicable, data has been distance corrected for relevant exposure

## Notes:

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 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

### Automatic Monitoring Site

The automatic continuous monitoring site at Grove Lodge is part of the national Automatic Urban and Rural Network (AURN) and complies with the EU Directive on ambient air quality (2008/50/EC). The site is audited and serviced every 6 months and Local Site Operator (LSO) routine calibrations are completed by Worthing Borough Council every 2 weeks.

### Diffusion Tube Bias Adjustment Factors

NO<sub>2</sub> diffusion tubes are provided and analysed by Gradko laboratory. The NO<sub>2</sub> tube preparation method used is 50% triethanolamine (TEA) in Acetone.

Data from the NO<sub>2</sub> diffusion tubes has been compared and bias corrected to the factors produced from the UK co-location data-base available from Defra, <http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>


The bias adjustment factor used for 2017, obtained via tools at the aforementioned website, was **0.92**.

### QA/QC of diffusion tube monitoring

All diffusion monitoring data has been ratified following the methods described in LAQM.TG(16). A quality assurance / quality control (QA/QC) programme including field duplicates and blanks, and instrument calibration with standard gases has been followed (AEAT, 2000).

## Fall off Calculations


Figure C.1 WT2 Continuous Monitoring site



Enter data into the pink cells

<b>Step 1</b>	How far from the KERB was your measurement made (in metres)?	2.9	metres
<b>Step 2</b>	How far from the KERB is your receptor (in metres)?	21.2	metres
<b>Step 3</b>	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	14.22	µg/m <sup>3</sup>
<b>Step 4</b>	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	37	µg/m <sup>3</sup>
<b>Result</b>	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	25.4	µg/m <sup>3</sup>


Figure C.2 Fall-off calculation for 6N Gainsborough Avenue



Enter data into the pink cells

<b>Step 1</b>	How far from the KERB was your measurement made (in metres)?	2	metres
<b>Step 2</b>	How far from the KERB is your receptor (in metres)?	10.5	metres
<b>Step 3</b>	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	12.24	µg/m <sup>3</sup>
<b>Step 4</b>	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	35.1	µg/m <sup>3</sup>
<b>Result</b>	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	26.2	µg/m <sup>3</sup>


Figure C.3 Fall-off calculation for N24



Enter data into the pink cells

<b>Step 1</b>	How far from the KERB was your measurement made (in metres)?	9	metres
<b>Step 2</b>	How far from the KERB is your receptor (in metres)?	7.8	metres
<b>Step 3</b>	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	12.24	µg/m <sup>3</sup>
<b>Step 4</b>	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	34.47	µg/m <sup>3</sup>
<b>Result</b>	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	35.6	µg/m <sup>3</sup>

Figure C.4 Fall-off calculation for N61




Enter data into the pink cells

<b>Step 1</b>	How far from the KERB was your measurement made (in metres)?	0.5	metres
<b>Step 2</b>	How far from the KERB is your receptor (in metres)?	4.5	metres
<b>Step 3</b>	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	14.22	µg/m <sup>3</sup>
<b>Step 4</b>	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	36.8	µg/m <sup>3</sup>
<b>Result</b>	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	28.0	µg/m <sup>3</sup>

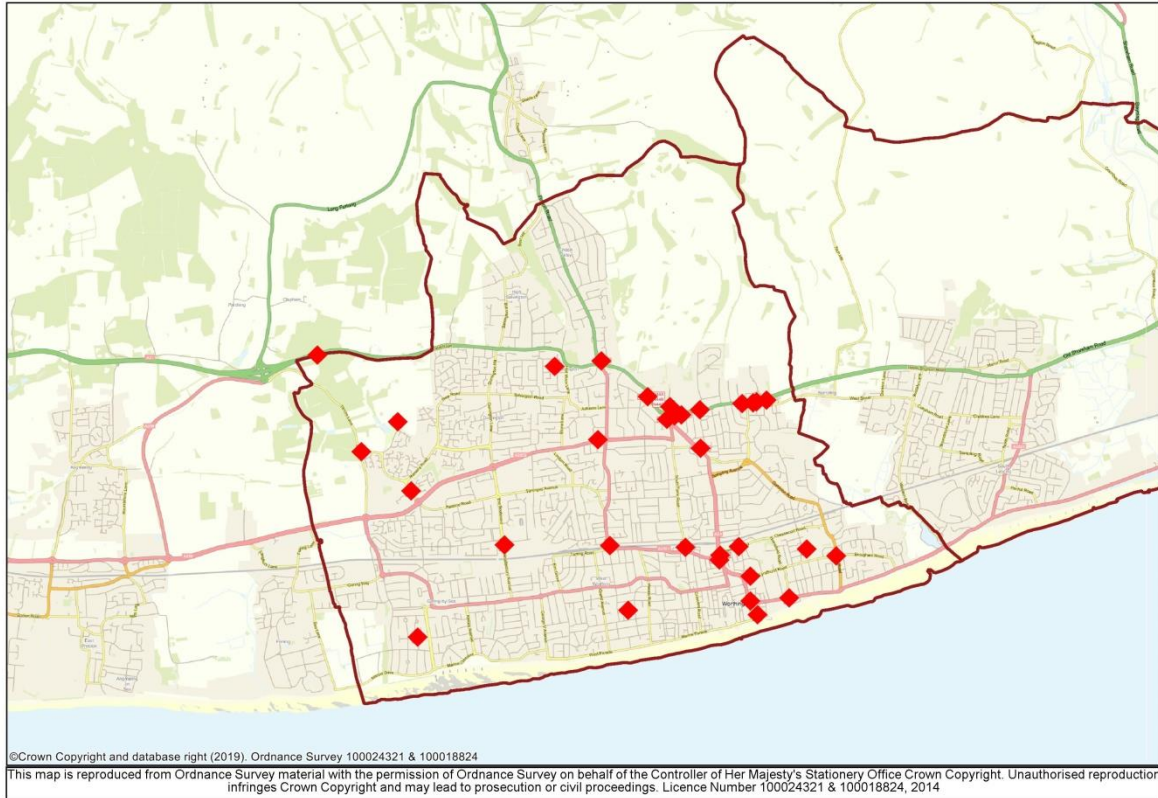


Figure C.5 Fall-off calculation for N44A, N44B, N44C

	Enter data into the pink cells					
Site Name/ID	Distance (m)		NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> )			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
N44A	2.9	21.2	14.2	39.8	26.8	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
N44B	2.9	21.2	14.2	41.6	27.6	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
N44C	2.9	21.2	14.2	40.8	27.2	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.

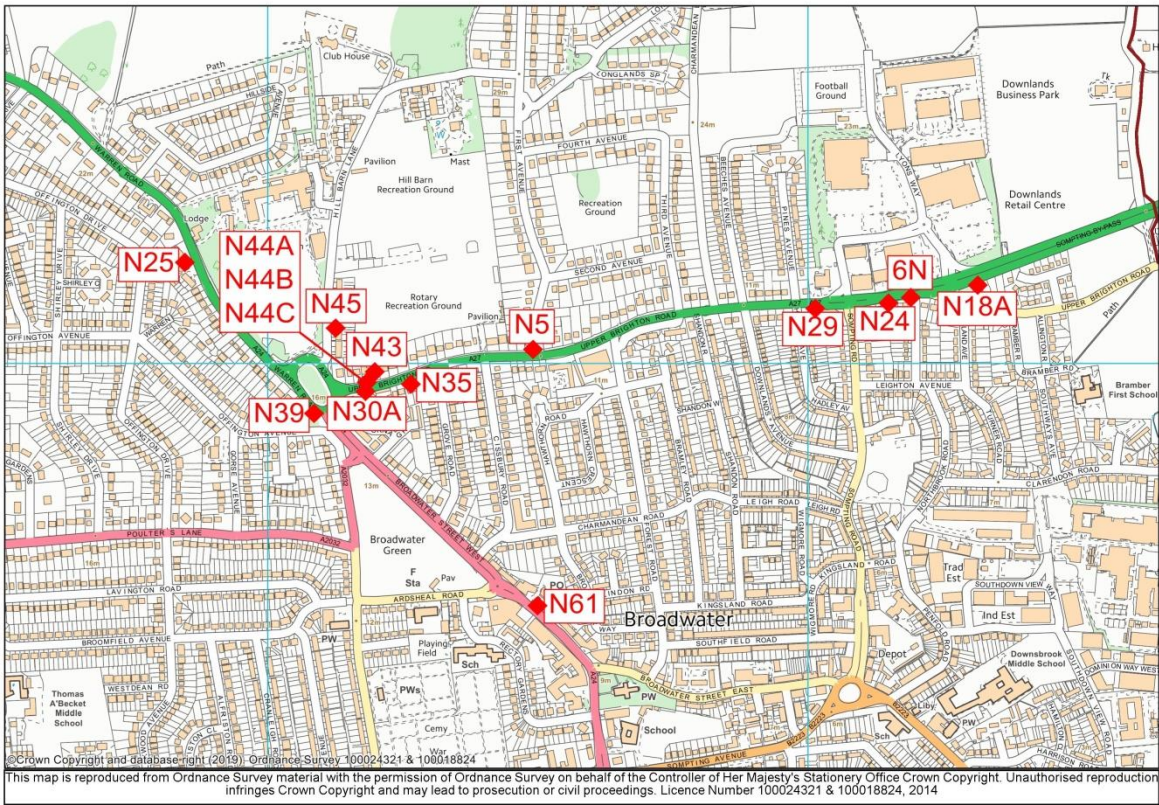
## Appendix D: Map(s) of Monitoring Locations and AQMAs

### Worthing Borough





Worthing AQMA

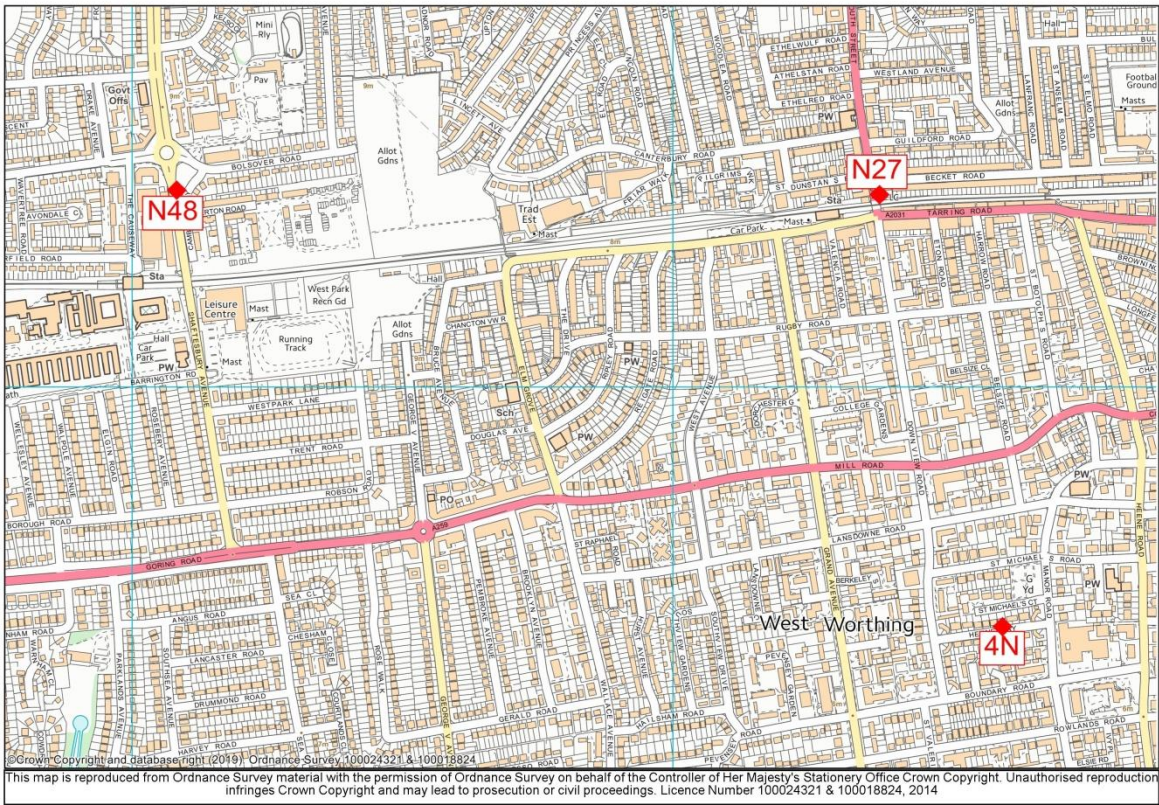


Worthing centre

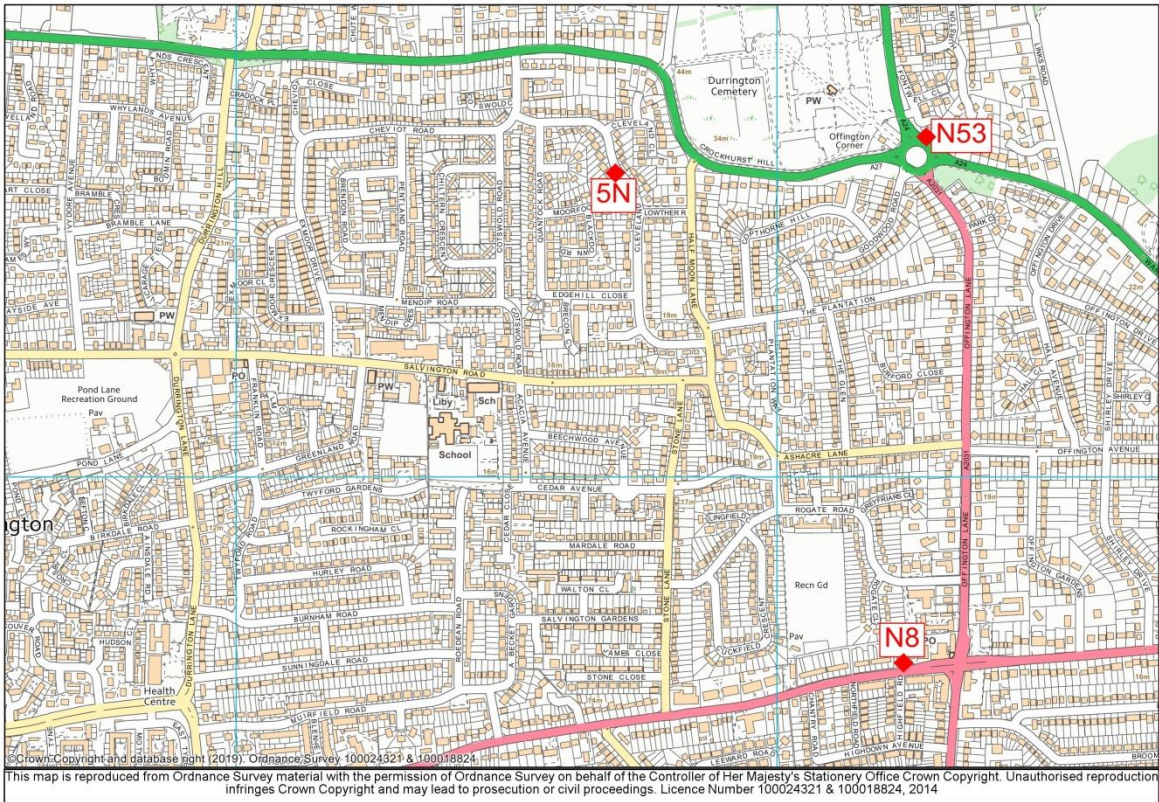




Worthing west

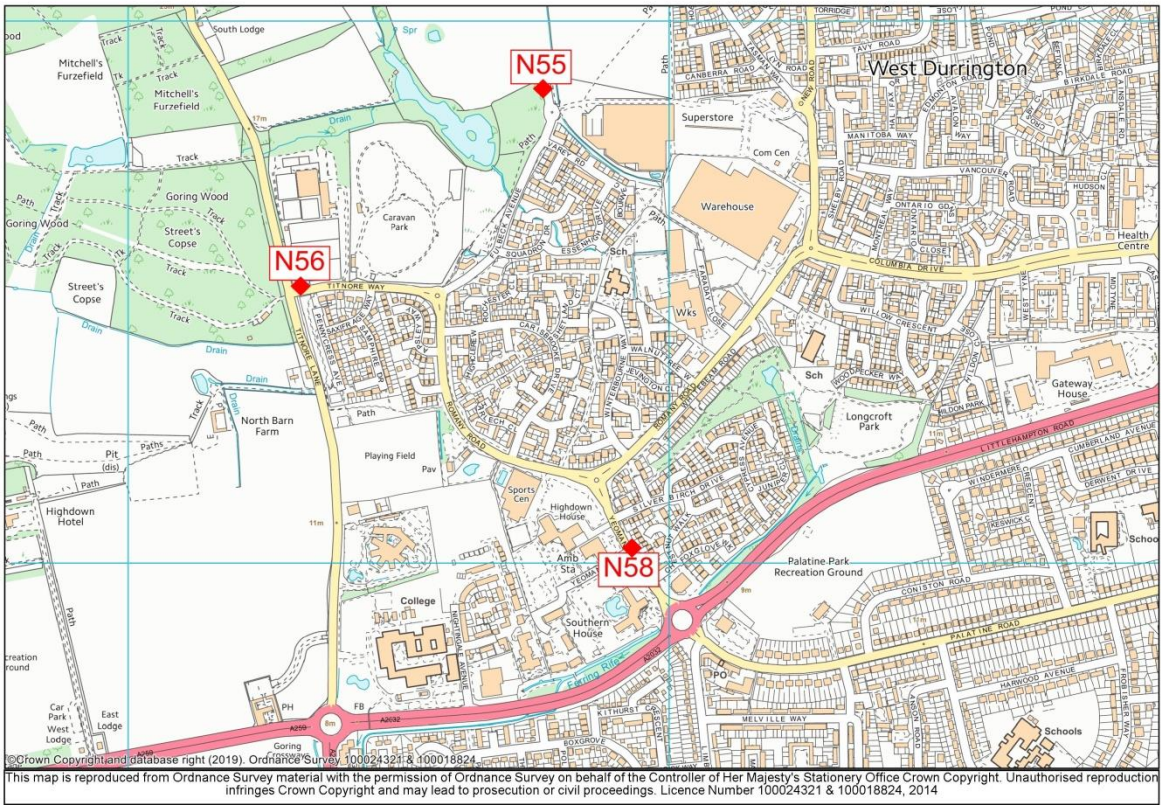


Offington

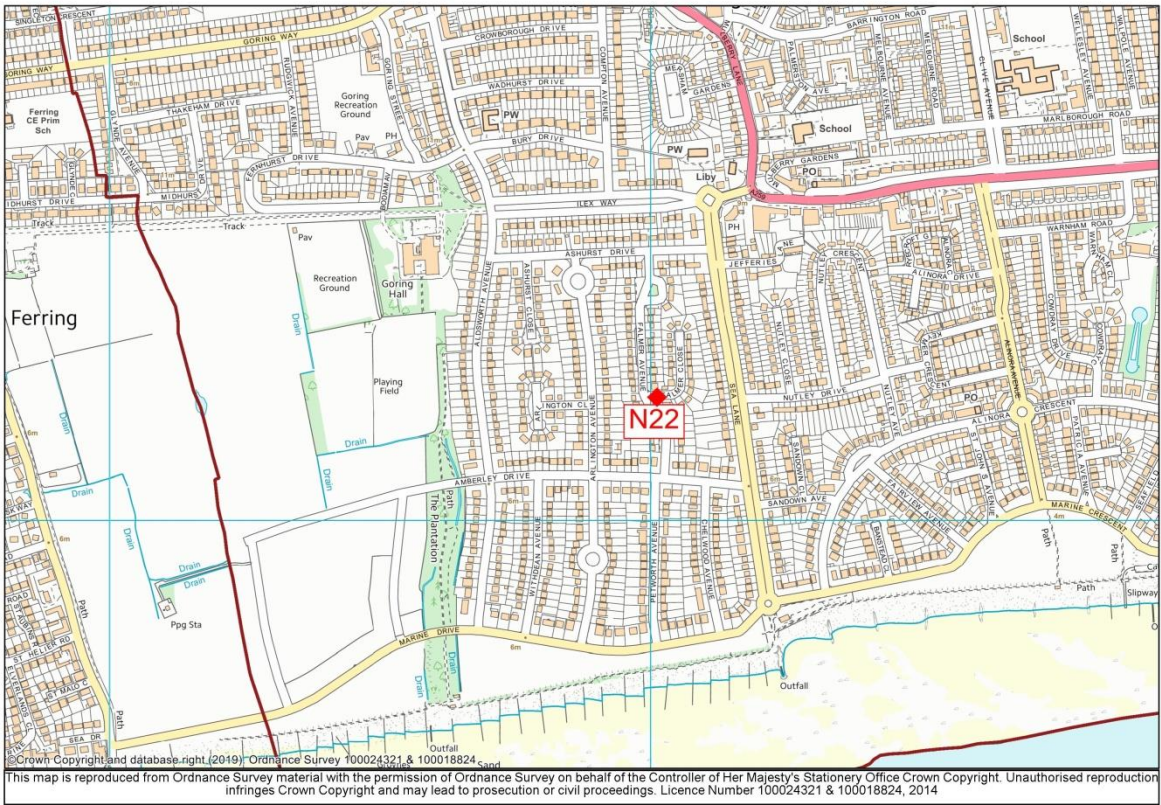




Durrington

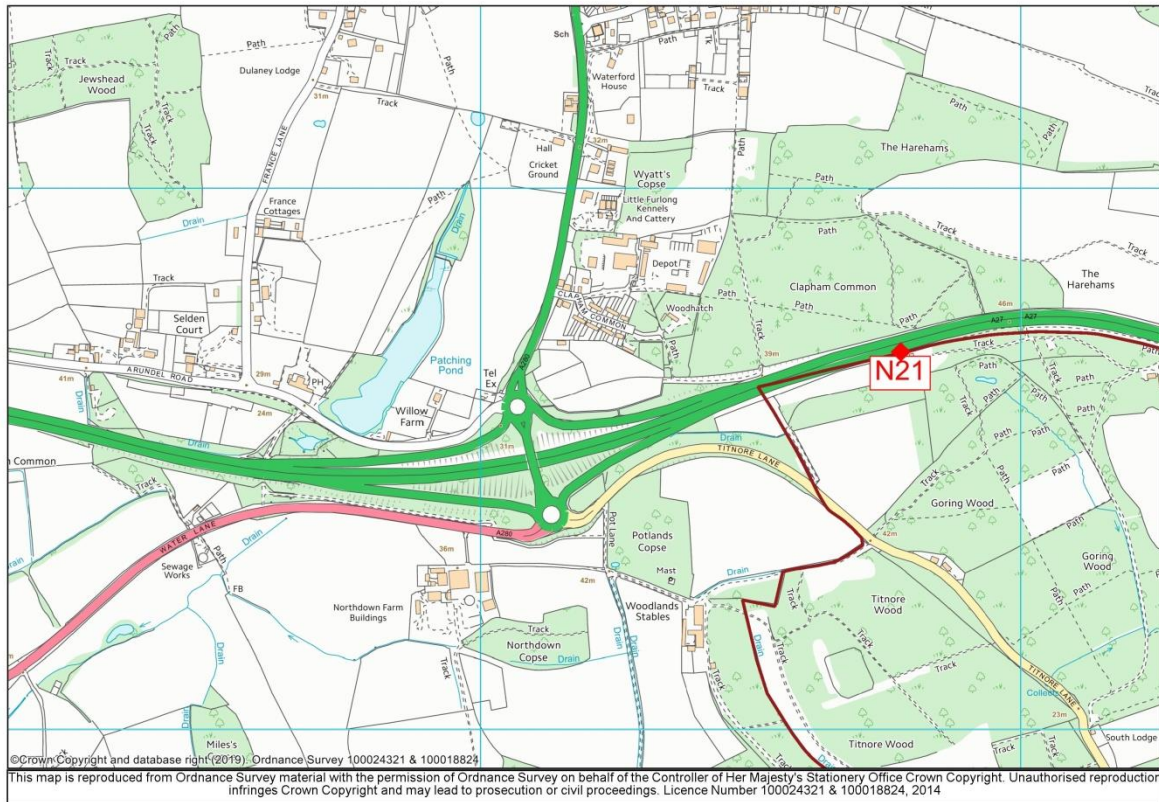


Goring





A27



## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

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

<sup>4</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## 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
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
HE	Highways England
HGV	Heavy Goods Vehicle
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide



## Worthing Borough Council

ULEV	Ultra Low Emission Vehicles
WSCC	West Sussex County Council

## References

Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006, Defra, Report Number AEAT/ENV/R/2170. Available from UK-AIR [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/0701110944\\_AQinequalitiesFNL\\_AEAT\\_0506.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/0701110944_AQinequalitiesFNL_AEAT_0506.pdf)

Local Air Quality Management Technical Guidance (TG16), Defra  
Available from <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf>

Local Air Quality Management Policy Guidance (PG16), Defra  
Available from  
[https://consult.defra.gov.uk/communications/laqm\\_changes/supporting\\_documents/LAQM%20Policy%20Guidance%202016.pdf](https://consult.defra.gov.uk/communications/laqm_changes/supporting_documents/LAQM%20Policy%20Guidance%202016.pdf)

Air Quality and Emission Mitigation Guidance for Sussex (2019)  
Available from <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/air-quality-and-planning/>

NO<sub>2</sub> Fall-Off with Distance Calculator available from:  
<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

Defra Background Maps for Worthing  
<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>