Crawley Borough Council

2019 Air Quality Annual Status Report (ASR)

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

Local Authority Officer	Gill Narramore
Department	Environmental Health (Community Services)
Address	Crawley Borough Council, Town Hall, The Boulevard, Crawley, West Sussex, RH10 1UZ
Telephone	01293 438 000
E-mail	environmentalservices@crawley.gov.uk
Report Reference number	2019 ASR

Executive Summary: Air Quality in Our Area

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Air Quality in Crawley

As part of the Local Air Quality Management process (LAQM) required by the Environment Act 1995, the council carries out an annual review and assessment of air quality in the borough, which helps identify local air quality hot spots, and relate these to pollution sources. Road traffic is the main source of nitrogen dioxide (NO_2) pollution in Crawley, and our network of monitoring sites records levels along busy roads as well as at background locations and areas of specific interest, in order to give a broad picture of pollution levels across the borough. If the council finds areas where air quality objectives are not being met, it will set out an Air Quality Management Area (AQMA) and produce an action plan (AQAP) showing what steps it will take to improve air quality in that area.

Air Quality in Crawley is mainly good, with national targets being met for all pollutants(4), with the exception of nitrogen dioxide (NO_2) at a small number of locations alongside busy roads and within the AQMA, where the Council is targeting actions to improve air quality.

A small reduction in nitrogen dioxide levels was seen at all of Crawley's long term monitoring site during 2018. This pattern was also seen regionally and is often attributed to climatic influences, rather than local conditions. It is therefore more informative to look at the long term trends. The long term monitoring data for Crawley

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

shows that concentrations of nitrogen dioxide have fallen throughout the borough since the mid-2000s, despite significant housing and commercial development over the same period. These improvements have mostly been driven by cleaner engine technologies. However levels have remained broadly consistent in more recent years as the rate of improvement slows. This is particularly evident when looking at the monitoring data over the last 5 years where an upward trend is beginning to emerge at background, as well as roadside locations. Increased development and traffic volumes may be a contributing factor in flattening out some of the improvements previously seen, however, it's too early to say if this upward trend is significant, or whether it is a result of the particularly low concentrations seen in 2015 skewing trends in an upward direction. The next few years will show if the year on year variation is just plateauing or if there is a more significant rising trend. The review and assessment process will continue to monitor the trends and report on them annually.

In 2018 there were no exceedances of the hourly objective for nitrogen dioxide, but two sites within the Hazelwick AQMA exceeded the annual objective for nitrogen dioxide, and a further two sites close to Three Bridges Station also showed exceedances of the objective levels. These sites are adjacent to the A2220, serving Three Bridges Railway station and a busy commuter route into the town centre. This area adjoins the south eastern border of the existing Hazelwick AQMA. It is therefore proposed to extend the boundary of the existing AQMA at this point to incorporate this newly identified area of exceedance.

Actions to Improve Air Quality

Crawley Borough Council has taken forward a number of measures during the reporting year designed to improve local air quality and increase sustainability:

- The Crawley Growth Programme - £60m package of investment, including sustainable transport infrastructure schemes completed this year: Manor Royal selective road space re-prioritising for bus routes through, bus shelter upgrades. Three Bridges station, additional new bus shelter at bus stop B.
- Draft Local Cycling and Walking Infrastructure Plan (LCWIP), due for consultation during 2019.

- Draft Local Transport Strategy for Crawley – setting out future transport infrastructure in the borough including; connectivity, public transport, walking, cycling and electric vehicle infrastructure.
- Implementation through the planning process of Sussex Air Quality Emissions Mitigation Guidance to obtain air quality mitigation from major development.
- Partnership working with WSCC's on joint Air Quality Action Plan 'Breathing *Better*', which aims to improve air quality and ensure that our county is a healthy place to live.
- Sussex Air Quality Partnership (SAQP) Defra Air Quality Grant funding to deliver interventions with schools and businesses in Sussex:
    i. *Schools Project* - completed March 2019 - educational programme on air quality and an anti-idling at Crawley schools within or close to the AQMA, delivered by our partners at Sustrans and Living Streets.
    ii. *Clean Air Business Programme* - completed June 2019 - business programme to help promote "clean air businesses" by providing support and advice on minimising emissions, reducing commuting and business mileage, improving plant efficiency, energy saving initiatives and up-take of ULEVs.
    iii. Sustainable Travel eVent – June 2019 hosted by Crawley seminar for local businesses on future sustainable transport and showcase/trial electric vehicles, fuel cell buses, electric bikes and e-car clubs.
- Successful SAQP grant bid for Defra air quality funding a project (Clean Burn Sussex) aimed at promotion of least polluting fuels and stoves to reduce particulate emissions.
- SAQP airAlert Service - a free messaging service for people in Crawley, (and Sussex) who suffer from respiratory problems such as COPD/asthma/heart conditions, alerting them to poor air quality in their area, so that they can take action to manage their condition.
- Marketing campaign for the airAlert service, during Breathe Easy week June 2019 - working with Sussex Public Health to promote the service through Clinical Commissioning Groups, and organisations such as British Lung Foundation and Breathe Easy groups. Using targeted social media and digital

marketing, including paid Facebook ads, Twitter PH Bulletin and e-newsletters to promote the service across Sussex.

- Annual Junior Citizen Event - 2 week educational programme for all Year 6 (KS2) pupils in Crawley, providing interactive teaching platform on environmental issues, safety and citizenship. “Air quality in our local area” was delivered through eco-action games and small discussion groups. As part of this programme the airAlert service was promoted and an information pack provided to each pupil. Over 1200 children took part in the event.

Pictured: Key Stage 2 Pupils from Crawley schools learning about air quality at Junior Citizen Event with Councillor Geraint Thomas

Conclusions and Priorities

The long term trend data shows that air quality has been improving in Crawley over the past 15 years, and pollution levels are still significantly lower than they were a decade ago.

The most recent 5 year trend pattern is showing an upward turn in pollution levels across Crawley. However, it’s too early to draw any significance from this as the influence of year on year climatic variations may skew trends where there are particularly low results followed by higher concentrations in the following year. The council will therefore continue to annually review monitoring data and assess emerging trends for significance.

Major development in and around Crawley will have a cumulative impact on air quality and it is therefore important that new development meets the requirements of planning policies and guidance in relation to air quality.

The small number of sites showing exceedances of the nitrogen dioxide standard are confined to the existing AQMA and along the busy commuter corridor into Three Bridges station. This year's review and assessment process identified that the existing AQMA should be extended to include the area around Three Bridges station.

The council's specific priorities for the coming year include:

- Extending the existing AQMA boundary to incorporate new areas of exceedance identified around Three Bridges rail station, following the fast track option in accordance with the Local Air Quality Management Policy Guidance (PG16).
- Drafting Crawley Borough Local Plan (2020-2035) - review air quality policies and supporting guidance with aim of minimising and, where possible, improving air quality through development control process.
- Crawley Growth Programme - Progressing delivery of infrastructure upgrades to support sustainable transport through Crawley Growth Programme - particularly in areas within or close to AQMA
- Completion of the Defra-funded Clean Burn Sussex project
- Defra Air Quality grant bid for 2020 - School Street Closure project
- Awareness raising for schools and businesses, including the annual Clean Air Day, Breath Easy, Junior Citizen, Sustainable Transport Event
- Identifying pollution hotspots and adjusting the monitoring network to respond to local developments and concerns within the borough.

The principal challenges in addressing air quality for the coming year are:

- Balancing the demand for development with the need to improve air quality
- Identifying funding to support action plan measures
- Identifying and overcoming barriers to modal shift

Local Engagement and How to get Involved

Crawley is one of the smallest local authorities in Sussex covering an area of 45 km^2. Despite its relative small size, it has the second highest job density in the country outside London and attracts more than 43,000 commuters every day, 80% of which commute by car. In addition to all the incoming commuter traffic, many local car journeys are less than 2km, and 58% of car trips are under 5km. These high volumes of traffic on our local roads cause congestion which contributes to worsening air quality. However, since many car journeys are short, there is opportunity to help improve local air quality by switching to sustainable transport options such as walking, cycling, public transport or car sharing.

Examples of how to take action on a personal level to improve air quality in Crawley:

Walk or cycle: Replacing a car journey by walking or cycling helps reduce traffic and traffic emissions. It has proven health and mental health benefits too.

Take public transport or car-share: For longer journeys consider car share or taking public transport, such as bus, coach or train.

Ultra-Low Emission Vehicle (ULEV): Consider buying an electric/hybrid car

If a car journey is necessary: try to drive in an eco-friendly style

- Drive smoothly and try not to accelerate or brake hard.
- Maintain your car to reduce harmful emissions
- Check tyre pressure is correct to minimise fuel use and emissions.
- Limited use of the air conditioning reduces fuel consumption and emissions
- When your car is stationary turn off your engine. Idling vehicles release lots of exhaust emissions.

Go for local produce: Long distance transport creates more air pollution.

Local authority engagement with decision makers and the public

The council publishes information on its website (www.crawley.gov.uk) and local magazine as well as holding public consultation and focus groups to keep people informed on the measures it is taking to improve local air quality and support public health initiatives. More information on local air quality in Crawley can be found at:

Air Quality Monitoring in Crawley

Sustainable Transport in Crawley

The Crawley Growth Programme

airAlert

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Crawley during 2018/19. 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 Crawley Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Crawley Borough Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at:

http://www.crawley.gov.uk/pw/web/PUB266050

http://www.crawley.gov.uk/pw/web/PUB241229

https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1600

(See full list see at: http://uk-air.defra.gov.uk/aqma/list)

Alternatively, see Appendix D: Maps of Monitoring Locations and AQMA, which provides for a map of air quality monitoring locations in relation to the AQMA.

The council proposes to amend the Hazelwick AQMA by extending the boundary to include the newly identified area of exceedance around Three Bridges Station. More detailed information on the rationale for this decision is given in Appendix C.

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 (inc. date of publication)
						At Declaration	Now	
Hazelwick AQMA	09.07.15	NO_2 Annual Mean	Crawley	Area surrounding the Hazelwick Roundabout, including land and properties bordering the roads coming on and of the roundabout.	NO	42 µg/m^3	41 µg/m^3	Crawley Borough Council Air Quality Action Plan

☒ **Crawley 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 Crawley

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

Key completed measures are:

- Crawley Growth Programme sustainable transport infrastructure schemes: selective road space re-prioritising for bus routes through Manor Royal, bus shelter upgrades at Three Bridges station, including a new bus shelter at bus stop B where there none previously

Key outcomes from measure: Encourage modal shift

- West Sussex County Council and district and borough councils new joint air quality plan, '*Breathing Better*' https://www.westsussex.gov.uk/media/12062/air_quality_plan.pdf

Key outcomes from measure: Reduce emissions and encourage modal shift.

- WSCC review of Parking Standards (in partnership with district and borough councils) to include provision for electric vehicles.

Key outcomes from measure: Reduce emissions

- Defra–funded air quality project - Business scheme (staff travel planning, energy efficiency of plant/machinery, and identifying grants to implement AQ improvements) - completed June 2019.

Key outcomes from measure: Encourage modal shift and reduce emissions

- Sustainable Transport eVent to promote sustainable travel alternatives and low/zero emissions transport options for businesses.

Key outcomes from measure: Encourage modal shift and reduce vehicle emissions

- SAQP successful bid to the Defra Air Quality Grant fund for a project 'Clean Burn Sussex' to raise awareness of health and environmental impacts of burning solid fuels and encourage choice of cleaner, more efficient fuels.

Key outcomes from measure: Reduce particulate emissions

- Junior Citizen - educational programme on environmental issues, safety and citizenship for all Year 6 (KS2) pupils in Crawley. "Air quality in our local area" was delivered through eco-action games and small discussion groups.

Key outcomes from measure: Helping school children understand air quality and encourage modal shift

- Promoting airAlert service

Key outcomes from measure: Awareness raising

- Clean Air Day Event – promoting sustainable modes of travel to CBC staff

Key outcomes from measure: encourage modal shift

- 6 new subscribers to the council's staff Bike to Work scheme.

Key outcomes from measure: Encourage modal shift. Promote zero emissions transport

- Water source heat pump and installation of solar panels at Crawley sheltered housing scheme

Key outcomes from measure: 49 per cent reduction in carbon emissions.

- Annual Living Streets campaign event for CBC staff
- Manor Royal Travel Planning guidance pack completed http://www.crawley.gov.uk/pw/Business/Business_Resources_and_Support/TravelPlanning/ManorRoyalTravelPlanning/index.htm
- Workplace Travel Planning Guide for CBC staff completed. http://www.crawley.gov.uk/pw/web/PUB282706

Key outcomes from measure: Encourage modal shift.

Crawley borough council expects the following measures to be completed over the course of the next reporting year:

- Draft local Plan to go for Council approval, public consultation and Planning Inspectorate Examination in Public by summer 2020.
- Draft air quality supplementary planning document to provide more detailed guidance about the air quality policies in the Local Plan when determining planning applications

Expected impact of measure: environmental policies and guidance to help improve air quality through the development control process.

- Crawley Growth Programme - Three Bridges Station: frontage and entrance/Improvement scheme/ Upgrade – improving transport interchange

facilities, bus connectivity, pedestrian and cycle links. Planning permission and procurement process due summer/autumn 2020.

- Crawley Growth Programme – Station Gateway Scheme: improving sustainable transport infrastructure and deliver residential and commercial/retail development accessible by sustainable modes of travel. The scheme will have no residential parking but will deliver Crawley's first car club scheme, with an all-electric fleet of vehicles and an electric vehicle charging hub in town centre. The development's sustainable energy strategy proposes heating/cooling via air source heat pumps which are not associated with any NOx or particulates emissions. Planning permission and procurement process due summer/autumn 2020.

Expected impact of measure: encourage modal shift and reduce vehicle emissions

- Produce EV Charging Strategy - Joint project between WSCC and partner authorities to launch an EV charging strategy to replace the work done by eV South East on ev charging facilities in the area

Expected impact of measure: encourage modal shift and reduce vehicle emissions

- Three new Nissan e-NV200 Vans (zero emissions) purchased by CBC to replace diesel vans in Environmental Health, Parking and Neighbourhood services.

Expected impact of measure: Reduce vehicle emissions.

Crawley Borough Council's priorities for the coming year are:

- Review air quality policies for Draft Crawley Local Plan (2020-2035) and draft air quality supplementary planning document.
- Crawley Growth Programme to deliver improved sustainable transport infrastructure upgrades and provide alternative sustainable transport options for Manor Royal business, Three Bridges Station and Crawley Stations.
- Seek grants/funding streams to support air quality action plan measures.
- Educational/promotional events to raise awareness of air quality issues, including the annual Clean Air day, Breath Easy, and Junior Citizen.
- Review and update the monitoring network to respond to local developments and identify pollution hotspots across the borough.

The principal challenges and barriers to implementation that the council faces continues to be:

- The scale of local development adjacent to the AQMA which threatens to offset improvements in vehicle emissions achieved over recent years,
- Funding restrictions to support action plan measures,
- Identifying and overcoming barriers to modal shift

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Crawley Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Hazelwick AQMA.

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	Crawley Growth Programme Three Bridges and Crawley railways stations Interchange improvement schemes	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	Coast to Capital Local Enterprise Partnership WSCC/ CBC	2014	2016-2022 Ongoing	Modal Shift/ Improved traffic flow	Reduced vehicle emissions Medium/High	Road space re-prioritising for bus routes to Gatwick via Manor Royal delivered. Further upgrades programmed.	Phased delivery, to be completed in stages. Final completion estimated 2022	working with LEP and partners to deliver major interchange improvements at Crawley, Three Bridges and Gatwick railways stations for both buses and cyclists
2	Crawley Growth Programme Upgrade to Super-Hub bus shelters	Transport Planning and Infrastructure	Bus route improvements	Coast to Capital Local Enterprise Partnership WSCC/ CBC	2019	2020	Modal shift	Reduced vehicle emissions Medium/High	Still in design for each phase of programme	2020/21	
3	Defra funded AQ project: Schools project - anti-idling campaign Business project - Eco-Audit Scheme	Traffic management/ Promoting Low Emissions Transport / Promoting Low Emissions Transport	Anti-idling enforcement/ Shift to installations using low emission fuels for stationary and mobile sources/ Prioritising uptake of low emission vehicles	SAQP/CBC	2017	2018/19	Modal shift/ Fuel economy/ reduction in vehicle emission	Reduced vehicle emissions Medium/High	Completed schools project 2018 Completed Business project 2019.	2018/19	
4	Sustainable transport Event on Manor Royal 2019	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	SAQP/CBC	2018	2018/19	Modal shift/ Fuel economy/ reduction in vehicle emission	Reduced vehicle emissions No Target set	Completed eVent 2019	2019	Plan to repeat event 2020
5	Defra funded AQ project Clean Burn Sussex Project to	Promoting Low Emission Plant	Other measure for low emission fuels for stationary and	SAQP/CBC	2019	2019/20	Public awareness – survey results	Reduced Particulate emissions No Target set	Grant funding awarded –SAQP web page due to launch Nov 2019.	2020	

	promote cleaner fuels, compliant stoves, efficient burning methods		mobile sources				Reduction in particulate emission		Public survey Dec 2019		
6	Air Quality and Emissions Mitigation Guidance for Sussex	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	CBC with Sussex-air	Reviewed 2018/19	ongoing	Conditions on planning applications to require emissions mitigation/ S.106 funding	Reduced vehicle emissions No Target set	Air Quality and Mitigation Guidance incorporated in Crawley Local Plan referenced to developers in local list	ongoing	
7	Crawley Cycle Network	Transport Planning and Infrastructure	Cycle Network	CBC - S106 funding	Completed	ongoing	Modal shift	Reduced vehicle emissions No Target set -	New cycle schemes and improvements to existing schemes including: Town Centre – County mall, Manor Royal Road, Fleming Way	Phased delivery, to be completed in stages. Final completion estimated 2020-2022	
8	Manor Royal Business Park Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	Crawley Borough Council (CBC)	complete	ongoing	Modal shift/ staff travelling by sustainable means	Reduced vehicle emissions No Target set	Planning requirement for Travel plans to be integrated into new development on MR Business District	ongoing	Sustainability officer promoting Travel pack to businesses operators
9	School Travel plans	Promoting Travel Alternatives	School Travel Plans	West Sussex County Council (WSCC)	complete	ongoing	Modal Shift %children travelling to school by sustainable means	Reduced vehicle emissions No Target set Medium/low	Increase % Uptake	Ongoing	Helps reduce emissions during morning rush hour
10	CBC Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	CBC	complete	ongoing	% staff travelling by sustainable means	Reduced vehicle emissions No Target set Medium/low	Draft Travel plan produced	ongoing	Time priorities
11	easit discount(15 %) on staff commuting on rail and bus - available to	Promoting Travel Alternatives	Promote use of rail and bus	easit/CBC	Completed	ongoing	% staff travelling by sustainable means	Reduced vehicle emissions No Target set Medium/low	Currently: 118 easit Organisations = 6.3% increase from 2018 5274 Crawley registered individuals	Ongoing	Council originally involved in funding the setting up of the scheme. 2018/19 there were 185 CBC staff registered

	CBC and business across Crawley.								with easitCARD = 8.8% increase from 2018		
12	Crawley car club scheme with private sector partner	Promoting Travel Alternatives	Personalised Travel Planning	CBC	2015	2018	Reduction in private vehicle ownership	Reduced vehicle emissions No Target set Medium/low	Procurement due 2020 Launch 2020/21	220/21	Procurement delayed launch now due 2020
13	Cycle Crawley campaign	Promoting Travel Alternatives	Promotion of Cycling	CBC	2011	ongoing	Modal shift	Reduced vehicle emissions No Target set	Events, activities and materials that support uptake and promotion of cycling in Crawley.	Ongoing/annual	Undertaken in partnership with the Crawley Cycle Forum
14	Living Streets campaign	Promoting Travel Alternatives	Promotion of Walking	CBC	2014	ongoing	Modal shift	Reduced vehicle emissions No Target set	No campaign event in 2019 – but planned for 2020	Ongoing	Information, events, and activities to promote walking amongst council staff and local businesses
15	Residential and Business Travel plans	Promoting Travel Alternatives	Residential/ Business travel plans	CBC	2015	ongoing	% residents or staff using sustainable transport modes	Reduced vehicle emissions No Target set	Developments of certain size required to implement Travel Plan	Ongoing	Implemented through Planning process - each application has its own target plan
16	New Manor Royal bus Route	Promoting Travel Alternatives	Bus route improvements	MetroBus	2017	2018/19	Improved journey times and timetable accuracy / Modal shift	Reduced vehicle emissions No Target set Medium/low	Still in design	2018/19	
17	Staff car loan - Council Vehicle procurement requires vehicle emissions limit eligibility for loan	Promoting Low Emissions Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	CBC	Completed	ongoing	Minimum CO2 level of < 150 g/kg.	Reduced vehicle emissions CO2 level of < 150 g/kg.	100% uptake for vehicle procurement and staff car loan applications	Ongoing	
18	Council Vehicle Fleet LEVs Fleet replacement prioritising uptake of	Promoting Low Emissions Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	CBC	2016	ongoing	Modal shift to LEV (zero emissions)	Reduced vehicle emissions	2018/19 procurement of 3 no. Nissan e-NV200 (zero emissions) to replace diesel vans in Parking	ongoing	2020 vehicle replacement programme replace Port Health diesel van with EV

	EV/low emission vehicles where meets operational criteria								and Neighbourhood Services		
19	CBC Staff Bicycle Loan Scheme	Promoting Low Emissions Transport	Prioritising uptake of low emission vehicles	CBC	completed	ongoing	Modal shift from private vehicle to bicycle	low	No new loan awarded 2018/19	ongoing	CBC staff loan to buy Bike
20	CBC Staff Bike to Work Scheme	Promoting Low Emissions Transport	Prioritising uptake of low emission vehicles	CBC	completed	ongoing	Modal shift from private vehicle to bicycle	low	6 new applicants 2018/19	ongoing	Bike Hire Scheme CBC/Partnership with Evans Cycle
21	Junior Citizen Event	Public Information Promoting Travel Alternatives	Other (interactive games and Awareness raising)	CBC	completed	ongoing	Education and Modal Shift	No Target set	Approx. 1200 KS2 (Yr6) pupils per year	ongoing	Funding
22	Council Home-working Policy	Promoting Travel Alternatives	Encourage / Facilitate home-working	CBC	Completed	completed	% annual working from home	No Target set	Positive staff uptake (numbers variable)	ongoing	
23	Taxi License Fee Discount Scheme for LEVs	Promoting Low Emissions Transport	Taxi emission incentives	CBC	Completed	ongoing	150 % increase in	No Target set	Gatwick Cars currently using 10 Teslas and 5 Mercedes Hybrids = trebling of EV/Hybrid fleet from last year	ongoing	Gatwick Cars have 350 vehicle fleet –not on target for 100% hybrid/electric vehicle fleet by 2020
24	Solar Panel Installation Program	Promoting Low Emission Plant	Shift to installations using low emission fuels	CBC	2010	2011-18	20% Reduction in CO2 Emissions by 2020 100% Reduction in CO2 Emissions by 2050	CO2 Savings from 4 new installations 2018: 14,000 Kg pa 25% reduction in last 5 years	Completed Solar panels installed at CBC properties 2018/19 K2 Leisure Center, Hawth Theatre, Waterlea and Millpond Play Centres	Completed 2019	Installation at Tilgate Nature Centre didn't go ahead due to difficulties with the nature of the work demand at the centre
25	airAlert Pollution Warning Service for vulnerable groups	Public Information	Via other mechanisms SMS/ Mobile phone App/ Email	CBC with Sussex Air Quality Partnership SAQP /CBC	2008	ongoing	Uptake: Number of people receiving forecasting alert	No Target set	Over 800 registered subscribers	ongoing	

26	Energise Network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	SAQP/CBC	2011	2013-2018	Uptake: Number of charges	No Target set	Refuelling infrastructure Network throughout East and West Sussex	Completed 2018	Funding for the Energise network project has ceased Joint partnership working with Horsham DC and WSCC see below
27	Sussex EV Charging Network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	CBC/ HDC/WSCC	2018/19	2020	Increase in Number of charging points across region	No Target set	Planning/discussions/ feasibility study on the Electric Vehicle Charging Infrastructure	ongoing	New partnership to replace Energise and continue expansion of regional ev charging network - joint project CBC/Horsham/WSCC to improve ev charging facilities in the area.
28	Town Centre Rapid Charging Point (50 kWh) for electric vehicles	Promoting Low Emissions Transport	Procuring alternative refuelling infrastructure to promote Low Emission Vehicles, EV recharging, gas fuel recharging	CBC	2018/19	2020/21	kWh of electricity supplied indicating EV usage.	High depending on uptake of LEV (zero emissions)	Planning and procurement for rapid charger to be installed in Town centre site as part of the Station Gateway Scheme for Crawley Growth Programme	Ongoing	Part of the CGP
29	Sussex Air Website upgrade/ improvement	Public Information	Via the Internet	SAQP	2017	ongoing	Number of views/visits accessed by partners/public to keep up to date with air quality locally.	No Target set	Draft technical specification/service level agreement	2019 completed	update to the website completed for 2019

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There is no direct monitoring of $PM_{2.5}$ in Crawley. However, using the correction factor in TG (16) it is possible to estimate concentrations from our local monitoring of PM_{10} (see Appendix C).This method suggests that 2018 $PM_{2.5}$ levels in Crawley are estimated at 12.24µg/m^3. The annual average EU limit for $PM_{2.5}$ is 25µg/m^3 so the risk of exceedance is negligible. However, the council is still committed to reducing emissions and exposure to this pollutant and is taking the following measures to address $PM_{2.5}$:

1. Regulation of Industrial Process to control emissions of $PM_{2.5}$ from mineral processes such as concrete batching, concrete rushing and road-stone coating.
2. Sussex electric vehicle charging network to encourage low/zero emissions vehicles.
3. Policy measures to which will help reduce $PM_{2.5,}$ including planning policy, local transport planning and the development of the Air Quality Action Plan.

- Local Plan Policy: Requirement to adhere to the Sussex Air Quality and Emissions Mitigation Guidance document
- Local Transport Plan: Traffic management measures to reduce congestion, improve traffic flow and reduce road traffic pollutant emissions (including $PM_{2.5}$)
- Air Quality Action Plan: the emerging action plan will include the promotion of low emission travel alternatives (e.g. cycling, walking, electric vehicles, car sharing etc).
- SAQP Defra grant funded project ‘Clean Burn Sussex’ to raise awareness and encourage choice of cleaner, more efficient fuels to reduce particulate emissions.

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

3.1 Summary of Monitoring Undertaken

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

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.

3.1.1 Automatic Monitoring Sites

Crawley Borough Council undertook automatic (continuous) monitoring at one site on the eastern border of Gatwick Airport (CA2) during 2018. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at https://uk-air.defra.gov.uk/. Monitoring results for Sussex authorities are also available at www.sussex-air.net/.

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.

3.1.2 Non-Automatic Monitoring Sites

Crawley Borough Council undertook non- automatic (passive) monitoring of NO_2 at 43 sites during 2018. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D (Figs D.1 – D.4). 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_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations (diffusion tube and continuous data) for the past 5 years with the air quality objective of 40µg/m^3.

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_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

The data in Table B.1 shows that air quality in Crawley is mainly good, with national targets being met at most monitoring sites with the exception of some sites close to busy roads. Exceedances of the nitrogen dioxide 40 µg/m^3 annual mean objective were found at seven roadside sites in 2018 (CR 55, , 63, 64, 69 and, 93, 97 101) . Four of these sites (CR 55, 63, 64, 69) are within the Hazelwick AQMA.

Only one of the sites (CR 69) was located at the façade of the house, the remaining sites were located closer to the road than the houses and therefore were not truly representative of residential exposure because pollution concentrations decrease with distance from the source. In order to account for this falling off in pollution concentration, an adjustment was made. After calculating the effect of fall off with distance from the road, to provide a more representative estimation of exposure, it was found that there were still exceedances at the point of relevant public exposure at four locations (CR 55, 69, 93 and 97). These measured values indicate that nitrogen dioxide levels within the AQMA (CR55 and 69) remain high. However, new sites at CR 93 and 97 indicate that further action is needed outside of the AQMA. There is no evidence that the hourly objective for NO_2 is being exceeded at these sites.

The rationale for the choice of bias adjustment factor is discussed fully in Appendix A, however, its effect on the reported results is explained in more detail here: Following Guidance from LAQM Guidance (TG.16) and the laqm helpdesk, the local adjustment factor (1.0) was chosen to take into account the effect of the airport and provide a conservative approach to the monitoring data. However, at busy road locations such as in the AQMA, the influence of road traffic sources is more dominant and the use of the national bias adjustment factor (0.92) may have been more appropriate. If the

national factor had been applied to the data, this would have resulted in only two exceedances of the objective being reported (CR93 and CR 101), and after fall off adjustments only one site (CR93) would have shown exceedances of the objective. However, it is not appropriate to apply two different adjustments within the same report.

Ultimately which ever factor had been chosen, the results at these locations would have been within +/- 10% of the air quality objective of 40ug/m^3 and therefore, with the potential to exceed, would have resulted in the same conclusions being drawn, that is: That the AQMA should remain in place and we should consider declaring a new AQMA or an the extension of the existing AQMA to cover these other locations.

Trends in Annual Mean NO_2

In 2018 there was a slight decrease in NO_2 levels across Crawley for the second year in succession. This pattern was also seen regionally. Slight fluctuations year on year are likely to be attributable to climatic influences rather than local conditions, however, long term downward trends are indicative that levels of nitrogen dioxide have generally fallen over time, driven mainly by cleaner engine technologies.

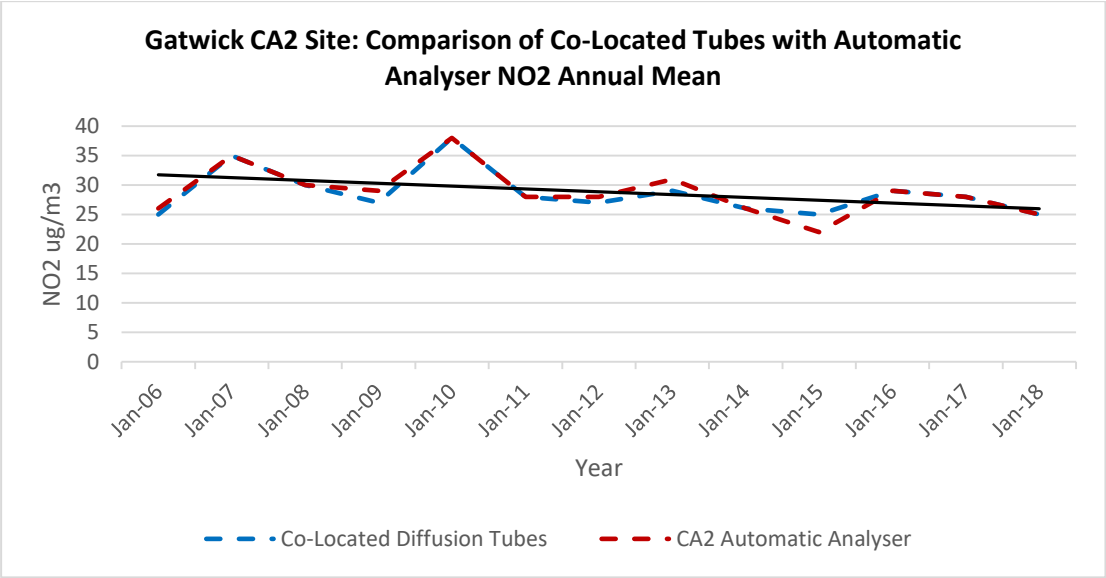
The long term (15yr) trends in Crawley show that levels of NO_2 at roadside, background and airport sites continues to be downwards. The only exception to this is within the AQMA where the long term trend continues to be upwards.

In more recent years annual mean NO_2 concentrations in Crawley have fluctuated but remained broadly consistent. When the trend data over the last five years is considered it shows a slight upwards trend in the background, roadside and airport levels in Crawley and an upward trend is still present within the AQMA. The Gatwick data from LGW3 site (at the end of the runway South Terminal) shows a slight downward trend in NO_2 levels over the last 5 years.

Trends in NO_2 at Gatwick

A decrease in annual mean NO_2 levels was measured at the Gatwick East continuous monitoring site in 2018. There were no exceedances of the annual or hourly mean objectives and the long term trend continues to be downwards (Fig 3.1). The co-located diffusion tube data at this site shows very good correlation with the continuous data, recording the same annual mean and the same trend pattern for the long term data.

Fig 3.1



Determining relevant exposure at residential properties within 1000m of the airport is one of the assessment criteria required for authorities with a major airport within their boundary. In 2018 there were no exceedances of annual mean NO_2 at any of these residential receptors (CR 48, 49, 50, 51, 74, 75).

In Fig 3.2 the levels of nitrogen dioxide from the airport's LGW3 site located at the eastern end of the runway (and therefore considered to be worst case) are compared to residential receptors in Crawley within 1000m of the airport.

The long-term trend at both these sites shows a decline over the last 15years (Fig 3.2). However the more recent 5 year trend (Fig 3.2a) is indicating a rising trend in NO_2 at the residential sites close to the airport and a flattening out of the trend at the LGW3 site since 2014, although concentrations are still significantly below peak levels of the previous decade. This upward trend will continue to be monitored and reviewed annually through the LAQM process.

Fig 3.2

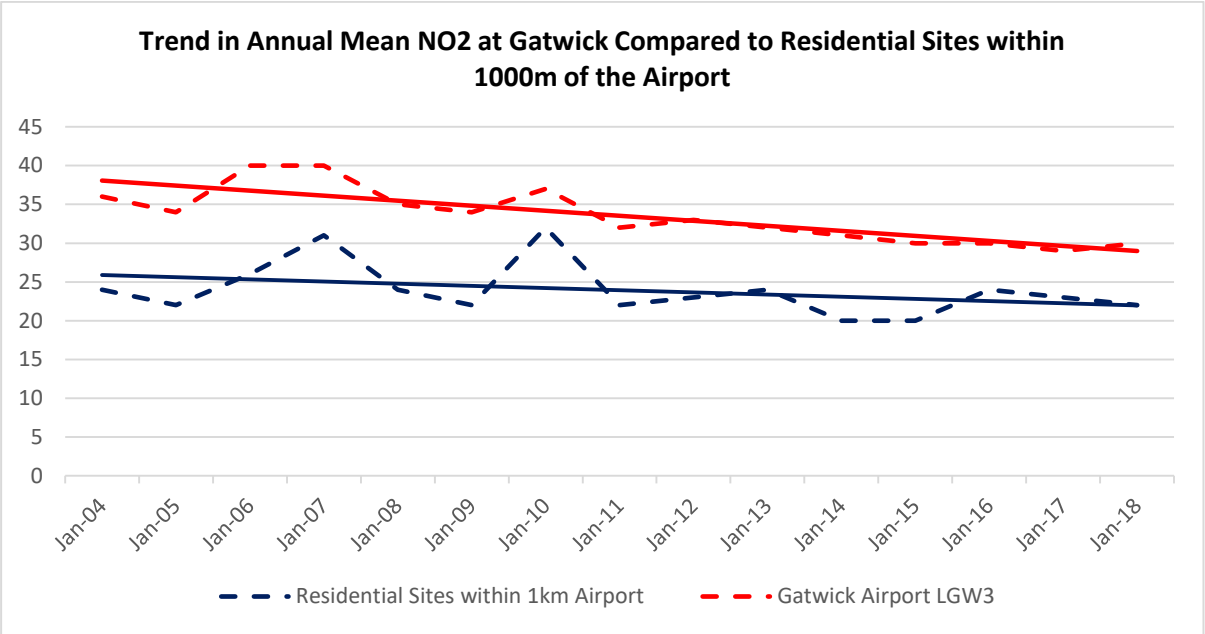
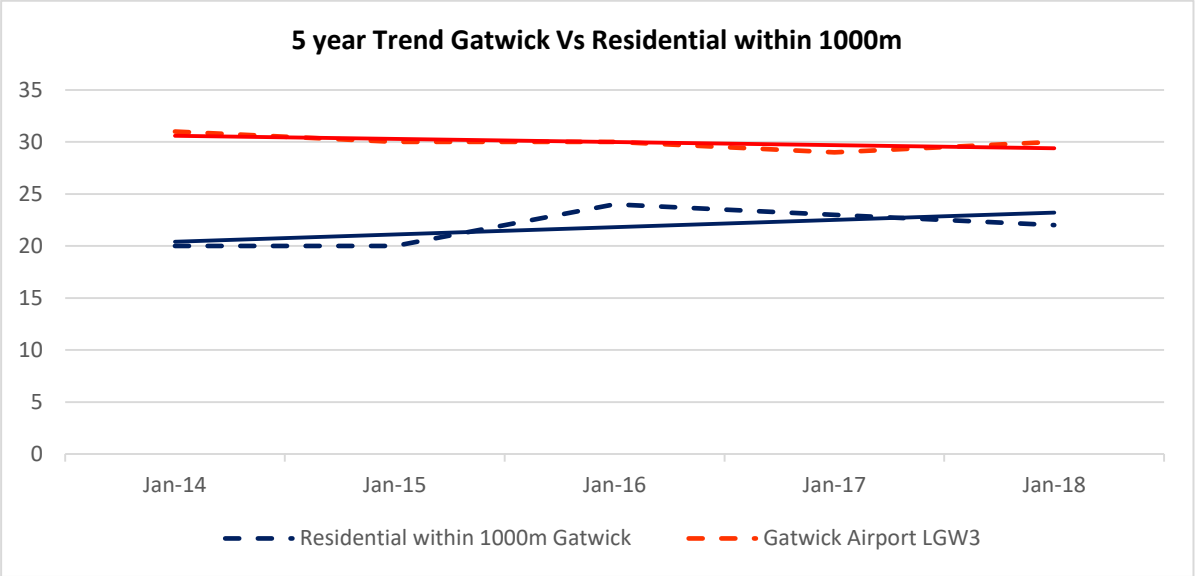


Fig 3.2a



Trends in Roadside NO_2 in Crawley

Fig 3.3 shows the long term (15yr) trend in roadside NO_2 in Crawley continues to be downwards indicating that overall levels have fallen despite an upward trend in traffic volumes over the same period (Fig 3.4). A range of measures at European, national and local level, such as improvements in engine technologies, and gradual shift to more sustainable forms of transport have helped reduce vehicle emissions, which, over time have resulted in reductions in NO_2 both regionally and locally. However, if the data

over more recent years is plotted (Fig 3.3a) it can be seen that the trend is upward. This trend may be influenced by a number of factors including increased traffic volumes on local roads, or year on year variations skewing the trend in an upwards direction. This upward trend will continue to be monitored and reviewed annually through the LAQM process.

Fig 3.3

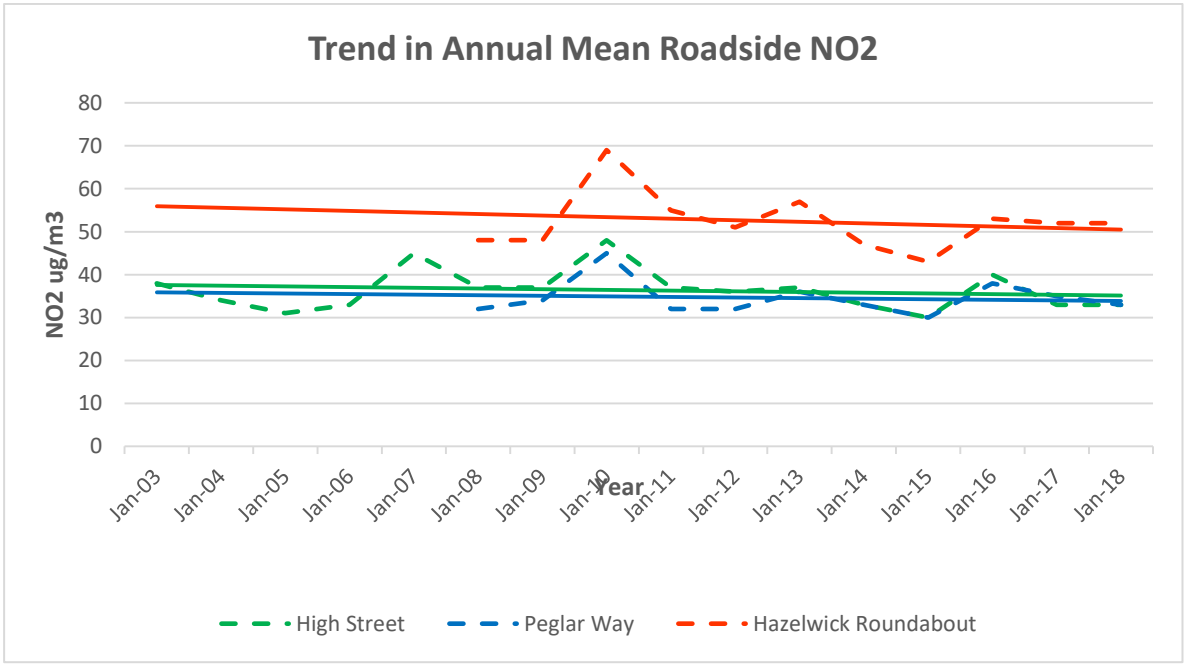


Fig 3.3a

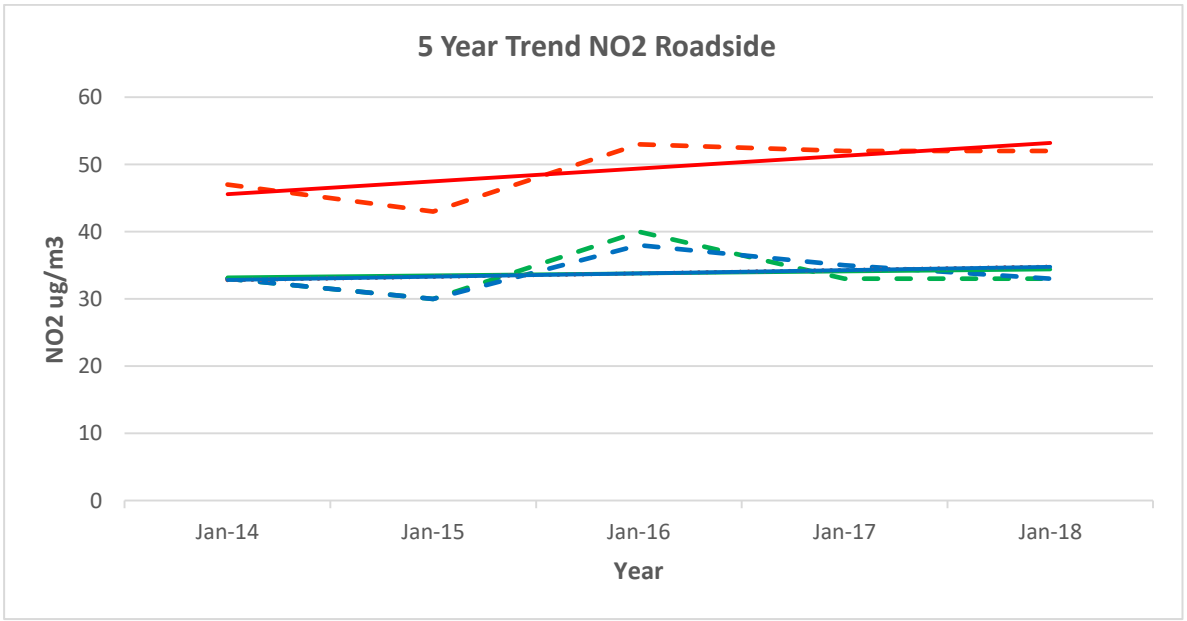
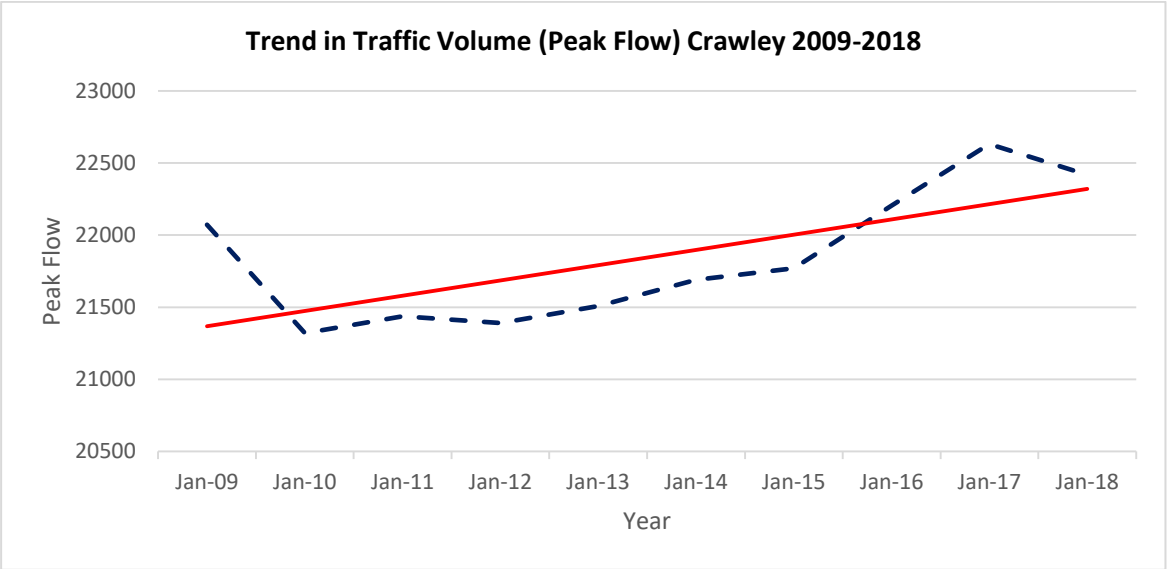


Fig 3.4



Trends in Background NO_2 in Crawley

Fig 3.5 shows the trend in NO_2 at background sites in Crawley gives a similar picture to that at roadside and airport sites, with the long term trend downwards, confirming that background levels of NO_2 have also been falling over the last 15years. The steeper downward slope indicates that background levels have shown greater improvement in air quality over the last decade than at sites close to busy roads. This helps to demonstrate the contribution vehicle emissions make to poor air quality at these roadside locations, and support the argument for restricting residential development close to busy roads.

When data over the last 5 years is plotted (Fig 3.5a) there is a slight upward trend, indicating that improvements are beginning to slow. This may be associated with increased development and traffic volumes in the borough, but climatic factors may be more relevant, with the particularly low concentrations in 2014/15, followed by higher 2016 levels influencing the short term trend. However, this upward trend will continue to be monitored and reviewed annually through the LAQM process to assess significance.

Fig 3.5

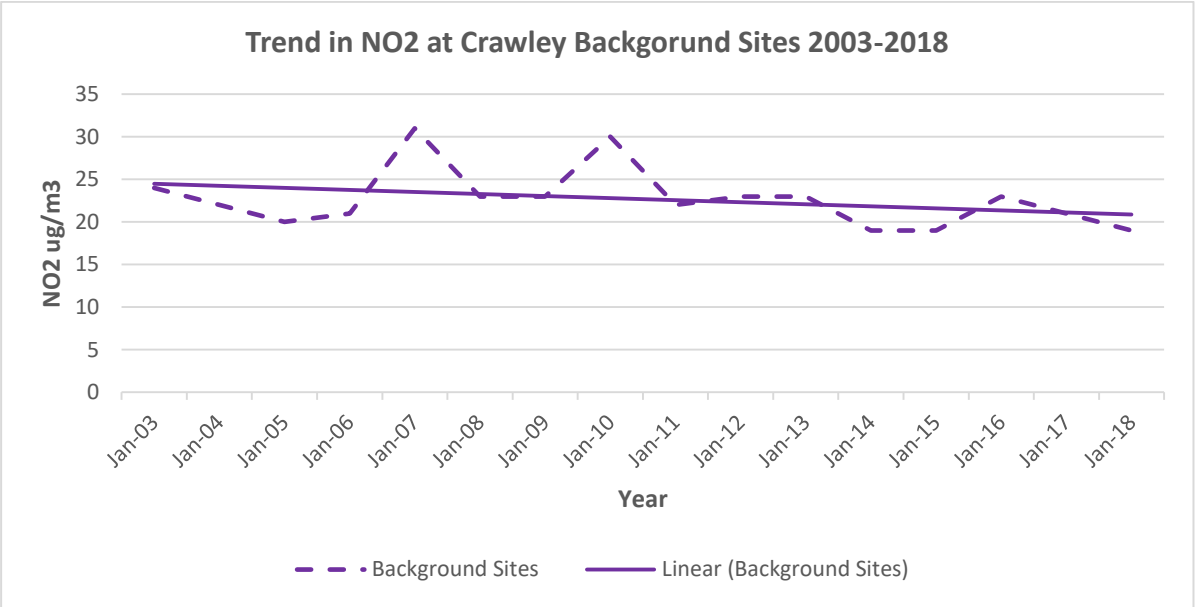
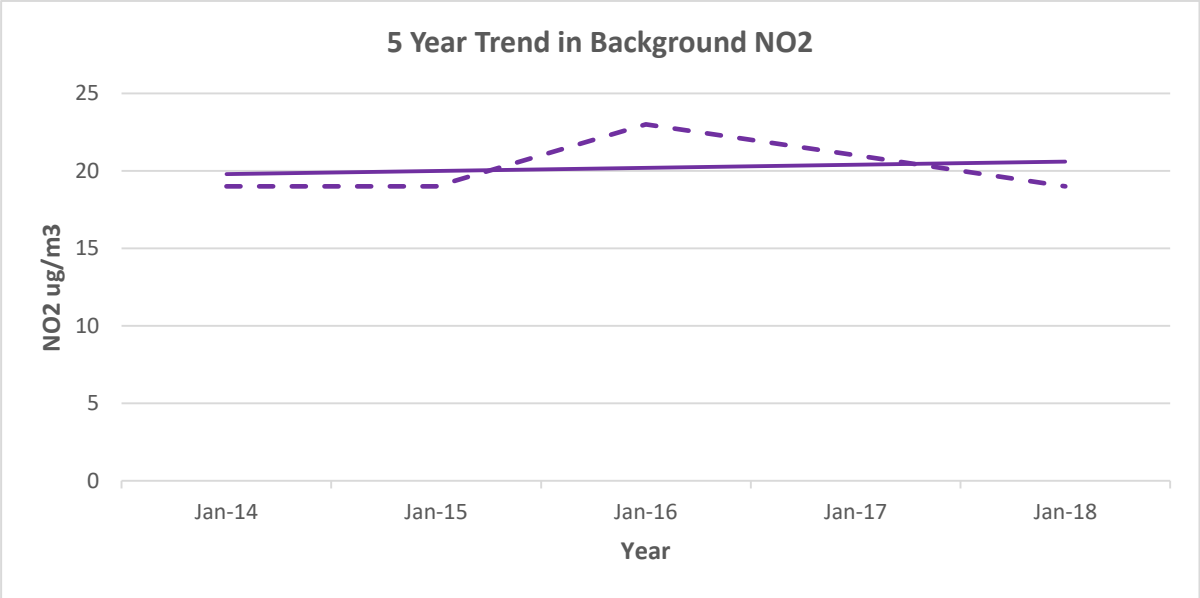


Fig 3.5a



Trends in AQMA NO_2 in Crawley

Although the long term trend for both background and roadside sites in Crawley is down, this is not seen at receptor sites within the AQMA where the long term data is still showing an upwards trend (Fig 3.6). When data over the last 5 years is plotted (Fig 3.6a) the trend is still upwards. The impact of major development (2000 dwellings) adjacent to the AQMA continues to be monitored. As a result, the council has no current plans to amend the AQMA.

Fig 3.6

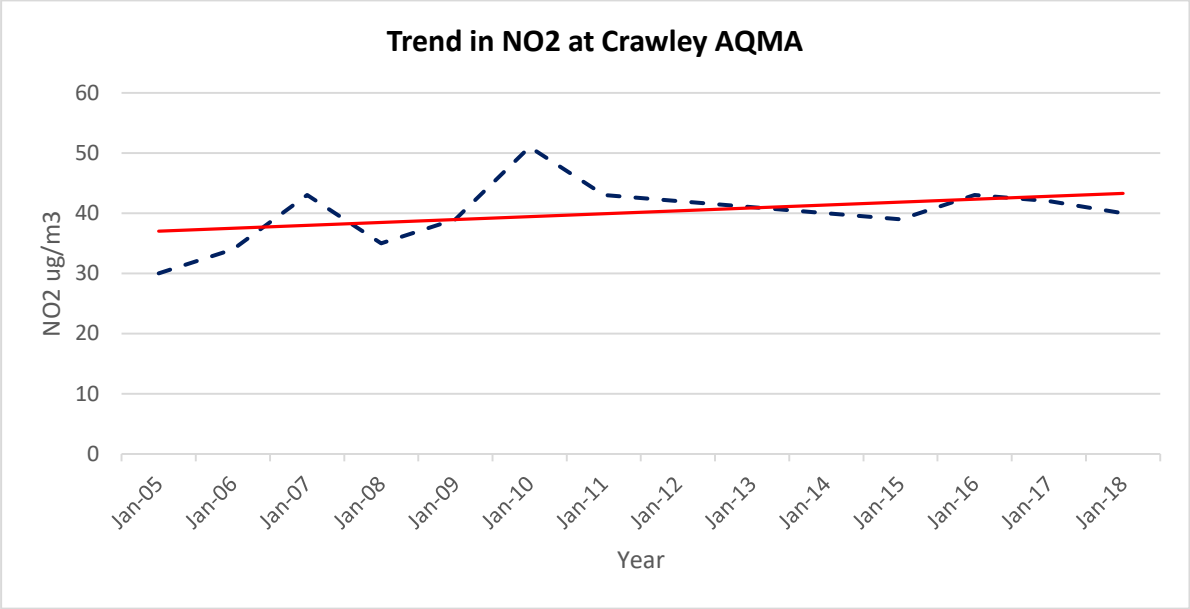
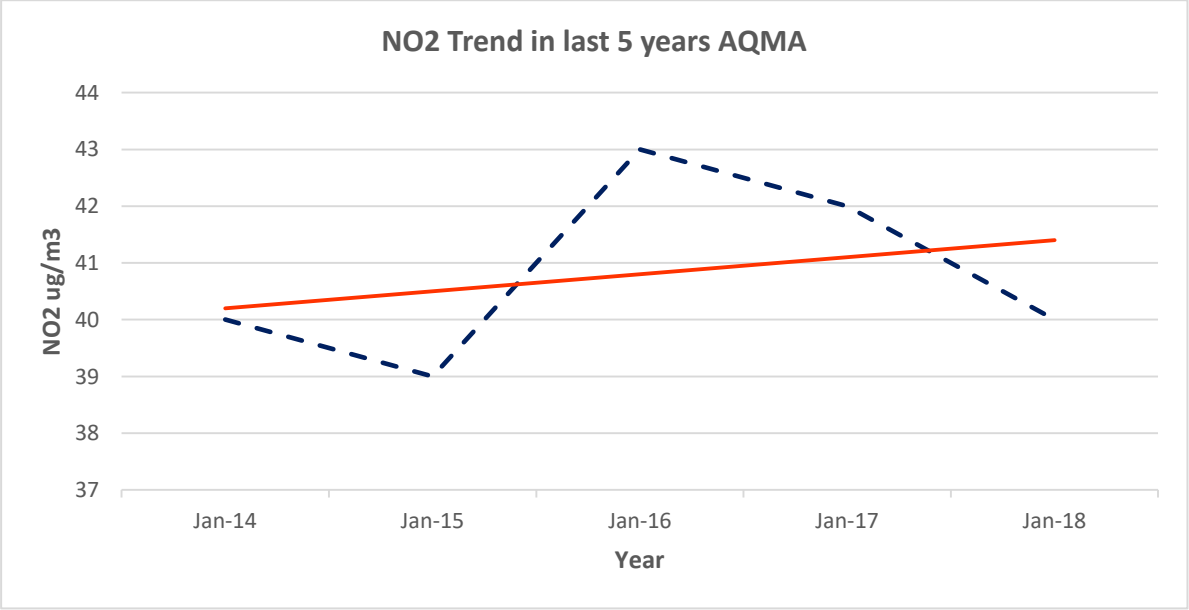


Fig 3.6a



Outside of the AQMA, a new site (CR93) was set up to monitor pollution levels at a residential receptor adjacent to a busy road junction in the Three Bridges area of Crawley on Worth Park Avenue (A2220). The first full year of data from this site in 2018 has shown that NO_2 concentrations are exceeding the 40µg/m^3 annual mean objective.

The A2220 Worth Park Avenue becomes the A2220 Haslett Avenue East at Three Bridges Station. Another site (CR97) was set up at a sensitive receptor along the A2220 adjacent to the Haslett Avenue East. This site also showed NO_2 concentrations exceeding the 40µg/m^3 annual mean objective.

Local Air Quality Management Policy Guidance (PG16) advises that once a pollutant is identified as exceeding the air quality objective subsequent follow-up assessment more often than not confirms the initial, identified risk.

Further information provided in Appendix C and the addendum to this report, sets out the council's rationale for the extending the existing AQMA boundary to incorporate this newly identified area of exceedance.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

The 2018 results show that annual mean PM_{10} concentrations decreased slightly in 2018 (17.5µg/m^3 vcm corrected), and there were no exceedances of the annual mean or daily mean objectives measured at the automatic monitoring site on the eastern boundary of the airport.

The long-term trend for PM_{10} shows a decline over the last 15years (Fig 3.7). However the more recent 5 year trend, is indicating a rising trend in PM_{10}, although concentrations are still significantly below peak 2006 levels. This upward trend will continue to be monitored and reviewed annually through the LAQM process. No recommendation for an AQMA is required for this pollutant.

Fig 3.7

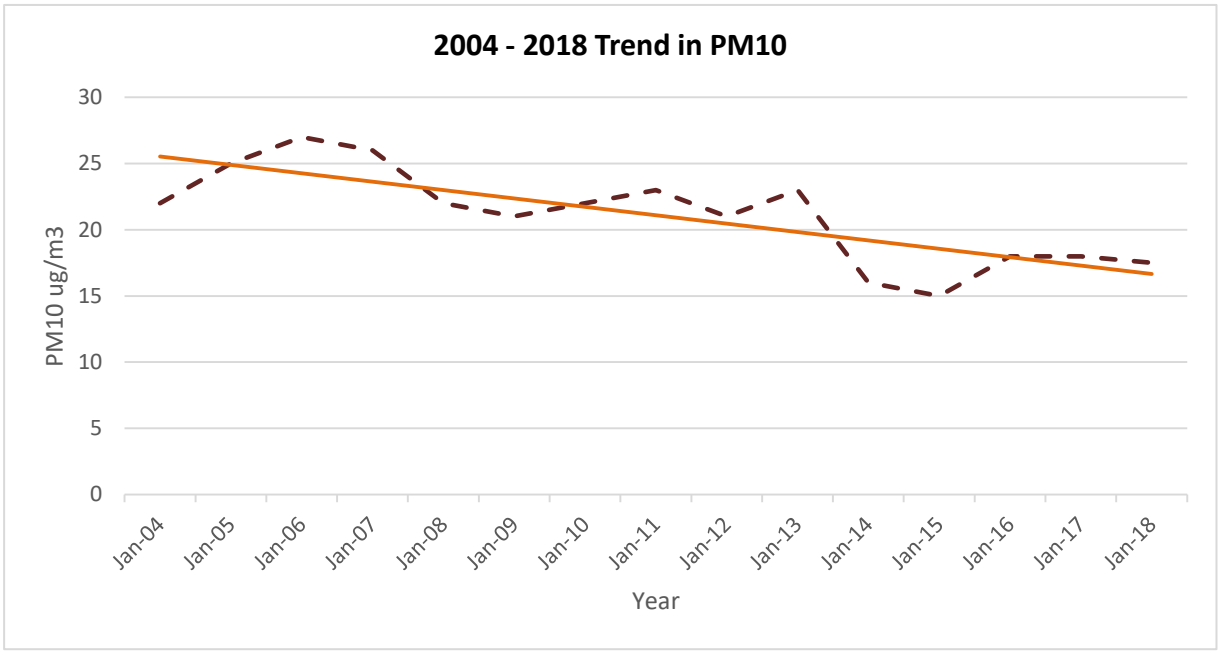
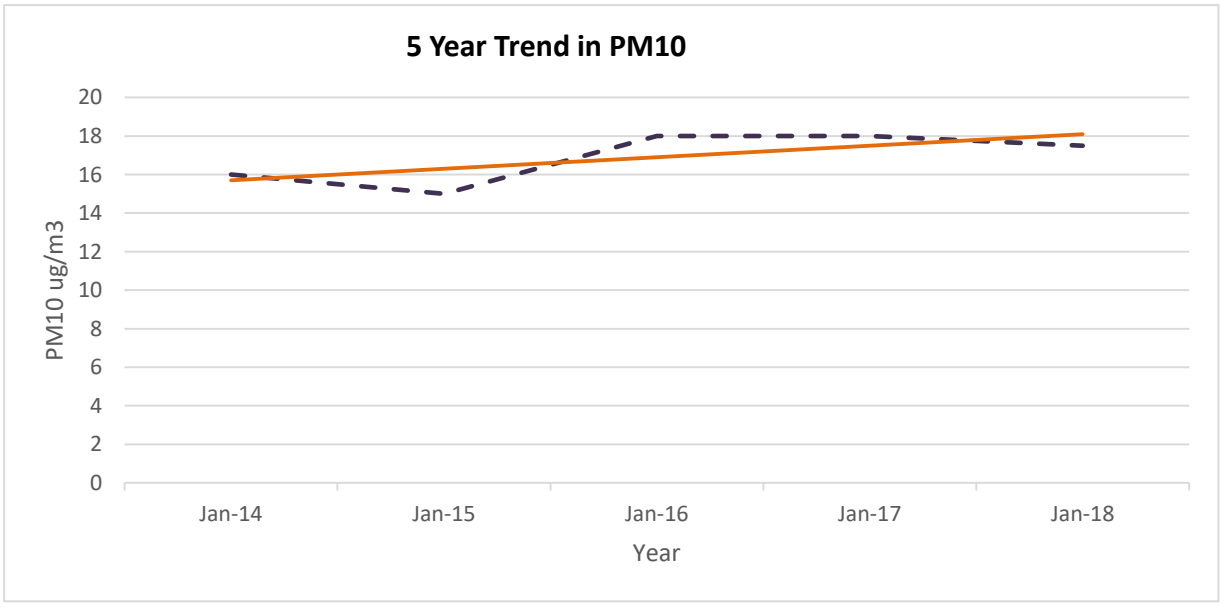


Fig 3.7a



Appendices

Appendix A: Monitoring Results

Appendix B: Full Monthly Diffusion Tube Results for 2017

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

Appendix D: Map of Monitoring Locations/ AQMA

Appendix E: Summary of Air Quality Objectives in England

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CA2	Gatwick East	Other/Suburban Industrial(AQD2008)	529417	141496	NO_2; PM_{10}	NO	Chemiluminescent; TEOM	63m	7m	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) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
CR1	High Street	Roadside	526799	136785	NO_2	N	15.8m	1.75m	N	2.0
CR3	Birch Lea	Urban background	528438	138392	NO_2	N	6.85m	0.5m	N	2.0
CR4	Headley Close	Urban background	529864	138204	NO_2	N	14.80m	0.5m	N	2.0
CR48	Lynhurst Cottage	Urban background	527110	139530	NO_2	N	0m	21m	N	1.5
CR49	Charlwood Nursery	Urban background	526320	139860	NO_2	N	0m	36m	N	1.5
CR50	Rowley Cottage	Urban background	527810	139929	NO_2	N	0m	75m	N	1.5
CR51	Balcombe Road	Urban background	529490	141460	NO_2	N	0m	21m	N	1.5

CR52 - CR54	Gatwick East, (Tri-location)	Other/Suburban Industrial (AQD2008)	529417	141496	NO_2	N	63m	7m	Y	1.8
CR 55	Tinsley Close Fence (11)	Roadside	528446,	138085	NO_2	Y	1.13m	5.7m	N	2.0
CR 60	Peglar Way	Roadside	526740	136934	NO_2	N	6.5m	2.31m	N	2.0
CR62	Tinsley Close (10)	Urban background	528438	138088	NO_2	Y	0m	13.6m	N	2.0
CR63	Woodfield Lodge (Roundabout)	Roadside	528153	137912	NO_2	Y	30m	7.4m	N	2.0
CR64	Woodfield Lodge (NorthgateAve)	Roadside	528150	137825	NO_2	Y	4.57m	1.62m	N	2.0
CR66	Brighton Rd (Rail crossing)	Roadside	526743	136346	NO_2	N	0.5m	1.2m	N	2.0

CR69	Tinsley Close Facade(11)	Urban background	528443	138082	NO_2	Y	0m	9.3m	N	2.0
CR72	Burlands	Urban background	525530	138472	NO_2	N	6.75m	1.3m	N	2.0
CR74	Tinsley Green Radford Road	Urban Background	528978	139599	NO_2	N	31.5m	0.5m	N	1.5
CR75	Steers Lane	Urban Background	529335	139589	NO_2	N	18.6m	2m	N	2.0
CR76	Hazelwick Court	roadside	528303	137800	NO_2	Y	10.3m	2.52m	N	2.0
CR77	Hazelwick Ave (Bays)	Roadside	528362	137812	NO_2	Y	6.34m	2.3m	N	2.0
CR78	Ferndown	Urban background	530037	138553	NO_2	N	0m	40m	N	2.0
CR79	St Hildas Close	Urban background	529312	138534	NO_2	N	0m	12m	N	2.0

CR80	Saxon Road	Urban background	530424	136521	NO_2	N	0m	8.7m	N	2.0
CR81	Bolton Road	Urban background	529047	134474	NO_2	N	0m	12.8m	N	2.0
CR85	Tinsley Lane Flats	Urban background	528286	138019	NO_2	Y	13m	32m	N	2.0
CR86	Crown Buildings The Boulevard	Roadside	526876	136819	NO_2	N	13.8m	0.5m	N	2.0
CR87	Broadway bus shelter	Roadside	526908	136754	NO_2	N	3.5m (planned residential)	0.5m	N	2.0
CR88	Filbert Crescent	Urban background	525489	136573	NO_2	N	0m	5.4m	N	2.0
CR89	Dalewood Garden	Urban background	527715	137893	NO_2	y	0m	13.8m	N	2.0
CR90	Costa County Oak, Way	Roadside	526953	138658	NO_2	N	2m	1.8m	N	2.0

CR91	Ocean Hse, Hazelwick Ave	Roadside	528681	137177	NO_2	Y	4.7m	0.5m	N	2.0
CR93	St Marys Drive	Roadside	528895	137115	NO_2	N	1.5m	1.8m	N	2.0
CR94	Station Hill	Roadside	528841	137069	NO_2	N	5.45m	3.45	N	2.0
CR95	Daniels Hse, Worth Park Ave	Roadside	528882	137086	NO_2	N	5.44m	2.2m	N	2.50
CR96	Pound Hill Junior School	Roadside	529125	137196	NO_2	N	35m	3.58m	N	2.0
CR97	Daisy Chain Nursery Haslett Ave East	Roadside	528615	136960	NO_2	N	3.52m	1.1m	N	1.5
CR98	Gatwick School Gatwick Road	Roadside	528515	139275	NO_2	N	12.6m	2.13m	N	2.0
CR 99	Furnace Farm Road	Urban background	528410	135628	NO_2	N	12.1m	1.5m	N	2.0

CR100	Horsham Road Level Crossing	Roadside	526326	136487	NO_2	N	2.08m	1.46m	N	2.0
CR101	Horsham Road A2220	Roadside	525679	135556	NO_2	N	8.91m	1.13m	N	2.0
CR102	Pease Pottage Hill A23	Roadside	526449	134139	NO_2	N	5.10m	4.45m	N	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_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
CA 2	Other/Suburban Industrial	Automatic	n/a	99	(26)*	22	29	28	25
CR1	Roadside	Diffusion	n/a	92	33	30	**40**	33	33
CR3	Urban background	Diffusion	n/a	92	20	20	24	22	20
CR4	Urban background	Diffusion	n/a	92	21	21	25	23	21
CR48	Urban background	Diffusion	n/a	92	23	24	28	27	25
CR49	Urban background	Diffusion	n/a	92	17	16	19	18	18
CR50	Urban background	Diffusion	n/a	92	18	19	25	21	21
CR51	Urban background	Diffusion	n/a	92	21	21	25	24	22
CR52	Other/Suburban Industrial	Diffusion	n/a	92	25	25	30	30	24
CR53	Other/Suburban Industrial	Diffusion	n/a	92	26	24	29	29	25
CR54	Other/Suburban Industrial	Diffusion	n/a	92	26	25	29	29	25
CR55	Roadside	Diffusion	n/a	92	**40**	39	**42**	**41**	**41**
CR60	Roadside	Diffusion	n/a	83	33	31	38	35	33
CR62	Urban background	Diffusion	n/a	92	36	31	**40**	**40**	38
CR63	Roadside	Diffusion	n/a	92	**47**	**44**	**53**	**52**	**52**
CR64	Roadside	Diffusion	n/a	92	37	37	**41**	**41**	**40**

CR66	Roadside	Diffusion	n/a	92	31	27	35	34	29
CR69	Urban background	Diffusion	n/a	92	37	36	**43**	**42**	**40**
CR72	Urban background	Diffusion	n/a	92	14(1)	13	16	15	15
CR74	Urban Background	Diffusion	n/a	92	30 (1)	26	37	37	34
CR75	Urban Background	Diffusion	n/a	92	20 (1)	20	25	23	21
CR76	roadside	Diffusion	n/a	92	**40**(1)	36	**43**	**40**	35
CR77	Roadside	Diffusion	n/a	92	35(1)	36	**42**	39	35
CR78	Urban background	Diffusion	n/a	83	-	-	29	26	24
CR79	Urban background	Diffusion	n/a	92	-	-	30	27	25
CR80	Urban background	Diffusion	n/a	92	-	-	32	27	28
CR81	Urban background	Diffusion	n/a	92	-	-	28	25	24
CR85	Urban background	Diffusion	n/a	92	-	-	-	27[1]	30
CR86	Roadside	Diffusion	n/a	92	-	-	-	22[1]	26
CR87	Roadside	Diffusion	n/a	83	-	-	-	38[1]	38
CR88	Urban background	Diffusion	n/a	92	-	-	-	18[1]	26
CR89	Urban background	Diffusion	n/a	83	-	-	-	19[1]	22
CR90	Roadside	Diffusion	n/a	92	-	-	-	25[2]	26
CR91	Roadside	Diffusion	n/a	75	-	-	-	39[2]	34
CR93	Roadside	Diffusion	n/a	83	-	-	-	**65[2]**	**48**
CR94	Roadside	Diffusion	n/a	75	-	-	-	-	26

CR95	Roadside	Diffusion	n/a	83	-	-	-	-	31
CR96	Roadside	Diffusion	n/a	83	-	-	-	-	30
CR97	Roadside	Diffusion	n/a	75	-	-	-	-	**41**
CR98	Roadside	Diffusion	n/a	75	-	-	-	-	35
CR 99	Urban background	Diffusion	n/a	83	20	16	20	20	17
CR 100	Roadside	Diffusion	80	42	-	-	-	-	30(1)
CR 101	Roadside	Diffusion	80	42	-	-	-	-	**54**(1)
CR 102	Roadside	Diffusion	80	42	-	-	-	-	37(1)

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

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

☒ **(2)New site - data reported as indicative only**

*** Analyser failure – adjusted value in brackets taken from tri-located tubes**

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.

* Values taken from tri-located diffusion tube as no valid data available from automatic monitor due to equipment failure

Table A.3.1 Automatic Monitoring for Nitrogen Dioxide at Gatwick Sites: CA2 (Crawley Gatwick East) and LGW3 (Adjacent to Runway Gatwick airport) Objective * Analyser failure – adjusted value in brackets taken from tri-located tubes

Site ID	Location	% Data Capture for mon period 2018	Annual mean concentrations (µg/m^3)												
			2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	2014	**2015**	**2016**	**2017**	**2018**
CA2	Gatwick East	99	32	26	35	30	29	38*	(28)*	28	31	(26)*	22	29	28	25
LGW3	Gatwick Airport	99	34	**40**	**40**	35	34	37	32	33	32	31	30	30	29	30

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
CA2	Other/Suburban Industrial	Automatic	N/A	99	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

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

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

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

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
CA2	Other/Suburban Industrial	N/A	96	16[3]	15	18	18	18
LGW3	Industrial	NA	95	24	22	17	19	19

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ 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) 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.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
CA2	Other/Suburban Industrial	N/A	96	0	1	1	0	2
LGW3	Industrial	NA	95	14	7	7	3	1

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2018

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

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 (1.0) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
CR1	36.85	28.38	35.86	32.32	29.70	25.34	33.52	25.05	*	31.72	**42.52**	**40.66**	32.90	33	24
CR3	27.19	22.27	23.42	21.51	15.50	14.22	16.79	12.59	*	19.53	25.42	22.59	20.10	20	20
CR4	26.58	22.92	24.23	22.66	18.29	15.19	18.88	16.21	*	20.74	26.85	23.14	21.43	21	19
CR48	31.18	24.48	28.96	24.67	24.54	20.12	21.84	20.36	*	24.84	24.60	26.75	24.76	25	25
CR49	19.20	16.75	23.03	19.06	19.68	11.79	19.29	11.44	*	16.39	26.82	16.99	18.22	18	18
CR50	22.04	22.43	25.98	19.79	18.74	13.38	17.94	13.70	*	21.30	27.77	23.44	20.59	21	21
CR51	30.16	22.59	22.15	20.33	16.48	19.92	17.41	21.03	*	19.02	23.48	25.80	21.67	22	22
CR52	33.06	23.91	27.35	24.24	21.85	22.03	22.43	18.77	*	24.21	23.06	26.86	24.34	24	24
CR53	29.62	25.39	28.11	23.90	21.46	22.13	23.15	22.89	*	23.15	30.38	28.52	25.34	25	25
CR54	32.10	25.64	28.68	23.37	19.71	21.72	21.70	21.64	*	22.04	28.54	26.71	24.71	25	25
CR55	34.67	36.04	**46.08**	**44.21**	36.00	**50.02**	38.86	**43.40**	*	**43.97**	**48.47**	34.06	**41.43**	**41**	**40**
CR60	33.71	27.94	39.26	33.58	27.53	37.56	28.36	28.07	*		**42.05**	36.22	33.43	33	27
CR62	29.35	31.75	**46.11**	38.86	28.93	**47.81**	38.67	**40.47**	*	34.52	**39.96**	38.56	37.73	38	38
CR63	**54.88**	**46.25**	**62.57**	**47.87**	**43.49**	**43.18**	**48.76**	**51.25**	*	**51.66**	**62.53**	**57.97**	**51.85**	**52**	37
CR64	**45.84**	35.74	**43.47**	38.11	38.27	36.36	**41.43**	38.44	*	39.92	**39.86**	38.47	**39.63**	**40**	35
CR66	29.92	31.78	33.89	22.46	23.44	28.63	28.56	23.56	*	29.01	33.54	33.06	28.90	29	28

CR69	33.93	32.84	**47.29**	**41.05**	34.57	**43.06**	**42.74**	**43.36**	*	39.09	**44.71**	38.37	**40.09**	**40**	**40**
CR72	17.16	16.95	16.36	14.58	11.87	9.02	13.38	10.62	*	13.14	21.15	16.46	14.61	15	14
CR74	36.64	25.95	37.54	34.25	35.02	30.45	**39.98**	28.74	*	33.70	33.84	34.57	33.70	34	25
CR75	26.17	24.07	23.46	23.17	20.88	17.43	19.26	15.12	*	19.29	23.36	23.40	21.42	21	18
CR76	**39.77**	34.08	37.61	35.18	32.66	30.55	36.06	28.26	*	32.87	36.70	36.65	34.58	35	31
CR77	**44.12**	35.25	**41.36**	37.67	32.40	30.48	34.81	14.41	*	35.98	**40.70**	37.58	34.98	35	31
CR78	22.84	14.53	29.81	25.64	28.42		27.15	15.63	*	22.92	29.73	26.14	24.28	24	24
CR79	27.76	26.22	26.68	22.74	30.69	21.05	30.50	16.38	*	23.28	25.18	22.40	24.81	25	25
CR80	21.86	23.90	34.12	29.32	33.33	25.59	33.65	18.37	*	25.54	34.16	27.73	27.96	28	28
CR81	24.48	25.41	26.76	25.21	18.72	22.59	22.49	20.71	*	20.08	28.44	23.95	23.53	24	24
CR85	31.94	32.14	37.68	28.82	26.44	24.92	27.66	29.76	*	18.90	36.43	33.76	29.86	30	34
CR86	30.85	25.45	30.93	24.54	20.61	22.47	20.35	21.43	*	24.80	33.51	32.95	26.17	26	20
CR87	**43.63**	36.49		32.91	33.91	36.53	**40.31**	34.79	*	37.08	**41.30**	38.39	37.53	38	30
CR88	19.61	24.41	32.84	27.14	28.83	19.55	30.79	16.32	*	23.17	32.57	25.90	25.56	26	26
CR89	26.38	24.26	24.86	21.95		17.36	24.36	15.14	*	21.07	23.31	24.21	22.29	22	22
CR90	24.84	26.60	28.78	21.91	25.24	27.82	26.72	20.72	*	22.18	34.40	29.94	26.29	26	26
CR91		32.21	38.95	**41.19**	27.90	34.57	33.37	30.06	*	27.90		34.95	33.46	34	30
CR93	**61.53**	**48.35**	**54.99**	**49.56**		**41.93**	**40.83**	**41.43**	*	**40.93**	**48.53**	**54.36**	**48.24**	**48**	**44**
CR94		27.93	32.14		25.98	25.57	24.27	18.58	*	22.79	30.29	29.15	26.30	26	26
CR95		31.32	34.93	27.20	25.97	31.47	30.87	26.98	*	29.29	37.22	33.95	30.92	31	29
CR96		31.15	28.42	**43.14**	**40.42**	24.35	24.25	24.28	*	22.84	29.97	29.54	29.84	30	23
CR97		39.32		**41.48**	32.90	**45.79**	**40.71**	**44.49**	*	34.83	**43.92**	**42.21**	**40.63**	**41**	**40**
CR98		38.83	38.78	36.09	30.17	35.76		31.71	*	31.48	34.35	33.31	34.50	35	24
CR 99	23.59	32.46	21.50	19.98	15.53	10.30	12.61	11.36	*	4.54	22.10		17.40	17	15
CR 100								24.93	*	26.33	32.79	30.77	28.70	30[(1)]	27
CR 101								**56.24**	*	**49.11**	**52.26**	**51.68**	**52.33**	**54**[(1)]	35
CR 102								34.06	*	27.20	36.30	41.85	34.85	37[(1)]	31

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

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

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

***** September data lost due to LA error

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

C.1: QA/QC Diffusion Tube Monitoring Data (NO_2)

All diffusion tube 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).

The NO_2 diffusion tube analysis was carried out and analysed by Gradko Environmental (part of Gradko International Ltd) .The QA/QC methodology for Gradko Environmental Ltd is given below:

Tube Preparation: The preparation of the tubes is done using 20% Triethanolamine / 80% Deionised Water. The preparation procedures adhere to the guidance detailed in the document 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance for Laboratories and Users', Issue 1a Feb.2008 (issued by AEA Energy and Environment).

Analysis Methods: Analysis of the NO_2 diffusion tubes is carried out using colorimetric techniques in accordance with Gradko International Ltd UKAS accredited (ISO/IEC 17025) internal laboratory procedures. The details in these procedures adhere to the DEFRA 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance for Laboratories and Users, Issue 1a Feb 2008', issued by AEA Energy and Environment.

Quality Control Procedures: All tube components are maintained in a high state of cleanliness. New absorbents are prepared by the Laboratory and checked for levels of contamination.

The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded.

Method Calibration: A full five to seven (dependant on range of concentrations being measured) point calibration is carried out monthly using NIST certified nitrite standards. The linear graph acceptance is $r^2 = 0.999$. At the start of every batch of tubes analysed, two nitrite standards are run to check the accuracy of the calibration graph, this is repeated at the end of the analysis run. Statistical graphs are maintained using the plots of the daily standard results and the acceptance criteria achieved before an analysis run is made. An instrument calibration is run every two months using certified optical filters plus an annual preventative maintenance programme carried out by an external engineer is in operation.

Quality Assurance: The laboratory has a fully documented Quality Management System which has been assessed and accredited by UKAS (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

Quality Control Procedures are supplemented by the use of external proficiency schemes such as W.A.S.P administered by Health and Safety Laboratories at Buxton and the NETCEN U.K. NO2 Field Inter-comparison project administered by National Physical Laboratories (NPL), Teddington.

C.2: NO_2 Diffusion Tube Precision, Accuracy and Bias Correction

Diffusion tube monitoring has inherent errors. In order to minimise these, a bias-adjustment factor is applied to the measurements to improve the accuracy of the results. This factor is obtained by co-locating three diffusion tubes at a continuous monitoring site.

The co-location study in Crawley is at the Gatwick East Site (CA2), where triplicate tubes (prepared and analysed by Gradko) are located next to the inlet of the chemiluminescence analyser. Using the results of this study, the average values from the monthly exposed tubes for a given year can be compared directly to the corresponding continuously monitored values; allowing the local authority to calculate the precision of their tubes as well as the bias.

Precision of the Crawley Co-location Site Diffusion Tubes: Precision is the ability of a measurement to be consistently reproduced; and the diffusion tube precision is therefore calculated by determining the coefficient of variation CV. Where the CV is <20% for 8 or more periods in a year, then the Tube Precision is considered to be “Good”. Tube precision was calculated using the calculator tool (version 04) on the laqm review and assessment support website www.airquality.co.uk/archive/laqm/tools.php. The results for the Crawley co-location study are shown in Table C.1 and C.2 below. Overall Precision was “Good”

Table C 2.1: 2018 Precision Assessment of Triplicate Tubes (from calculator tool (version 04) on the LAQM Review and Assessment Support Website)

Site Name/ ID:	GATWICK EAST SITE (CA2)								
2018 Co-Location Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2018	31/01/2018	33.1	29.6	32.1	32	1.8	6	4.4
2	01/02/2018	28/02/2018	23.9	25.4	25.6	25	0.9	4	2.3
3	01/03/2018	31/03/2018	27.4	28.1	28.7	28	0.7	2	1.1
4	01/04/2018	30/04/2018	24.2	23.9	23.4	24	0.4	2	1.1
5	01/05/2018	30/05/2018	21.9	21.5	19.7	21	1.1	5	2.8
6	01/06/2018	31/06/2018	22.0	22.1	21.7	22	0.2	1	0.5
7	01/07/2018	31/07/2018	22.4	23.2	21.7	22	0.7	3	1.8
8	01/08/2018	31/08/2018	18.8	22.9	21.6	21	2.1	10	5.2
9	01/09/2018	30/09/2018							
10	01/10/2018	31/10/2018	24.2	23.2	22.0	23	1.1	5	2.7
11	01/11/2018	30/11/2018	23.1	30.4	28.5	27	3.8	14	9.5
12	01/12/2018	31/12/2018	26.9	28.5	26.7	27	1.0	4	2.5
13	01/01/2019	31/01/2019	31.9	25.4	30.1	29	3.4	12	8.4
Precision	**13 out of 13 periods have a CV smaller than 20%**								

Table C 2.2: 2018 Co-location Overall Tube Precision and data Capture (from calculator tool (version 04) on the LAQM Review and Assessment Support Website)

2018 Automatic Monitoring Data (Gatwick East CA2)		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data Capture Check
29.24	96		**Good**
29.15	100		**Good**
25.54	100		**Good**
21.74	100		**Good**
26.22	100		**Good**
20.36	100		**Good**
21.2	100		**Good**
20.25	100		**Good**
24.22	100		
25.42	100		**Good**
23.65	100		**Good**
26.4	100		**Good**
31.99	100		**Good**
Overall survey		**Good precision**	**Overall Good Data Capture**

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2018	31/01/2018	33.1	29.6	32.1	32	1.8	6	4.4
2	01/02/2018	28/02/2018	23.9	25.4	25.6	25	0.9	4	2.3
3	01/03/2018	31/03/2018	27.4	28.1	28.7	28	0.7	2	1.7
4	01/04/2018	30/04/2018	24.2	23.9	23.4	24	0.4	2	1.1
5	01/05/2018	31/05/2018	21.9	21.5	19.7	21	1.1	5	2.8
6	01/06/2018	30/06/2018	22.0	22.1	21.7	22	0.2	1	0.5
7	01/07/2018	31/07/2018	22.4	23.2	21.7	22	0.7	3	1.8
8	01/08/2018	31/08/2018	18.8	22.9	21.6	21	2.1	10	5.2
9	01/09/2018	30/09/2018							
10	01/10/2018	31/10/2018	24.2	23.2	22.0	23	1.1	5	2.7
11	01/11/2018	30/11/2018	23.1	30.4	28.5	27	3.8	14	9.5
12	01/12/2018	31/12/2018	26.9	28.5	26.7	27	1.0	4	2.5
13	01/01/2019	31/01/2019	31.9	25.4	30.1	29	3.4	12	8.4

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method	
Period Mean	Data Capture (% DC)
29.24	96
29.15	100
25.54	100
21.74	100
26.22	100
20.36	100
21.2	100
20.25	100
24.22	100
25.42	100
23.65	100
26.4	100
31.99	100
Overall survey -->	

Data Quality Check	
Tubes Precision Check	Automatic Monitor Data
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good precision	Good Overall

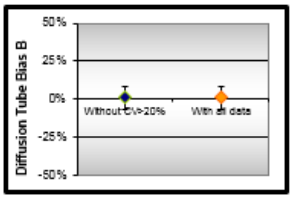
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	1 (0.93 - 1.07)
Bias B	0% (-7% - 7%)
Diffusion Tubes Mean:	25 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	25 (23 - 27) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1 (0.93 - 1.07)
Bias B	0% (-7% - 7%)
Diffusion Tubes Mean:	25 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	25 (23 - 27) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Diffusion Tube Bias Adjustment Factors: Bias represents the overall tendency of the diffusion tubes to depart from the true value, ie to under or over-read relative to the reference method (chemiluminescence analyser). The bias can be corrected, using the appropriate bias correction factor, to improve the accuracy of the diffusion tube results. Local bias adjustment factors are obtained by co-locating three diffusion tubes at a continuous monitoring site in the local authority and national factors are derived from the mean value of a number of different local authority studies. The derivation of the National and Local bias adjustment factors are shown below. (Tables C.3 – C.6).

Local Bias Adjustment factor for Crawley: Crawley has a co-location study located at the Gatwick East Site (CA2). A local bias adjustment factor was calculated using data from triplicate tubes (prepared and analysed by Gradko) mounted next to the inlet of the analyser during 4-week periods throughout the year. The 2018 local bias correction for Crawley was calculated using the method described in LAQM.TG(16) (7.191-7.199) and the spread sheet tool provided in www.airquality.co.uk/archive/laqm/tools.php . The bias value (B) derived from the tube data *without* CV > 20% was used to calculate the locally derived bias adjustment factor for Crawley (following the method in foot note 4 on this web-page).

Table C 2.3: Bias and Accuracy - Calculated without periods with CV > 20% (with 95% confidence interval)	
Bias calculated using 12 periods of data Bias factor A Bias B	 1 (0.93 – 1.07) 0% (-7% - 7%)
Diffusion Tube Means Mean CV (Precision)	25 µg/m^3 6
Automatic Mean Data capture for periods used	25 µg/m^3 100%
Adjusted Tubes Mean	25(23-27) µg/m^3

Table C 2.4: Bias and Accuracy - Calculated with all data including periods with CV > 20% (with 95% confidence interval)	
Bias calculated using 12 periods of data Bias factor A Bias B	 1 (0.93 – 1.07) 0% (-7% - 7%)
Diffusion Tube Means Mean CV (Precision)	25 µg/m^3 6
Automatic Mean Data capture for periods used	25 µg/m^3 100%
Adjusted Tubes Mean	25(23-27) µg/m^3

Table C 2.5 Local Bias Correction Factor for NO_2 diffusion Tube from 2018 Co-location Data Following foot note [4] of the Precision and Accuracy calculator tool LAQM Helpdesk Website (version 03/16)	
Bias (B) value	**= 0%**
Bias value expressed as a factor	**= 0.00**
Bias value, expressed as a factor + 1	**= 0.00 + 1 = 1**
The inverse of 1.0 = The Bias Adjustment Factor	**= 1/1**
Local Bias Correction Factor for Crawley 2018 data	**= 1.0**

National Bias Adjustment Factor: Data from co-location studies are used to calculate the Bias Adjustment Factor. Not all local authorities carry out their own co-location studies, therefore Defra collates the UK co-location study results, and from these calculated the mean value for each laboratory, to provide a national bias adjustment value for the users of each laboratory. The National Bias Adjustment Factor (Gradko) is shown below.

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/19

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of September 2019
LAQM Helpdesk Website

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

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

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[5]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By[1]	Method (To add your selection, choose (All) from the pop-up list)	Year[5] (To add your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)	
Socotec Didcot	50% TEA in Acetone	2018	R	Wrexham County Borough Council	11	21	18	16.1%	G	0.86	
Aberdeen Scientific Services	20% TEA in water	2018		Overall Factor[3] (7 studies)				Use		0.82	
Edinburgh Scientific Services	50% TEA in acetone	2018		Overall Factor[3] (2 studies)				Use		0.96	
Glasgow Scientific Services	20% TEA in water	2018		Overall Factor[3] (10 studies)				Use		0.89	
Gradko	20% TEA in water	2018		Overall Factor[3] (37 studies)				Use		0.92	
Gradko	50% TEA in acetone	2018		Overall Factor[3] (18 studies)				Use		0.89	

Table C 2.6 National Bias Correction Factor for 2018 NO_2 diffusion Tube data from Gradko Co-location Studies (20% TEA in water)
The full spread sheet data for all 37 studies can be view at the LAQM Review and Assessment Support Website http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html)

2018 National Bias Adjustment Factor (Gradko 37 Studies)	**0.92**

Choice of Factor for Bias Adjustment: The annual mean NO_2 for the triplicate co-located tubes was the same value as the annual mean NO_2 measured at the automatic analyser for the CA2 Gatwick site in 2018 (25 µg/m^3). This was reflected in the locally derived bias adjustment figure of 1.0, indicating a very good correlation in the tube data relative to the reference method (chemiluminescence analyser), over the data capture period. The national bias adjustment value for 2018 was 0.92, which also showed very good correlation and was based on a large number of studies (37).

In deciding which Bias adjustment value to use, the following factors were taken into account in accordance to the guidance in LAQM-TG16:

Box 7.11 advises that: **"**If the co-location site is unusual in some way: for example, affected by specific large NOX sources other than road traffic, such as local industrial installations, this is a strong indication in favour of using a locally-derived factor"

The co-location site is situated on the eastern boundary of the Gatwick Airport and therefore affected by NOX sources from the Airport. The site is only 60m from the nearest residential property, and there are many other residential properties within 1000m of the airport. Determining relevant exposure within 1km of the airport boundary

is one of the assessment criteria required for authorities with a major airport within their boundary. This would therefore favour using the locally derived factor.

However, in paragraph 7.197 the guidance says that: “care should be taken to avoid applying a bias adjustment factor derived from a local co-location study carried out for concentrations that are very different to those being measured in the wider survey”

Although the effect of the airport as an area source should be considered it may be less of an influence at roadside locations where traffic sources will be the major consideration. At these locations the nationally derived factor may be more relevant.

After consulting the laqm helpdesk it was decided to use the more conservative locally derived bias factor of 1.0. The rational for this decision was that it wouldn’t be appropriate to use two different bias factors within the report, but since both national and local factors were close in value and the precision and accuracy of the local co-location study was very good, the more cautious approach would be use the local factor. Consequently all conclusions and recommendations made in this report were based on monitoring results adjusted with the 2018 bias adjustment figure of 1.0.

C.3: Annualising NO_2 Diffusion Tube Monitoring Data (where data capture is < 9 months)

Where data capture is below 75%, it is necessary to annualise the data as described in Box 7.9 of the LAQM Technical Guidance TG (16). The reason for annualisation is that the concentration varies throughout the year, and the instrument may have been operational for a period of above or below average concentrations.

For those sites with fewer than 9 months’ worth of data, it is necessary to perform annualisation. This was undertaken for Three sites (CR100, 101 and 102) using the technique discussed in Box 7.9.

Methodology:

- Data was available for 5 full calendar months in 2018.
- The measured mean concentration **M** for this period was calculated.
- Two nearby, long-term, continuous monitoring sites: Gatwick East (CA2) and Poles Lane (RG3), with ≥ 85% data capture were identified.
- Annual means, $\mathbf{A_m}$, for 2018 were calculated for these sites (CA2 and RG3)
- Period means, $\mathbf{P_m}$, were calculated for the period of interest, (Aug - Dec)

- The ratio, **R**, of the annual mean to the period mean ($\mathbf{A_m/P_m}$) for each of the sites was calculated
- The average of these ratios, $\mathbf{R_a}$ was calculated. This is then the annualisation factor.
- The measured period mean concentration **M** multiplied by this annualisation factor $\mathbf{R_a}$ to give the estimate of the annual mean for 2018.

Table C 3.1 Annualising Diffusion Tube Monitoring data where data capture <9 months

Background Site	Annual Mean 2018 (A_m)	Period Mean 2018 (P_m)	Ratio (A_m/P_m)
Gatwick East, Crawley (CA2))	25	24	25/24= 1.04
Poles Lane, Crawley (RG3)	16	15	16/15 =1.06
		Average (R_a)	1.05

The estimated annualised mean for the five sites with less than 9 months of data was calculated using the annualized factor R_a. The results are given in Table C.8 below

Table C 3.2 Estimated Annualised Mean NO_2 Diffusion Tube Data 2018

Site	Measured Period Mean M	Annualisation Factor (Ra)	Estimated Annual Mean
CR100	29	1.05	**30**
CR101	52	1.05	**54**
CR102	35	1.05	**37**

C.4: Fall off with Distance Calculator for NO_2 Annual Mean

This calculation allows the prediction of annual mean NO_2 concentration for a location "receptor" that is close to a monitoring site, but further from the road than the monitor. Often, for practical reasons, the monitoring site is not located at the façade of the receptor property. Where concentrations are measured closer to the source than the receptor, a fall off with distance calculation is used to check if measured concentrations are representative of exposure.

Where measurements have been carried out at the receptor/façade no fall-off calculation is necessary since the measurement is already representative of relevant public exposure.

Tables C4.1- C4.30 show the results of the adjusted concentrations. These fall-off concentrations are reported in Table B.1

Table C 4.1: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 1 – High Street (526799, 136785)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.75	17.7	15	33	**24**

Table C 4.2: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 3 – Birch Lea (528438,138392)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	7.35	19	20	**20**

Table C 4.3: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 4 – Headley Close (529864, 138204)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	14.8	18	21	**19**

Table C 4.4: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 52 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	28	25	23	24	**24**

Table C 4.5: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 53 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	28	25	23	25	**25**

Table C 4.6: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 54 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	28	25	23	25	**25**

Table C 4.7: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 55 - 11Tinsley Close (Fence) (528446 138085)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	5.7	6.7	19	**41**	**40**

Table C 4.8: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 60 – Peglar Way (526740, 136934)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2.3	8.8	15	**33**	**27**

Table C 4.9: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 63 – Woodfield Lodge, Hazelwick Roundabout (528153, 137912)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	7.4	37.4	24	**52**	**37**

Table C 4.10: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 64 - Woodfield Lodge, Northgate Avenue (528150, 137825)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.62	6.2	24	**40**	35

Table C 4.11: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 66 – Brighton Road Level Crossing (526743,136346)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.2	1.7	15	29	28

Table C 4.12: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 72 - Burlands (525530, 138472)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.3	8	11	15	14

Table C 4.13: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 74 – Radford Road, Tinsley Green (528978, 139599)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	11.9	17	34	25

Table C 4.14: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 75 – Steers Lane (529335, 139589)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2	20.6	16	21	18

Table C 4.15: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 76 - Hazelwick Ave slip road, (528303, 137800)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2.52	12	24	**35**	31

Table C 4.16: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 77 - Hazelwick Ave The Bays, (528362, 137812)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2.3	8.8	24	35	31

Table C 4.17: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 85 – Tinsley Lane Flats, (528286, 138019)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	27	15	19	30	34

Table C 4.18: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 86 – The Boulevard, Flats, (526876, 136819)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	13.8	15	26	20

Table C 4.19: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 87 – The Broadway (526908, 136754)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	3.5	15	38	30

Table C 4.20: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 91 – Ocean House, Hazelwick Ave, (528681, 137177)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	0.5	5.7	24	34	30

Table C 4.21: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 93 St Mary's Drive, Three Bridges (528895, 137115)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.8	3.5	24	48	**44**

Table C 4.22: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 94 Station Hill, Three Bridges (528841, 137069)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	3.5	8.5	24	26	26

Table C 4.23: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 95 – Daniels House, Worth Park Ave, (528882, 137086)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2.2	8.0	24	31	29

Table C 4.24: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 96 – Pound Hill Junior School Worth Park Ave (529125, 137196)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	3.5	33.6	18	30	23

Table C 4.25: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 97 – Daisy Chain Nursery, Haslett Avenue East (528615, 136960)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.1	1.4	16	41	**40**

Table C 4.26: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 98 – Gatwick School, Gatwick Road, (528515, 139275)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	2.1	30.5	17	35	24

Table C 4.27: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 99 - Furnace Farm Rd , (528397, 135579)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.5	13.6	13	17	15

Table C 4.28: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 100 – A2220 Horsham Road Level Crossing, (526326, 136487)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.6	3.7	15	30*	27

* Estimated concentration from annualised value

Table C 4.29: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 101 – A2220 Horsham Road Gossops Green, (525679, 135556)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	1.3	12.1	13	54*	35

* Estimated concentration from annualised value

Table C 4.30: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 102 – Pease Pottage Hill A23 (526449, 134139)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2018	3.7	9.2	13	37*	31

* Estimated concentration from annualised value

C.5: Adjustment of PM_{10} Monitoring Data Using Volatile Correction Model (VCM)

For the TEOM data the Volatile Correction Model (VCM) was used to adjust the data for the gravimetric equivalent concentration. VCM corrected data for the Gatwick East data is shown in Table C5.1 below.

Table C 5.1: Gatwick East PM_{10} Monitoring Adjustment using Volatile Correction Model (VCM) (from Kings College London ERG vcm web portal)

Local Measurement Data for VCM correction		**2018 Measured Data**	
Site	Gatwick East, Crawley	TEOM Annual Mean PM_{10} (uncorrected) µg/m^3	13.97
Year	2018 (1/01/18-31/12/18)		
Timescale	Daily Mean		
Monitor	TEOM		
EPA Constant A	3		
EPA Constant B	1.03		
Instrument Temp ^oC	25		
Instrument Pressure mbar	1013		
Reports to local ambient readings	No	No of exceedances of the 50µg/m^{3}in Daily Mean in 2017	0
Pressure Site	Brent Ikea (BL0)	VCM Corrected Annual Mean PM_{10} µg/m^3	17.49
Temperature Site	Camden - Bloomsbury		
FDMS Sites	1. Reigate and Banstead (RG5) 2. Sutton – Worcester Park (ST6)Blackheath 3. Average of remaining sites*. * Correction includes unratified data		

C.6: Estimating $PM_{2.5}$ Concentrations from Nationally Derived Correction Ratio - TG (16) Method

Where no appropriate local sites measuring both PM10 and PM2.5 are available, then it may not be possible to use a locally derived ratio. In this situation, a nationally derived correction ratio of 0.7 can be used.

This factor was calculated as the average of all ratios of PM2.5/PM10 found for years 2010 to 2014 for forty sites within the AURN where both PM10 and PM2.5 are measured on an hourly basis.

Crawley 2018 Annual Average PM_{10} (CA2 site Gatwick East) = 17.49 µg/m^3 (VCM)
$PM_{2.5}$ = 17.49 x 0.7µg/m^3
$PM_{2.5}$ = 12.24µg/m^3.

C.7: New Pollution Sources and New Developments

There are a number of significant new or ongoing developments within the borough which may cumulatively contribute to pollution sources in the area. These include:

Commercial/Industrial Development:

1. **Manor Royal Business District** (adjacent to the Hazelwick AQMA) major redevelopment works, including:

a. Astral Towers/The White House (marketed as Nova), Betts Way - B8 warehouse permitted subject to S106

b. Former GSK Site – B1 Office development

c. Space Gatwick, Faraday Road – Flight Training Centre

d. Land at Jersey Farm – B8 industrial development on greenfield land (subject to legal agreement)

e. Forgewood employment land - 5000m^2 business land Flexible B1/2/8

2. **Crawley Growth Programme:** £60m investment programme (public and private) to deliver infrastructure improvements and growth/regeneration to sites in the town centre and Manor Royal business district, including: delivery of 11,300m^2 office/industrial space at the Nova site London Road, 1,000 new homes in Crawley town centre by 2030, new Crawley railway station and sustainable transport infrastructure (bus, cycle routes and pedestrian walkways)

Residential Development:

1. **Forgewood Residential neighbourhood**: Ongoing development of new neighbourhood, including 2000 new residential units, local shops, amenities, community centre, school and realignment of surrounding roads. The Forgewood development is adjacent to the Hazelwick AQMA. The development is still in the building phase, but the full impact of the development won't be known until fully operational – expected to be in 2022/3

2. **Key Housing Sites:** The following sites were identified as key housing sites in the Local Plan Map and are currently under construction:

    - 15 – 29 Broadway Upper Floors, Northgate (57 dwellings)
    - Kilnmead Car Park, Northgate (40 dwellings)
    - Zurich House, East Park, Southgate (59 dwellings)
    - Goffs Park Depot, Southgate (30 dwellings)
    - Car Park Land North of the Boulevard (140 dwellings)

All new developments are examined through the planning system and where necessary air quality assessments and mitigation are required in order to offset the impacts of existing and new sources of pollution on future residents.

In addition, diffusion tube monitoring within the AQMA and surrounding areas will measure the effects of new developments and new pollution sources, allowing the council to identify pollution hotspots and assess long term trends. These results are reported annually through the LAQM process.

C.8: Rationale for Extending Existing AQMA Boundary

Local Air Quality Management Policy Guidance (PG16) advises that *"once a pollutant is identified as exceeding the air quality objective or is at risk of being exceeded, the follow-up assessment more often than not confirms the initial, identified risk, leading to the declaration of an AQMA"*

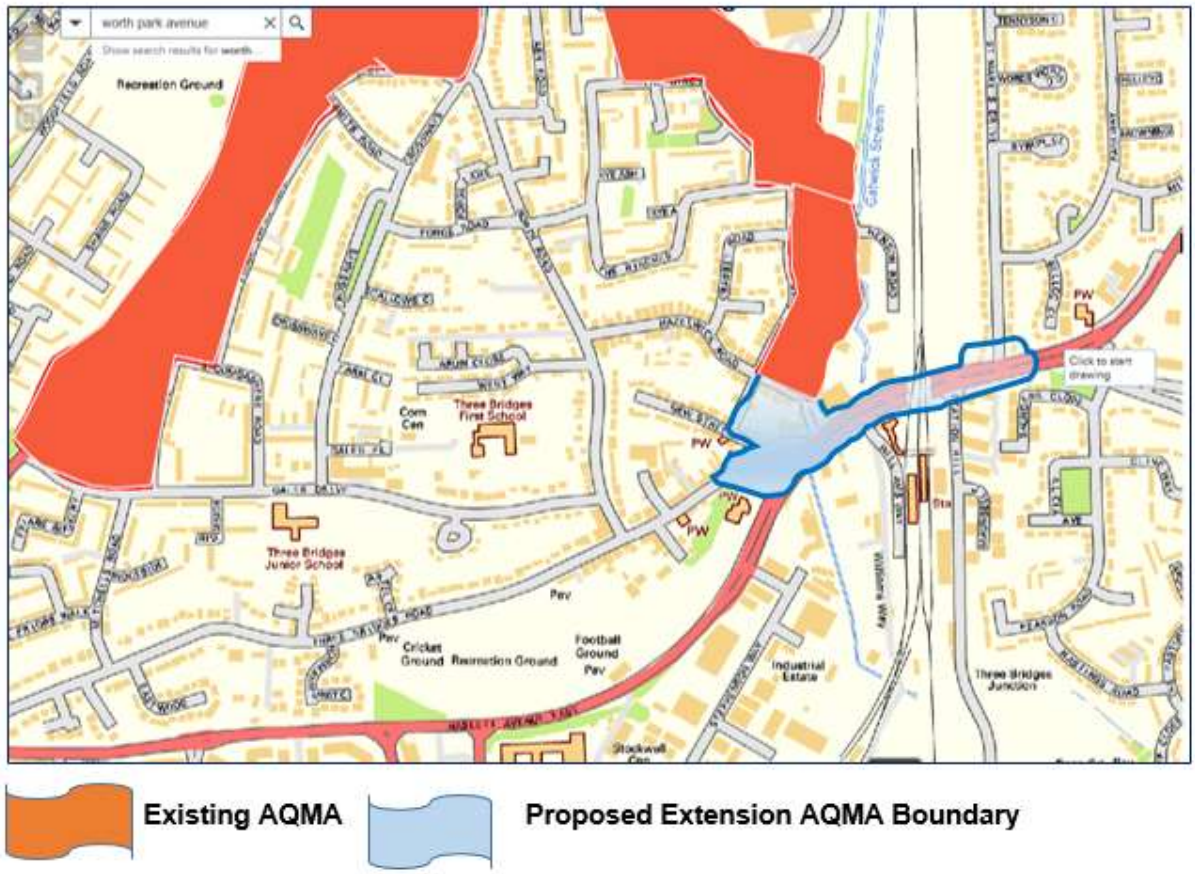
As a result a new fast track to declaration was introduced in LAQM (PG 16) and *"the local authority is encouraged to consider moving immediately to declaring and establishing (or extending) an AQMA and hence to the development of action plan measures to remediate the problem".*

This newly identified area of exceedance was highlighted during last year's review and assessment as a location potentially at risk of exceeding the air quality objectives, due to the high traffic volumes, peak hour congestion and proximity of relevant public exposure. As a result, the council carried out additional monitoring during 2018 at sites

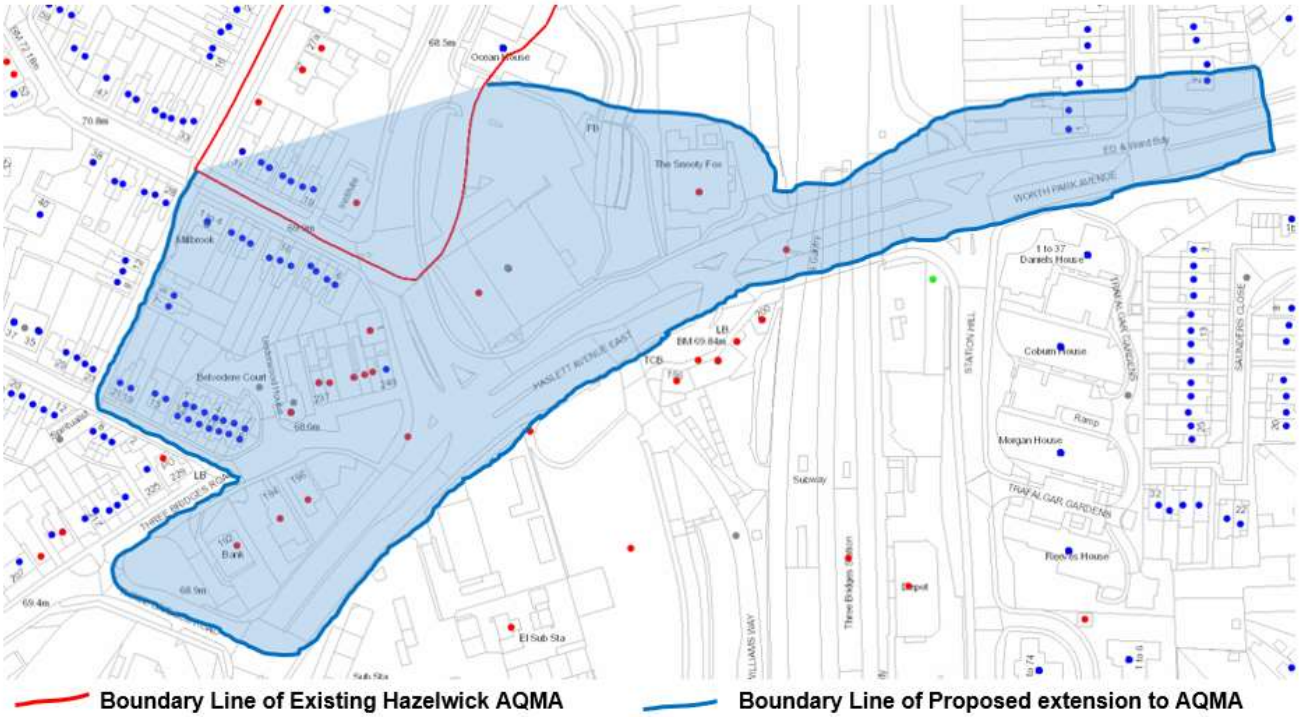
in the area (CR 94,95,96) to obtain further information on the extent of the problem in order to more closely define the boundary. None of these additional sites recorded exceedances of the NO_2 annual mean objective of 40µg/m^3. This has enabled the council to identify a specific geographical area that requires more targeted action to help improve the air quality. The area runs from the junction of St Mary's Drive with Worth Park Avenue west to the junction of Haslett Avenue East with Three Bridges Road. This area adjoins the south eastern border of the existing Hazelwick AQMA. The council therefore proposes to use the fast track option to extend the boundary of the existing Hazelwick AQMA at this point to incorporate this newly identified area of exceedance.

Monitoring Sites (Relevant Public Exposure) – Three Bridges A2220

Proposed Extension to AQMA Boundary



Proposed Extension to AQMA Boundary - Detail



Appendix D: Maps of Monitoring Locations and AQMA

Fig D.1 Hazelwick AQMA

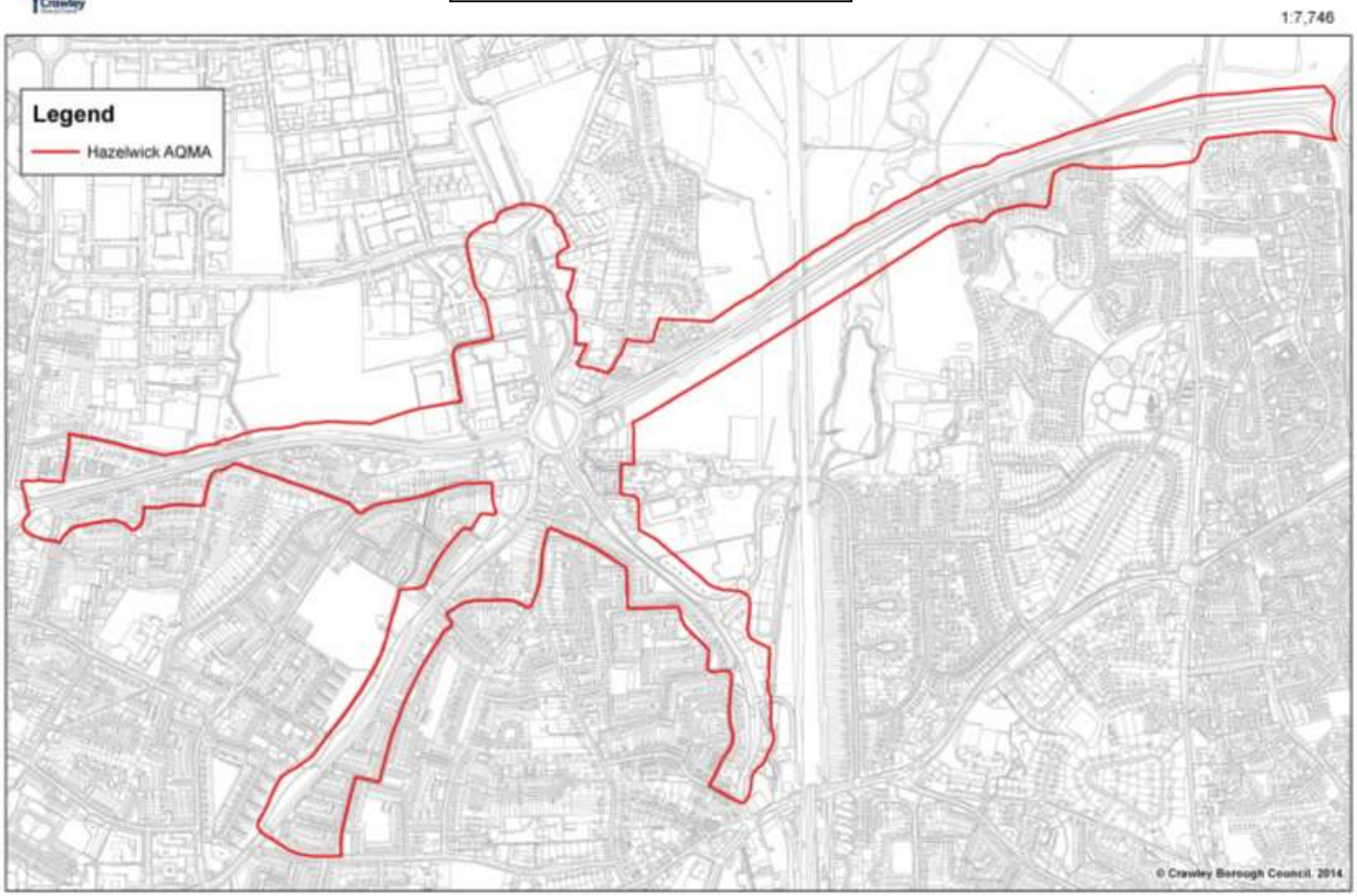


Fig D.2 2018 Diffusion Tube Monitoring Site Crawley Borough Council

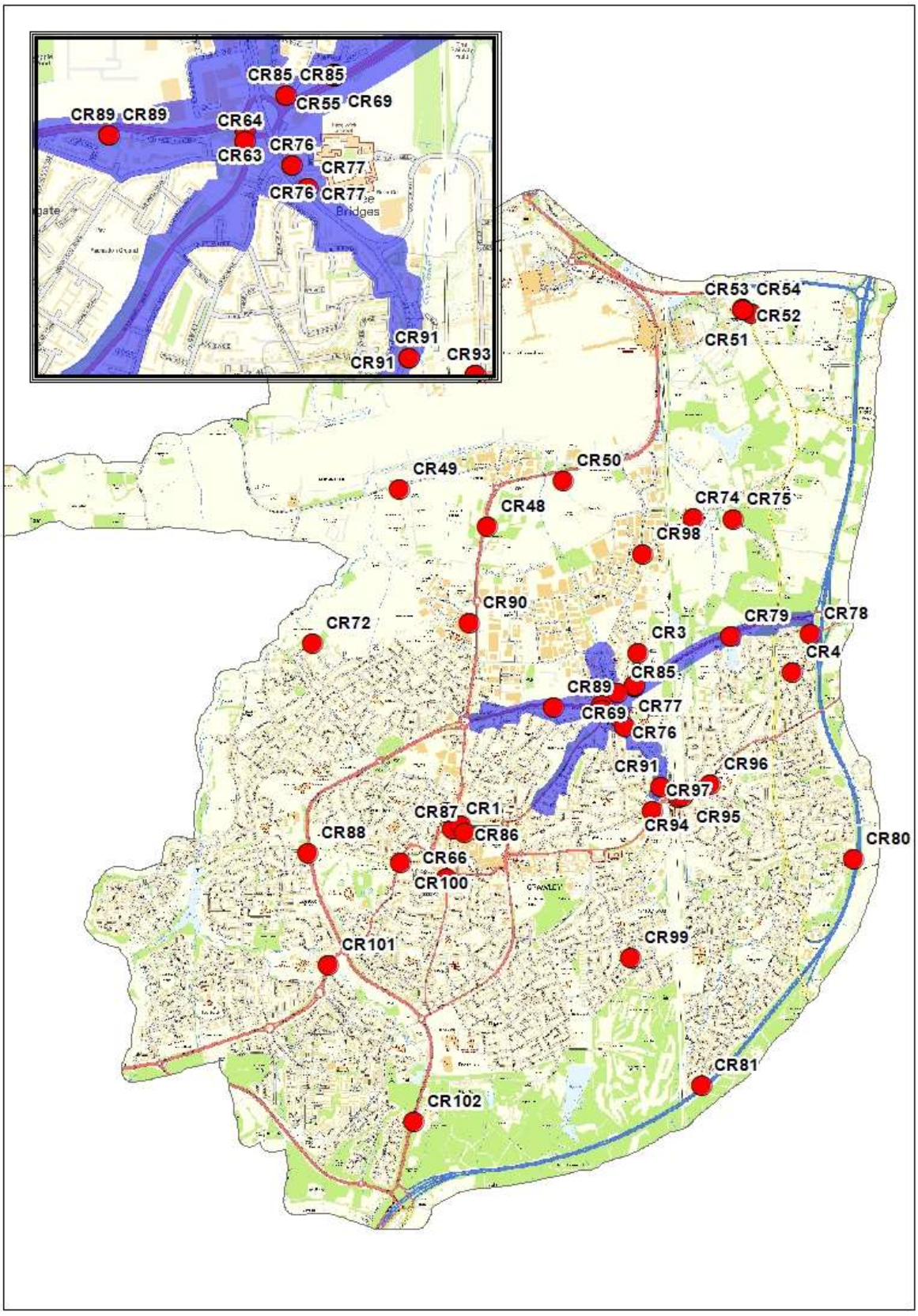


Fig D.3 Monitoring Sites in Hazelwick AQMA

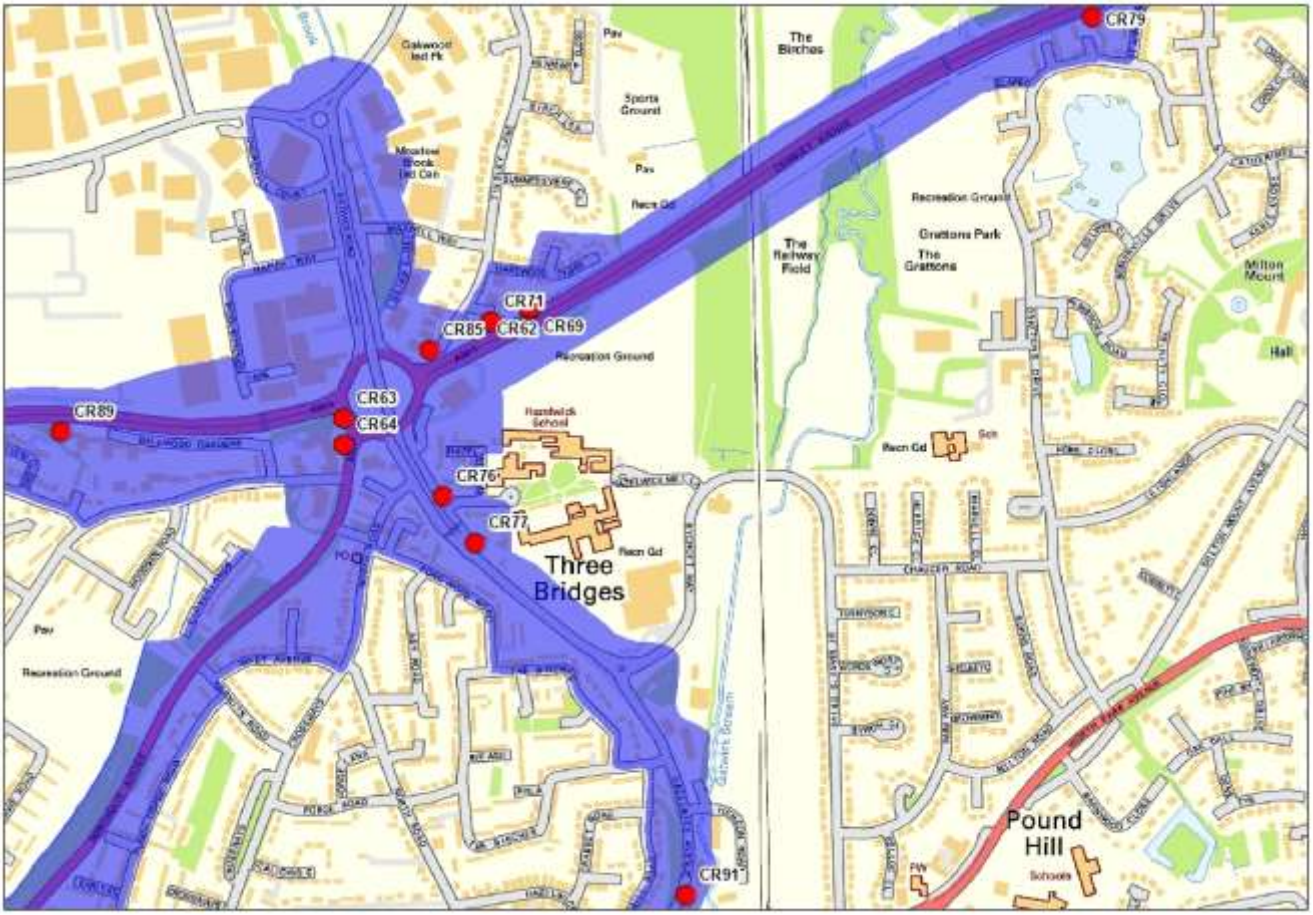
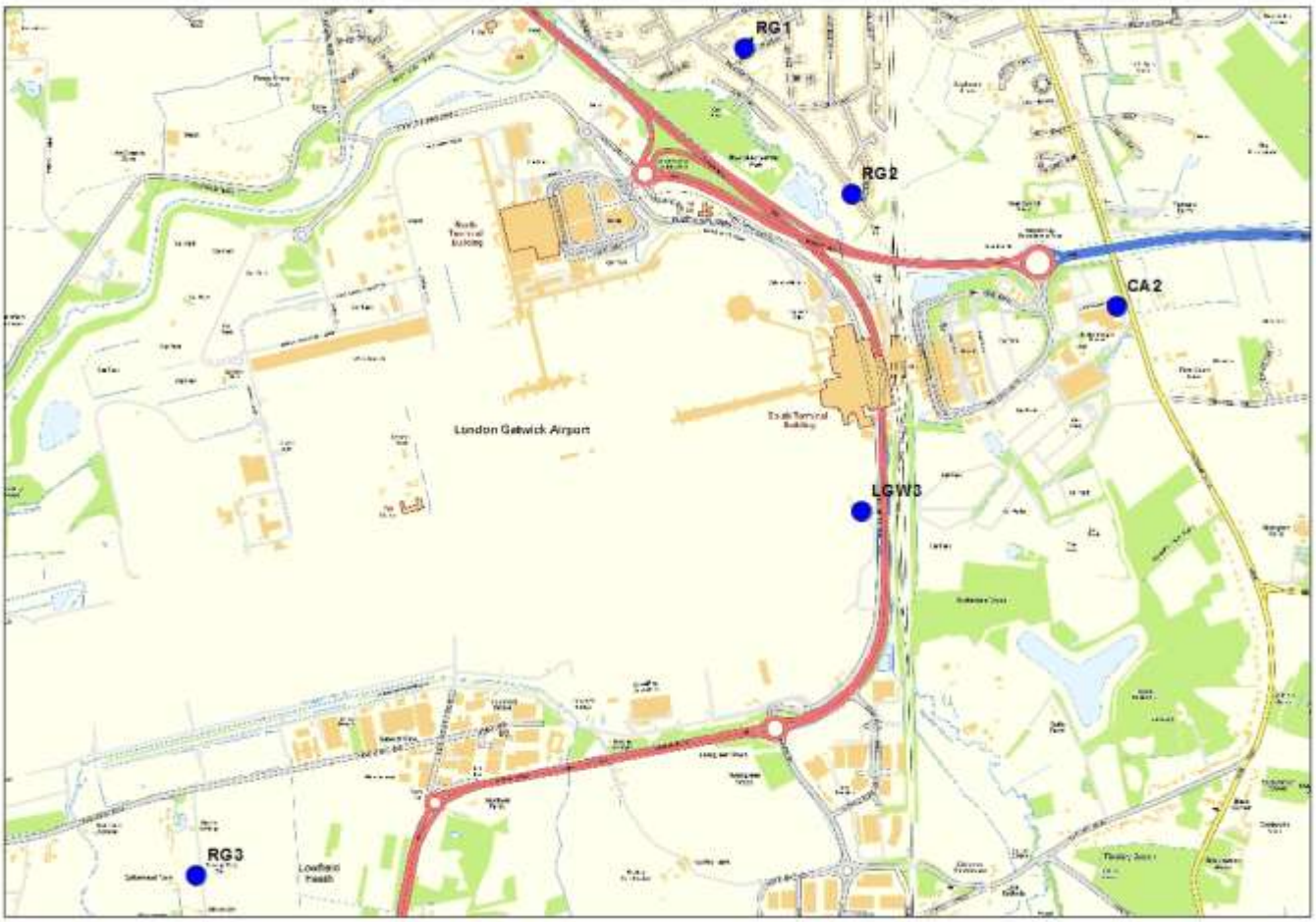


Fig D.4 Automatic Monitoring Sites - Gatwick Airport



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in micrograms 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
CBC	Crawley Borough Council

References

Local Air Quality Management Technical Guidance 2016 - LAQM.TG(16)

Sussex Air Quality Emissions Mitigation Guidance 2013

Crawley Borough Council Local Plan 2015

Crawley Growth Programme 2016

Crawley Town Centre Regeneration Programme 2016

National bias adjustment factor spreadsheet:
http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Tube precision spreadsheet:
www.airquality.co.uk/archive/laqm/tools/AEA_DifTPAB_v03.xls

Volatile Correction Model website:

http://www.volatile-correction-model.info/

Air Quality Consultants: Nitrogen Dioxide Distance from Road Calculator (Issue 4)