

## **Air Quality Monitoring: Joint Report by RBBC and GAL for 2020.**

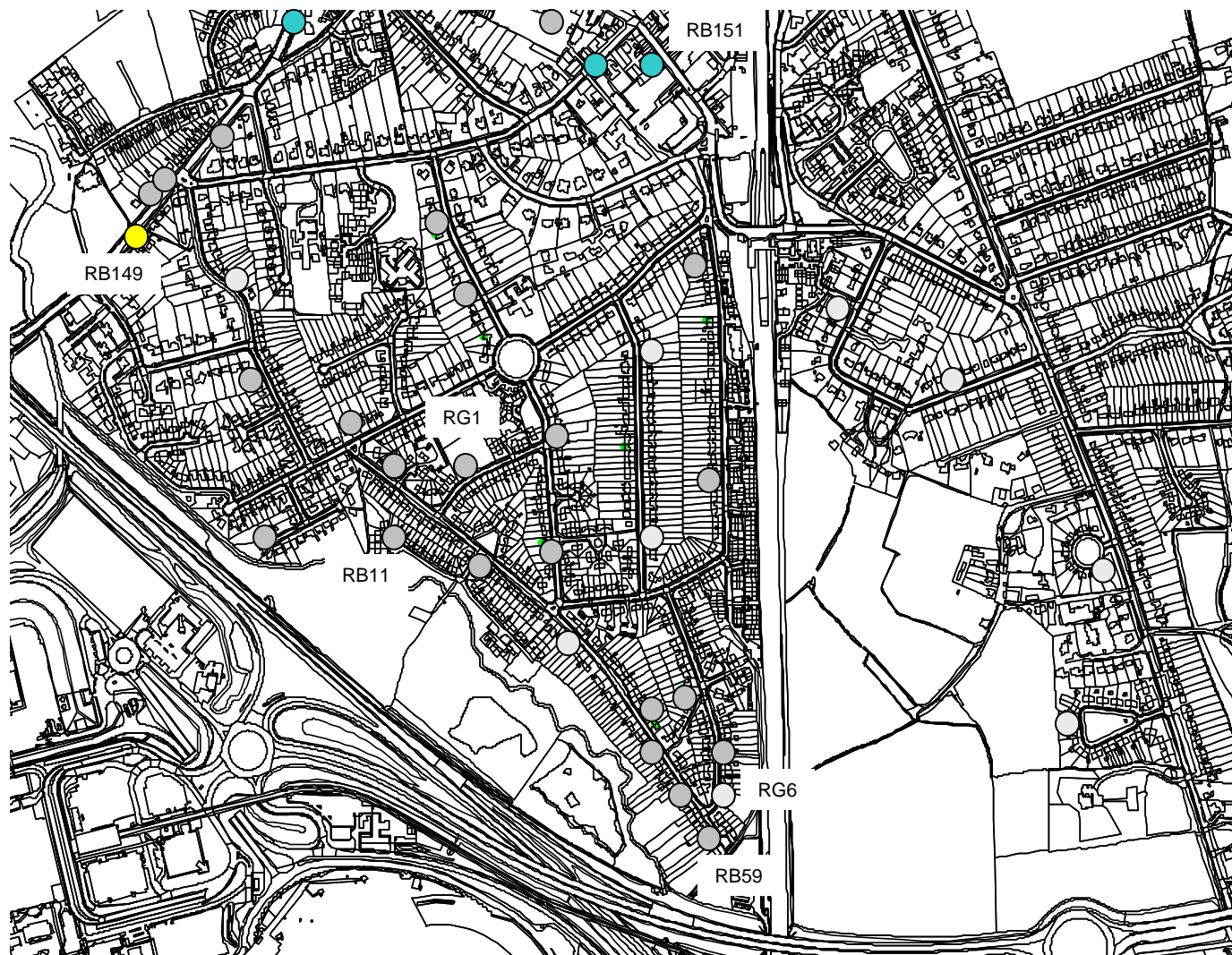
1. The following report presents the results from the 2020 air pollution monitoring program undertaken on, and in the vicinity of, Gatwick Airport.
2. Committee members are reminded that details of:
  - i. the legislation,
  - ii. the rationale for the monitoring of certain pollutants,
  - iii. and factors to bear in mind when examining the data e.g. the impact of the weather, and / or changes in the source of a pollutant, were covered in the initial report to the GP sub committee on 11<sup>th</sup> January 2007<sup>1</sup>.

## **Off Airport Monitoring at Relevant Receptors on the Horley Gardens Estate. Annual Monitoring of Compliance with UK air quality objectives – Nitrogen Dioxide.**

3. The annual average concentration of nitrogen dioxide across the Horley Gardens Estate in 2020 is shown in Figure 1.
4. Given the restrictions on movement in place during 2020 both at a local, national, and international level due to the COVID pandemic it is perhaps not surprising that nitrogen dioxide concentrations were below the UK annual average objective of 40  $\mu\text{g m}^{-3}$  (micrograms per cubic metre) at sites normally assessed on the Horley Gardens Estate, on Victoria Road, and at the A23 site (RB149) - which has historically not met the objective - where the annual average concentration was 31.4  $\mu\text{g m}^{-3}$  in 2020 compared to 43  $\mu\text{g m}^{-3}$  in 2019.
5. On Victoria Road (RB151) nitrogen dioxide concentrations were 23  $\mu\text{g m}^{-3}$  (33  $\mu\text{g m}^{-3}$  in 2019), while the highest concentration measured on the Horley Gardens Estate was 17  $\mu\text{g m}^{-3}$  compared to 26  $\mu\text{g m}^{-3}$  in 2019. However in 2020 on the estate the highest concentrations were on the feeder roads into the estate, and not at the sites in the vicinity of RB59 which are normally associated with the highest concentrations. At the RB59 'worst case' receptor concentrations were around 15  $\mu\text{g m}^{-3}$  in 2020 which compares to the highest concentration in 2019 of 26  $\mu\text{g m}^{-3}$  and 27  $\mu\text{g m}^{-3}$  in 2018.
6. Local sources of pollution on the estate remained unchanged throughout 2020, i.e. no new significant sources were introduced, and so the results are comparable to previous years monitoring work.
7. Data capture from all of the real time monitoring sites was over 90 %, and so the data from these sites along with the diffusion tube data is valid for monitoring compliance with the air quality objectives.
8. The results from 2020 are in line with the predicted distribution of nitrogen dioxide concentrations for the Horley Gardens Estate, with the COVID restrictions resulting in some of the largest reductions in nitrogen dioxide (10 to 11  $\mu\text{g m}^{-3}$ ) occurring at sites closest to the airport e.g. RB59, while elsewhere on the estate concentrations have fallen by 5 to 8  $\mu\text{g m}^{-3}$ . To put these changes into context, at suburban residential sites elsewhere in the borough nitrogen dioxide concentrations have fallen by 4  $\mu\text{g m}^{-3}$  in 2020.

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<sup>1</sup> Contact GATCOM Secretariat for historical reports.



**Key:**

- 10.1 to 15  $\mu\text{g m}^{-3}$
- 15.1 to 20  $\mu\text{g m}^{-3}$
- 20.1 to 25  $\mu\text{g m}^{-3}$
- 25.1 to 30  $\mu\text{g m}^{-3}$
- 30.1 to 35  $\mu\text{g m}^{-3}$
- 35.1 to 40  $\mu\text{g m}^{-3}$
- 40.1 to 45  $\mu\text{g m}^{-3}$
- 45.1 to 50  $\mu\text{g m}^{-3}$



Other sites in the vicinity of the of the Airport:

- Charlwood: 12  $\mu\text{g m}^{-3}$   
(Russ Hill)
- Hookwood: 8  $\mu\text{g m}^{-3}$   
(Withey Meadows)
- Smallfield: 14  $\mu\text{g m}^{-3}$   
(Ontario Close)

Comparable sites elsewhere within the Borough:

- Reigate: 12  $\mu\text{g m}^{-3}$
- Banstead: 12  $\mu\text{g m}^{-3}$
- Redhill: 12  $\mu\text{g m}^{-3}$
- Merstham: 16  $\mu\text{g m}^{-3}$

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**Figure 1: Monitoring Results for Nitrogen Dioxide Concentrations across the Horley Gardens Estate in 2020.**

Tube Correction Factor = 0.92 (n=9 min).

9. Nitrogen dioxide concentrations in Charlwood and Hookwood fell in 2020 by 3 to 4  $\mu\text{g m}^{-3}$ , while concentrations in Smallfield decreased by 5  $\mu\text{g m}^{-3}$ .
10. Passenger numbers at Gatwick fell by 78 % in 2020 compared to 2019, while aircraft movements fell by 72 % over the same period (Appendix A).
11. Traffic flows on the M23 spur were difficult to determine in 2020, as no data is available on the Highways England website. At this stage it is unclear if the traffic counters were out of action or if the data has yet to be published.

### **Annual Monitoring of Compliance with UK air quality objectives – PM<sub>10</sub>.**

12. The PM<sub>10</sub> air quality objective was met on the Horley Gardens Estate in 2020 with an annual average concentration at RG1 of 15.1  $\mu\text{g m}^{-3}$  (VCM methodology), which is the lowest annual average concentration recorded to date. Although this was an improvement on 2019 (15.9  $\mu\text{g m}^{-3}$ ) the reduction in PM<sub>10</sub> was no greater than that seen normally e.g. due to the impact of weather, and reflects the fact that the majority of the PM<sub>10</sub> measured on the Horley Gardens estate is from the regional background rather than any specific local source e.g. the airport or road traffic.
13. At present comparisons between PM<sub>10</sub> data from RG1 and LGW3 are complicated slightly by the differences in equipment used at both sites<sup>2</sup>. However in 2020 GAL provided funding for the upgrade of the RG1 site under the terms of the s106 legal agreement and so from 2021 the equipment used for PM<sub>10</sub> measurement at RG1 (a FIDAS) will be identical to that used by Gatwick at LGW3.

### **Trends in Pollutant Concentrations.**

#### **Nitrogen dioxide.**

14. A three year rolling average concentration is used in the trend analysis work to help remove the year to year fluctuations in concentrations caused by the prevailing weather conditions. While the data to date (Figure 2) shows that the long term downward trend in annual average nitrogen dioxide concentrations at the RG1 site continued in 2020, given the impact of the COVID restrictions on nitrogen dioxide concentrations no real assessment can be made at this stage on the overall long term trend.
15. At the 'worst case' receptors closer to the airport (RG2(6), RB59) again the impact of the restrictions can clearly be seen, with the steeper falls between 2019 and 2020 compared to the RG1 site reflecting the bigger influence that aviation and road traffic emissions have on these two sites.
16. The position of the monitoring stations around Gatwick means that it is possible to examine the nitrogen dioxide pollution coming from the airport and the A23 Airport Way when winds are from the SW, by subtracting the readings from the RG3 station to the SW of the airport from those made at the RG2(6) station to the NE of the airport (Figure C.1 - Appendix C).
17. Figure C.1 demonstrates that while the airport / A23 Airport Way had delivered significant reductions in pollution by 2012, by 2016 these improvements had been lost. The relocation of the RG2 site at the end of 2016 made direct comparisons difficult in 2017 but the 2019 data suggested that the rapid increase in nitrogen dioxide from the airport / Airport Way between 2012 and 2016 was declining, albeit to levels similar to those in 2007.
18. The 2020 data (Figure C1) shows that nitrogen dioxide pollution from the airport and A23 airport way fell by over 50 % in 2020 from 21  $\mu\text{g m}^{-3}$  in 2019 to 9  $\mu\text{g m}^{-3}$  in 2020. However this annual average figure masked some significant falls in May and June 2020 (Table C1 – Appendix C), when nitrogen dioxide levels were up to nine times lower than in a normal year.

<sup>2</sup> See GATCOM Steering report 2020 – Appendix D.

**PM<sub>10</sub>.**

19. It is important to note that the airport is not a significant source of PM<sub>10</sub>, and computer modelling<sup>3,4</sup> consistently indicates that the airport is responsible for no more than 1 – 2 µg m<sup>-3</sup> of the total PM<sub>10</sub> concentration at the worst affected properties on the Horley Gardens Estate.
20. The COVID restrictions in 2020 have in effect confirmed the computer model, as despite the significant reductions in aircraft movements at the airport the PM<sub>10</sub> concentrations have remained largely unchanged in 2020 compared to 2019.
21. The main purpose of monitoring PM<sub>10</sub> on the Horley Gardens Estate is to examine trends in the PM<sub>10</sub> concentration, as the UK Government is aiming to reduce people's exposure to particulate matter<sup>5</sup> in the longer term even where the air quality standards are met.
22. Using a three year rolling average to examine the trends in the data there is evidence of an overall downward trend from 2003 to 2010, with concentrations of 23.9 µg m<sup>-3</sup> in 2003 and 19.5 µg m<sup>-3</sup> in 2010 (Figure 3), although much of this improvement in non airport PM<sub>10</sub> occurred between 2007 and 2010. From 2010 the overall trend was flat to 2015, with the slight rise between 2011 and 2013 largely an artefact of the elevated concentration measured in 2011, while from 2015 the downward trend has resumed.

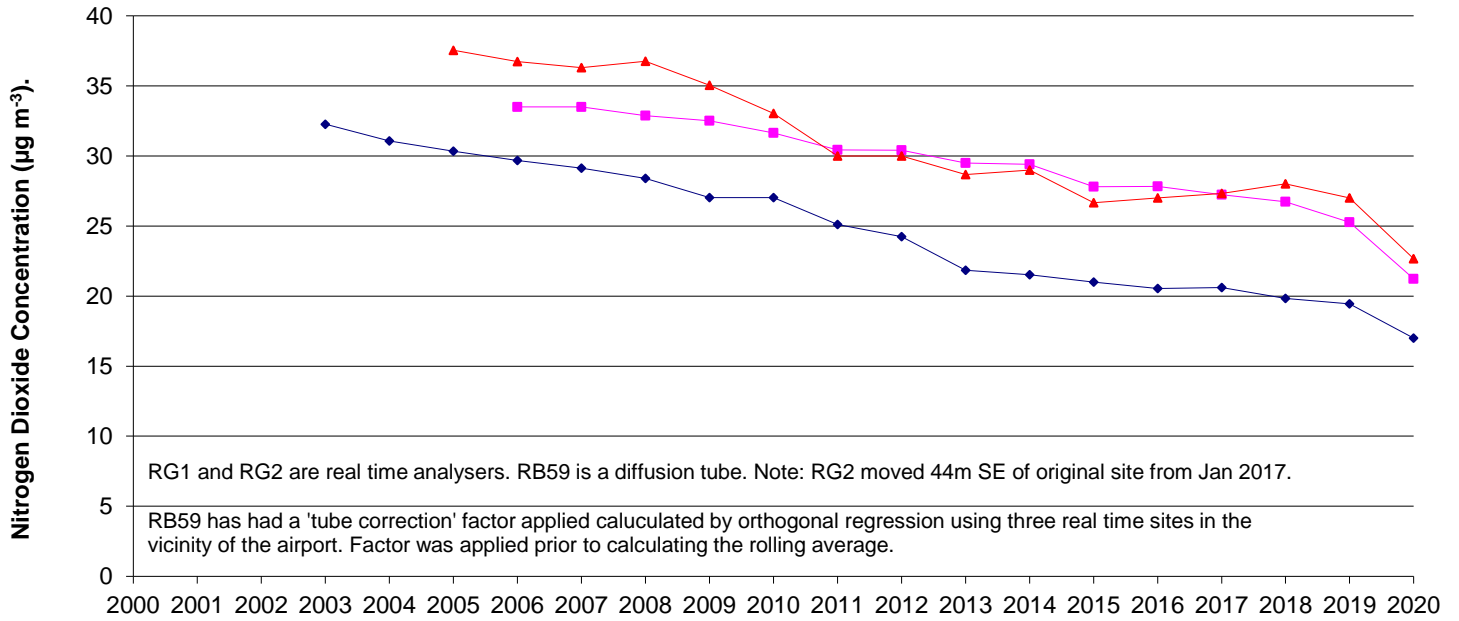
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<sup>3</sup> Air Quality Assessment – 2015 Emissions Inventory and Modelling. ARUP - AQ-02 - 20th November 2017.

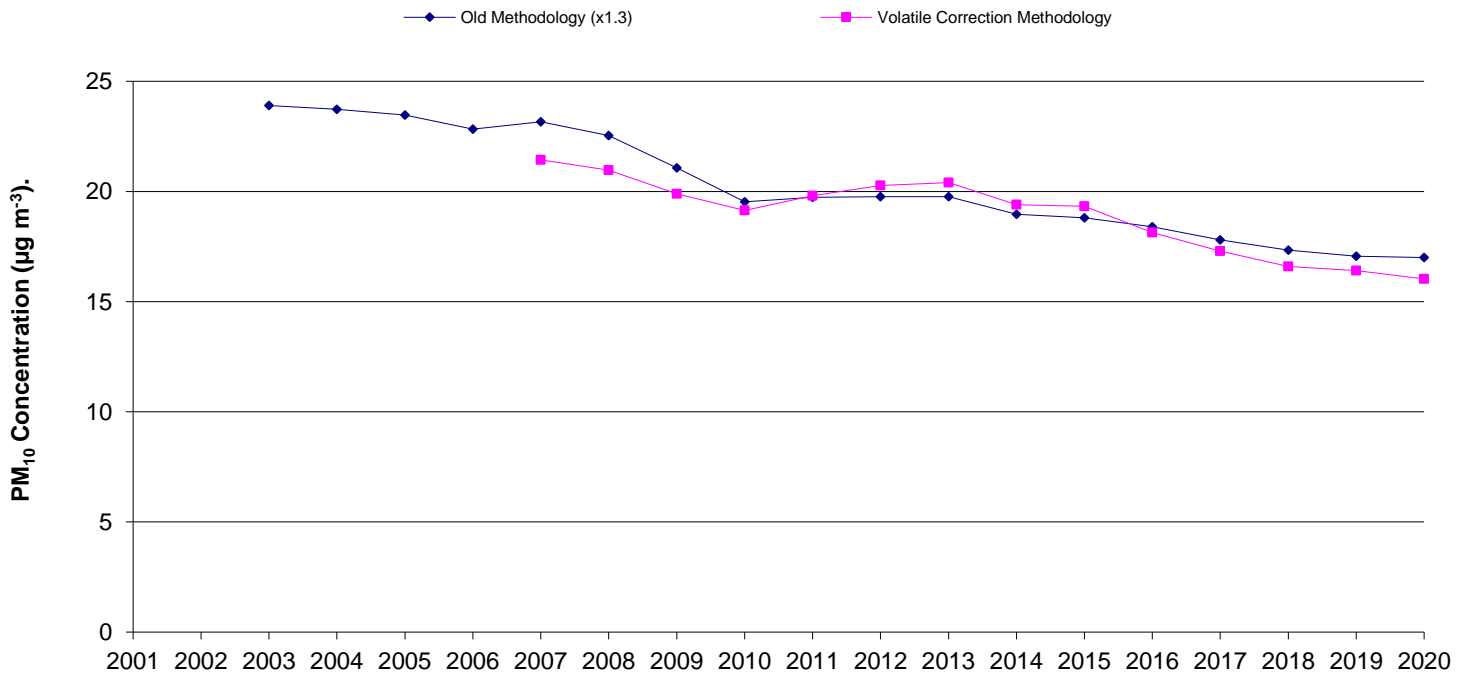
<sup>4</sup> Gatwick Air Quality Assessment for 2010 (AEAT/ENV/R/2795/Issue 1 – June 2009)

<sup>5</sup> Specifically PM<sub>2.5</sub> which is a subset of PM<sub>10</sub>.

**Figure 2: Three year Rolling Annual Average Nitrogen Dioxide Concentration at RG1, Michael Crescent Horley (Blue diamond), RG2, The Crescent Horley (Purple square), and RB59 (Red triangle).**



**Figure 3: Three Year Rolling Annual Average PM<sub>10</sub> Concentration at RG1, Michael Crescent, Horley.**



### On Airport Monitoring.

23. In the absence of relevant receptors<sup>6</sup> at the airport monitoring site, it is largely academic whether or not the air quality objectives are breached. However the monitoring results from 2020 (Table 1) indicate that the objectives were met at the LGW3 monitoring station for PM<sub>10</sub> and nitrogen dioxide.

	On Airport (LGW3)	Objective	Objective Met?
Annual Average nitrogen dioxide Concentration	16.6	40	Yes
Nitrogen Dioxide: No. of hours over 200 $\mu\text{g m}^{-3}$	0	18	Yes
Annual Average PM <sub>10</sub> Concentration Using FIDAS instrument <sup>*</sup>	13.6*	40	Yes
PM <sub>10</sub> : No. of days over 50 $\mu\text{g m}^{-3}$	0	35	Yes
<small>All concentrations are in <math>\mu\text{g m}^{-3}</math>.            Data Capture: Nitrogen Dioxide 96.8 %, PM<sub>10</sub> 97.0 %.  <sup>*</sup>GAL replaced the TEOM PM<sub>10</sub> analyser with a FIDAS instrument in 2019. For comparison purposes this value should be compared to the RG1 VCM value in Appendix B.</small>			

**Table 1: Nitrogen Dioxide and PM<sub>10</sub> Concentrations on Airport in 2020.**

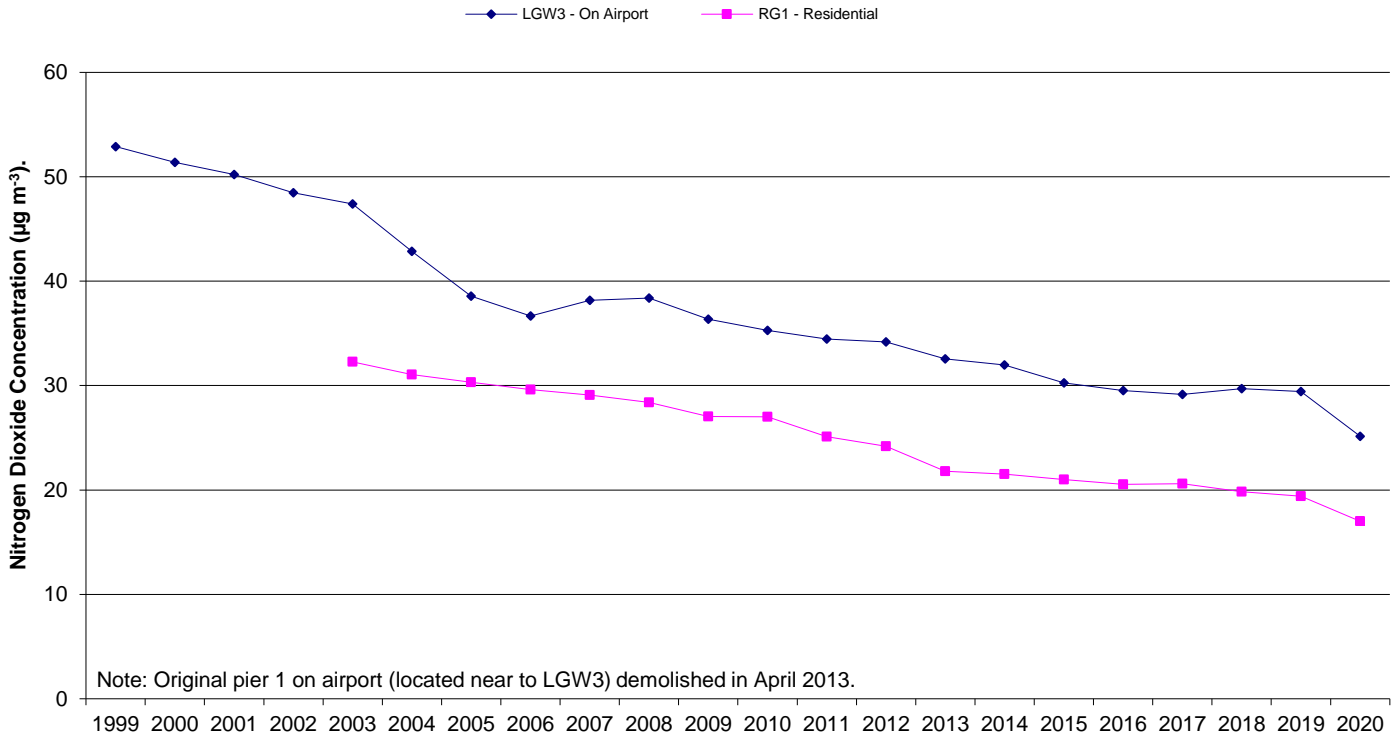
24. It should be pointed out that while the LGW3 monitor is of limited use for compliance monitoring, it is of particular use for verifying the computer modelling work used to make forward predictions about air quality at the airport.
25. During 2013 Pier 1 on the airport was closed for redevelopment, which represents a major change in the airport sources of air pollution affecting this monitor. Thus the results for 2014 and subsequent years are not directly comparable to data pre 2013 when examining trends in on airport pollution.

### On Airport Pollutant Trends.

26. Bearing in mind the changes in the on airport sources of pollution Figure 4 shows the 3 year rolling average nitrogen dioxide concentration at the on airport monitor LGW3, and the data from the residential monitor RG1 for comparison. The graph shows a steady improvement in nitrogen dioxide concentrations at the LGW3 monitor, with a significant improvement from 2003 onwards, followed by a subsequent increase in 2007 and 2008. While concentrations from 2009 to date continue to follow the long term downward trend, the slight increase in 2018 resulted from a relatively low concentration in 2015 (as seen in the RB59 trend data) and fairly flat concentrations over the past three years to 2019.
27. As with the residential monitoring the impact of the COVID restrictions is clearly seen in the trend data, with the annual mean nitrogen dioxide concentration at the airport (Table 2) falling from 29  $\mu\text{g m}^{-3}$  in 2019 to 16.6  $\mu\text{g m}^{-3}$  in 2020 - a fall of 12.4  $\mu\text{g m}^{-3}$  - compared to a maximum residential fall of around 11  $\mu\text{g m}^{-3}$ . This reflects the greater contribution that aviation / local road traffic emissions normally make to nitrogen dioxide concentrations at LGW3.

<sup>6</sup> 'Relevant receptors' were discussed in the outline air quality paper presented to the GP sub committee in January 2007. However, for the purposes of this of this report relevant exposure can be taken as residential housing, or in the case of the 1 hour nitrogen dioxide objective where a member of the public might be present for 1 hour or more.

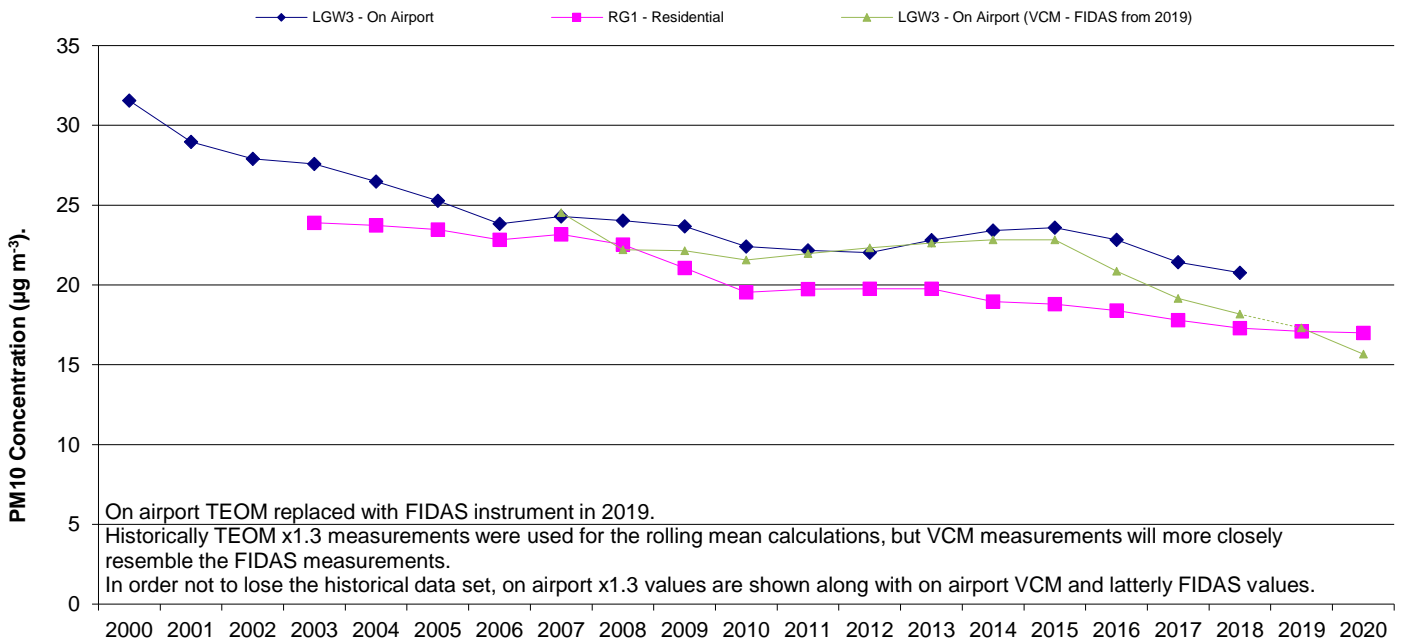
**Figure 4: Three Year Rolling Annual Average Nitrogen Dioxide Concentration at LGW3, Gatwick Airport.**



**Table 2: Annual and Three Year Annual Average Nitrogen Dioxide Concentrations (µg m<sup>-3</sup>).**

LGW3	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ann. Average	53.8	52.6	52.3	49.2	49.1	47.0	46.0	35.5	34.2	40.3	40.0	34.8	34.3	36.8	32.3	33.4	32.0	30.6	28.2	29.8	29.5	29.8	29.0	16.6
Data Capture	94.9	89.2	93.3	93.4	93.5	96.1	94.0	95.4	96.7	96.3	94.2	96.8	93.7	99.2	96.4	94.7	99.2	99.2	99.4	99.1	99.5	98.9	91.3	96.8
Hours over 200 µg m <sup>-3</sup>	2	0	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Year Roll. Av. LGW3			52.9	51.4	50.2	48.5	47.4	42.9	38.6	36.7	38.2	38.4	36.4	35.3	34.5	34.2	32.6	32.0	30.3	29.5	29.2	29.7	29.4	25.1
3 Year Roll. Av. RG1							32.3	31.1	30.3	29.6	29.1	28.4	27.0	27.0	25.1	24.2	21.8	21.5	21.0	20.5	20.6	19.8	19.4	17.0

**Figure 5: Three Year Rolling Annual Average PM<sub>10</sub> Concentration at LGW3, Gatwick Airport.**



28. Figure 5 shows the three year rolling annual average PM<sub>10</sub> concentrations at the airport monitor, and PM<sub>10</sub> data from the residential monitor for comparison. The graph shows a steady improvement in PM<sub>10</sub> concentrations on airport until 2006, at which point concentrations remained largely static for a few years before resuming a downward trend. In 2013 PM<sub>10</sub> concentrations increased slightly on airport and while this trend ran to 2015 it largely reflected elevated concentrations in 2013 and 2014. Given the redevelopment of Pier 1 and the trend seen off airport the increase at LGW3 was most likely related to the local building works, especially given the subsequent fall in concentrations in 2016 which continued in 2018.
29. In 2019 the airport replaced its existing TEOM PM<sub>10</sub> monitoring equipment with a new FIDAS instrument. To assess the impact of the change in measurement technique the airport ran both instruments side by side for around 6 months in 2018. The results<sup>7</sup> of this work suggested that the new measurement technique gave a slightly lower reading than would have been the case with the old equipment, which was in line with results from comparisons made on the UK national network.
30. It is important to stress that the new equipment is approved for use on the UK national network, but it does mean that magnitude of the PM<sub>10</sub> improvement seen at LGW3 (VCM measurement) in Figure 5 and Appendix B between 2018 and 2020 reflects both a genuine fall in PM<sub>10</sub> concentrations (as also seen at the residential monitor) and also partially reflects the change in the measurement technique.
31. As with the residential PM<sub>10</sub> monitoring the LGW 3 monitoring demonstrates little (if any) impact from the lockdown measures on PM<sub>10</sub> concentrations, reflecting the very limited contribution from local airport / road traffic sources.

#### **Benzene Monitoring Data.**

32. The concentration of benzene is measured at one residential site (RB11) on the Horley Gardens Estate and on airport at LGW3.
33. As expected measurements met the air quality objectives in 2020 (Table 3). Concentrations remained unchanged at the residential site and were down slightly on airport compared to 2019. Due to the nature of the measurement technique it is difficult to compare values over the long term, but it is worth noting that residential benzene concentrations fell year on year from 2007 to 2012, levelled off from 2013 to 2016, and have fallen slightly since 2016 with the concentrations in 2019 and 2020 the lowest to date.

	Concentration ( $\mu\text{g m}^{-3}$ )	Objective	Objective Met?
Annual Average Benzene Concentration: Residential	0.7	5	Yes
Annual Average Benzene Concentration: On Airport	0.5	5	Yes

**Table 3: Annual Average Benzene Concentrations on the Horley Gardens Estate at RB11 and Gatwick Airport (LGW3) in 2020 (Non pumped BTEX Tubes).**

#### **Additional Monitoring Data.**

##### **Ozone.**

34. Ozone monitoring began to the SW of the airport in 2005 at the RG3 site in Poles Lane Crawley. The aim of this site is to monitor long term trends in ozone concentrations in the vicinity of the airport.
35. Although the airport is not responsible for local ozone pollution i.e. it does not emit ozone, ozone plays an important role in the formation of nitrogen dioxide which is the main pollutant of concern in the vicinity of the airport. Therefore examining the long term ozone trend is important for understanding nitrogen dioxide concentrations in both the short and longer term.

<sup>7</sup> GATCOM Steering report 2020 – Appendix D.



36. At present there are fourteen years of valid data from the ozone monitor and based on a three year rolling average the overall trend to 2019 was flat at around  $50 \mu\text{g m}^{-3}$  (data not shown). However in 2020 the annual mean ozone concentration jumped to around  $56 \mu\text{g m}^{-3}$ , reflecting the general lack of NO<sub>x</sub> pollution that it would normally react with to form nitrogen dioxide. So while the COVID restrictions have resulted in an improvement in nitrogen dioxide concentrations they have also led to a slight deterioration in ozone concentrations.
37. Compared to the air quality standards ozone concentrations failed to meet the UK objective in 2020 for the fourteenth time in 15 years of monitoring (the UK standard was met in 2014), while the EU standard (which is less strict) was met in 2020 (Table 4).

	Number of exceedences.	Standard Met?	
		UK <sup>a</sup>	EU <sup>b</sup>
RG3: Poles Lane Crawley.	41 / 14 <sup>b</sup>	No	Yes
<b>Standards:</b>			
UK: Daily Max. of running 8 hour mean of $100 \mu\text{g m}^{-3}$ .	10 max.	-	-
EU: Daily Max. of running 8 hour mean of $120 \mu\text{g m}^{-3}$ (averaged over 3 years).	25 max.	-	-
<sup>a</sup> in 2020.			
<sup>b</sup> The EU standard is averaged over 3 years i.e. 2018, 2019, and 2020.			

**Table 4: Number of exceedences of the Ozone standard in 2020.**

38. The number of exceedences in 2020 was up on 2019 when there were 22 exceedences, but in line with levels seen in 2018. Thus while the lock down restrictions resulted in a significant increase in annual average ozone concentrations, this did not translate into more exceedences of the standard than seen historically.

## Summary.

39. In summary:

- i) The annual average air quality objective for nitrogen dioxide was met at all sites in the vicinity of the airport during 2020 (Table 7), which was perhaps not unexpected given the restrictions on local, national, and international travel in 2020. The air quality standards were also met for the other pollutants under the local authority air quality management regime (Table 7).
- ii) Ozone concentrations in the vicinity of the airport failed to meet the relevant UK air quality objective, although the airport is not responsible for local ozone pollution.
- iii) The concentration of nitrogen dioxide measured on airport in 2020 at LGW3 meets the UK air quality objective of  $40 \mu\text{g m}^{-3}$ . The concentrations of the other pollutants measured at LGW3 also met the relevant air quality objectives.
- iv) In view of the significant falls in nitrogen dioxide pollution in 2020 the trend in nitrogen dioxide concentrations both on and off airport continues downwards. However, the extent to which some of this step change in concentrations persists will depend on the rate at which air traffic and road transport returns compared to the rate of electrification of the road vehicle fleet and other technological improvements over the next 4 to 5 years.

	Measured value	Objective	Objective Met?
<b>Nitrogen Dioxide:</b>			
Highest measured annual average residential concentration.	31	40	Yes
Annual Average nitrogen dioxide concentration Airport monitor.	16.6	40	Yes
<b>PM<sub>10</sub>:</b>			
Annual Average PM <sub>10</sub> Concentration: Residential Monitor. (VCM value)	16.7 (15.1)	40	Yes
PM <sub>10</sub> : No. of days over 50 µg m <sup>-3</sup> : Residential Monitor. (VCM value)	0 (0)	35	Yes
Annual Average PM <sub>10</sub> Concentration: Airport Monitor. (FIDAS equivalent to VCM value)	13.6	40	Yes
PM <sub>10</sub> : No. of days over 50 µg m <sup>-3</sup> : Airport Monitor. (FIDAS equivalent to VCM value)	0	35	Yes
<b>Benzene:</b>			
Residential Benzene Monitor (Site RB 11).	0.7	5	Yes
<b>Ozone:</b>			
RG3 Monitor to SW of Airport (Number of exceedences).	41	10	No
All concentrations are in µg m <sup>-3</sup> .			

**Table 7: Summary of Air Quality in the Vicinity of Gatwick Airport in 2020.**

Figure A.1: Passenger and Aircraft Movement Trends at Gatwick Airport.

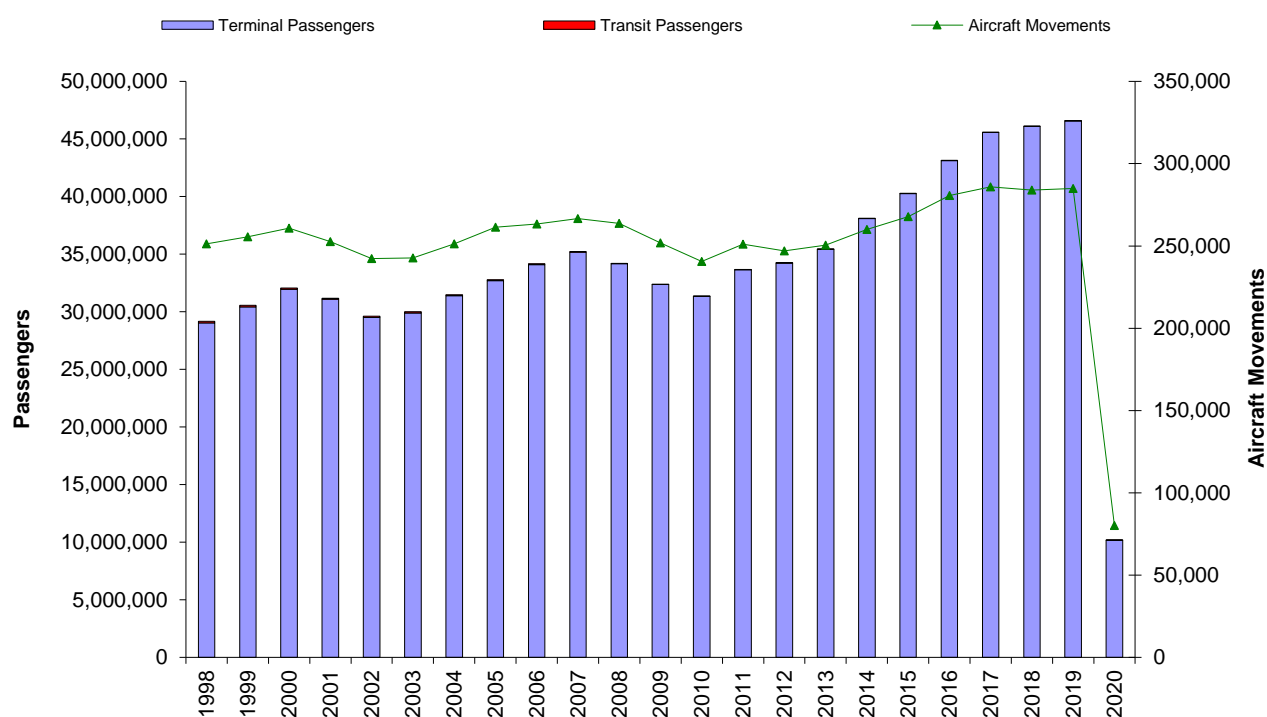


Table A.1: Annual Passenger Numbers and Aircraft Movements at Gatwick Airport.

	Number of Passengers			No. of Aircraft Movements
	Terminal	Transit	Total	
1998	29,032,838	140,292	29,173,130	251,321
1999	30,409,860	153,761	30,563,621	255,570
2000	31,947,524	119,601	32,067,125	260,859
2001	31,096,563	85,207	31,181,770	252,543
2002	29,517,894	109,515	29,627,409	242,379
2003	29,893,288	111,974	30,005,262	242,731
2004	31,391,352	75,418	31,466,770	251,195
2005	32,693,005	82,690	32,775,695	261,292
2006	34,080,345	83,234	34,163,579	263,363
2007	35,165,404	50,709	35,216,113	266,550
2008	34,162,014	43,873	34,205,887	263,653
2009	32,360,773	31,747	32,392,520	251,879
2010	31,342,263	33,027	31,375,290	240,500
2011	33,643,989	30,275	33,674,264	251,067
2012	34,218,668	17,314	34,235,982	246,987
2013	35,428,548	15,658	35,444,206	250,520
2014	38,093,930	9,737	38,103,667	259,962
2015	40,260,068	9,019	40,269,087	267,760
2016	43,114,888	4,740	43,119,628	280,666
2017	45,555,837	3,062	45,556,899	285,912
2018	46,081,327	4,762	46,086,089	283,919
2019	46,574,786	1,687	46,576,473	284,987
2020	10,171,867	1,564	10,173,431	80,161

Data from Civil Aviation Authority. [www.caa.co.uk/default.aspx?catid=80&pagetype=90](http://www.caa.co.uk/default.aspx?catid=80&pagetype=90)From 2016: <http://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-airport-data/>

## Appendix B: Summary of Annual Monitoring Results 1999 to 2020.

### Nitrogen Dioxide

Site	Parameter	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
RG1	Ann. Average ( $\mu\text{g m}^{-3}$ )	-	-	34.1	31.3	31.4	30.5	29.1	29.4	28.9	26.9	25.3	28.9	21.1	22.7	21.7	20.2 <sup>e</sup>	21.1	20.3	20.4	18.8	19.1	13.1
RG2	Ann. Average ( $\mu\text{g m}^{-3}$ )	-	-	-	-	-	33.8	34.3	32.4	33.8	32.4	31.3	31.2	28.8	31.2	28.5	28.5	26.4	28.6	26.7 <sup>d</sup>	24.9 <sup>d</sup>	24.2 <sup>d</sup>	14.6 <sup>d</sup>
RG3	Ann. Average ( $\mu\text{g m}^{-3}$ )	-	-	-	-	-	-	-	19.4	20.9	18.9	18.2	20.5	17.8	23.2	19.3	17.5	14.0	16.7	13.9	15.5	15.1	9.7
LGW3	Ann. Average ( $\mu\text{g m}^{-3}$ )	52.3	49.2	49.1	47.0	46.0	35.5	34.2	40.3	40	34.8	34.3	36.8	32.3	33.4	32.0 <sup>c</sup>	30.6 <sup>c</sup>	28.2 <sup>c</sup>	29.8 <sup>c</sup>	29.5 <sup>c</sup>	29.8 <sup>c</sup>	29.0	16.6
RB59	Ann. Average ( $\mu\text{g m}^{-3}$ )	-	-	-	-	40	39	34	37	38	35	32	32	26	32	28	27	25	29	28	27	26	15
RG1	Data Capture (%)	-	-	99.0	100.0	99.7	99.6	98.0	98.5	99.1	99.4	100.0	91.4	99	99.5	99.5	89.1	98.6	98.9	98.5	99.1	99.1	99.1
RG2	Data Capture (%)	-	-	-	-	-	89.0	97.0	96.0	96.3	92.8	95.0	92.4	88.5	85.1	99.3	99.4	98.7	97.6	99.4	98.3	99.2	99.5
RG3	Data Capture (%)	-	-	-	-	-	-	-	97.8	98.8	99.2	99.0	97.5	92.3	99.4	96.9	99.4	99.3	98.2	98.6	99.2	97.6	97.9
LGW3	Data Capture (%)	93.3	93.4	93.5	96.1	94.0	95.4	96.7	96.3	94.3	96.8	93.7	99.2	96.4	94.7	99.2	99.2	99.4	99.1	99.5	98.9	91.3	96.8
RB59	Data Capture (%)	-	-	-	-	91.6	100	91.6	100	100	100	100	100	91.6	100	100	100	100	91.6	100	100	100	100
RG1	Hours Over $200 \mu\text{g m}^{-3}$	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0 <sup>b</sup>	0	0	0	0	0	0
RG2	Hours Over $200 \mu\text{g m}^{-3}$	-	-	-	-	-	0	0	0	0	0	0	0	0 <sup>b</sup>	0 <sup>b</sup>	0	0	0	0	0	0	0	0
RG3	Hours Over $200 \mu\text{g m}^{-3}$	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGW3	Hours Over $200 \mu\text{g m}^{-3}$	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RB59	Hours Over $200 \mu\text{g m}^{-3}$	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

### Particulate Matter (PM<sub>10</sub>)

RG1	Ann. Average ( $\mu\text{g m}^{-3}$ )	-	-	22.8	23.2	25.7	22.3	22.4	23.8	23.3	20.5	19.4	18.7 <sup>a</sup>	21.1	19.5	18.7	18.7	19.0	17.5	16.9	17.6	16.7	16.7
	Ann. Average VCM* ( $\mu\text{g m}^{-3}$ )								21.2	22.0	19.7	18.0	19.7	21.7	19.4	20.1	18.7	19.2	16.5	16.2	17.1	15.9	15.1
LGW3	Ann. Average ( $\mu\text{g m}^{-3}$ )	31.0	28.7	27.2	27.8	27.8 <sup>***</sup>	23.8 <sup>***</sup>	24.2 <sup>***</sup>	23.3	25.3	23.4	22.3	21.6	22.7	21.9	23.8 <sup>c</sup>	24.5 <sup>c</sup>	22.5 <sup>c</sup>	21.5 <sup>c</sup>	20.3 <sup>c</sup>	20.5 <sup>c</sup>	-	-
	Ann. Average VCM* ( $\mu\text{g m}^{-3}$ )								21.1	23.7	21.8	20.9	22.0	23.0	22.0	22.9 <sup>c</sup>	23.6 <sup>c</sup>	21.6 <sup>c</sup>	17.0 <sup>c</sup>	18.5 <sup>c</sup>	19.0 <sup>c</sup>	14.4 <sup>f</sup>	13.6 <sup>f</sup>
RG1	Data Capture (%)	-	-	99.7	100	99.5	100	100	99.4	99.3	99.0	100	73.1	97.8	98.1	98.9	100	80.2	97.9	98.9	100	98.1	94.1
	Data Capture VCM** (%)								96.4	98.1	99.0	99.1	73.1	98.6	98.1	98.1	99.0	80.2	97.9	98.9	99.4	98.1	94.1
LGW3	Data Capture (%)	91.5	92.9	97.3	99.2	97.3	97.3	97.3	96.2	95.1	93.4	85.7	97.2	100	98.9	99.0	97.8	100	93.0	99.7	94.8	-	-
	Data Capture VCM** (%)								93.6	93.6	93.4	85.7	97.2	99.5	98.9	99.0	97.8	100	93.0	99.7	94.8	96.1 <sup>f</sup>	97.0 <sup>f</sup>
RG1	No. days over $50 \mu\text{g m}^{-3}$	-	-	6	6	16	0	3	5	9	4	0	0 <sup>b</sup>	1	2	1	0	1 <sup>b</sup>	1	1	0	0	0
	No. days over $50 \mu\text{g m}^{-3}$ (VCM)								6	18	5	2	0 <sup>b</sup>	9	7	2	4	3 <sup>b</sup>	3	2	0	0	0
LGW3	No. days over $50 \mu\text{g m}^{-3}$	35	28	20	17	31 <sup>***</sup>	10 <sup>***</sup>	9 <sup>***</sup>	7	18	13	0 <sup>b</sup>	3	1	6	7 <sup>c</sup>	10 <sup>c</sup>	5 <sup>c</sup>	6 <sup>c</sup>	3 <sup>c</sup>	0 <sup>c</sup>	-	-
	No. days over $50 \mu\text{g m}^{-3}$ (VCM)								10	23	16	2 <sup>b</sup>	4	19	15	11 <sup>c</sup>	14 <sup>c</sup>	7 <sup>c</sup>	7 <sup>c</sup>	3 <sup>c</sup>	1 <sup>c</sup>	4 <sup>f</sup>	0 <sup>f</sup>

Locations:

RG1 is located on the Horley Gardens Estate in Michael Crescent (NE of the , RG2 is located on the Horley Gardens Estate in The Crescent (NE of the Airport).

RG3 is located to the SW of the airport in Poles Lane, Crawley.

RB59 is a diffusion tube (not a real time site) located at the southern most end of the Horley Gardens Estate to the NE of the Airport.

\*for details on volatile correction methodology see [www.volatile-correction-model.info](http://www.volatile-correction-model.info). Spreadsheets downloaded 05/05/09 for values to 2009. From 2009 data direct from London Air Website [www.londonair.org.uk](http://www.londonair.org.uk).

\*\* as the VCM requires data from three other sites VCM data capture can be lower than from the site of interest.

\*\*\* figures have been revised down as data originally supplied for these 3 years was incorrect. Correction made in July 2010 report.

<sup>a</sup> data capture under 75 %. Therefore these values cannot be compared to the relevant air quality standard.

<sup>b</sup> data capture under 90 %. Therefore these values cannot be compared to the relevant air quality standard. Data shown will be minimum number of hours or days depending on standard.

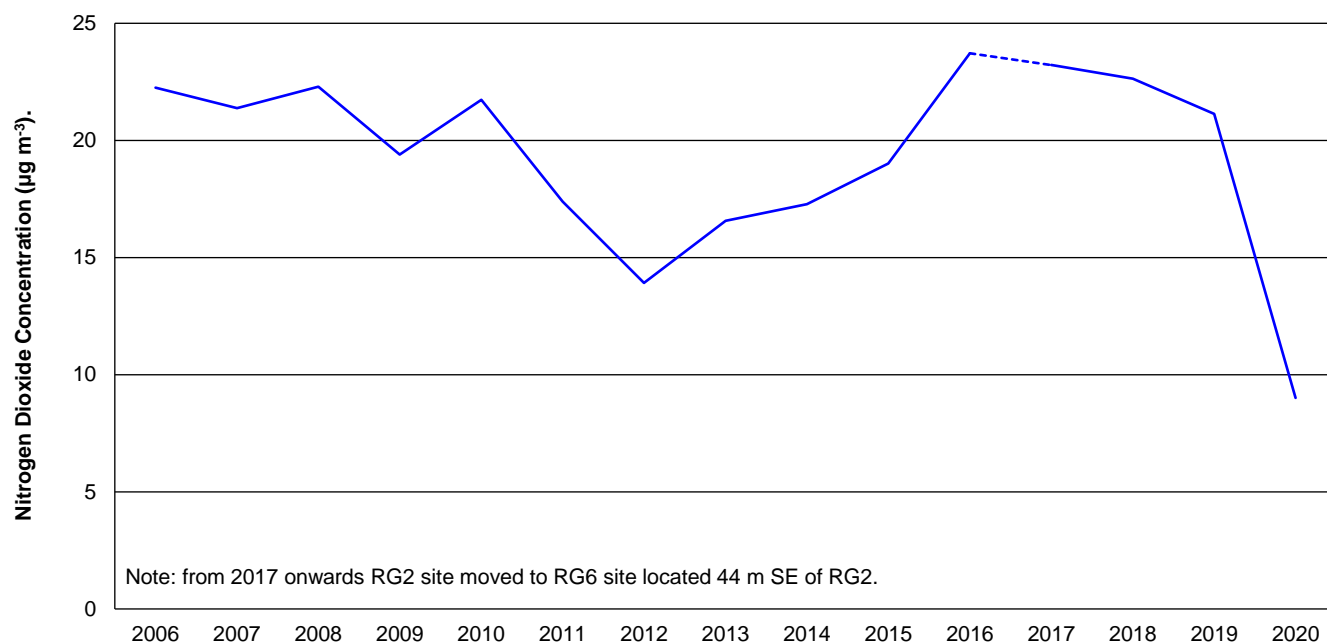
<sup>c</sup> pier 1 on the south terminal closed 8th April 2013 for redevelopment. Thus values from 2013 onwards not necessarily comparable to pre 2013 values.

<sup>d</sup> RG2 site moved 44 m south east of original location at the start of 2017 becoming RG6. Thus data from 2017 on technically not directly comparable to pre 2017 data (see 2018 steering group report for comparison).

<sup>e</sup> 2014 value adjusted from 21.8 to 20.2 based on rescaling of data.

<sup>f</sup> LGW3 TEOM replaced with FIDAS instrument from 2019. For colocation study results see appendix D of 2020 AQ report.

Figure C.1: RG2(6) minus RG3 when wind on 202 to 248 degrees - Mean of hourly values.

Table C.1: Airport & A23 Airport Way Contribution to Nitrogen Dioxide (µg m<sup>-3</sup>) by Month. (RG6 minus RG3 when winds 202 to 248 degrees).

Month	Range 2017 to 2019	Average	2020
Jan	22.7 to 24.1	23.4	21.0
Feb	24.0 to 27.2	25.4	18.1
Mar	20.9 to 26.6	24.4	19.5
Apr	15.9 to 24.7	21.5	3.7
May	17.0 to 21.8	19.6	2.2
Jun	20.8 to 21.4	21.1	2.4
Jul	20.2 to 21.5	20.7	2.8
Aug	20.4 to 22.6	21.3	5.0
Sep	21.4 to 22.9	22.1	7.3
Oct	21.5 to 25.3	23.1	6.2
Nov	17.3 to 24.2	21.3	4.6
Dec	20.8 to 28.1	24.3	7.1

Note less than 100 hours of data Feb 2018, Apr 2019, Apr 2020, and Oct 2018.

**Abbreviations and Definitions.**

AQMA	Air Quality Management Area.
FIDAS	Fine Dust Analysis System. Device for measuring PM <sub>10</sub> (and PM <sub>2.5</sub> ) concentrations in real time using optical light scattering.
GAL	Gatwick Airport Limited.
m <sup>3</sup>	cubic metre.
mg	milligram (1 thousandth of a gram).
NETCEN	National Environmental Technology Centre, UK.
ng	nanogram (1 billionth of a gram).
nm	nanometre (1 billionth of a metre or 1 millionth of a millimetre)
NO <sub>2</sub>	Nitrogen Dioxide.
NO <sub>x</sub>	Oxides of Nitrogen (mainly NO and NO <sub>2</sub> expressed as NO <sub>2</sub> equivalent).
O <sub>3</sub>	Ozone.
PM	Particulate Matter.
PM <sub>10</sub>	Essentially particles under 10 µm in diameter. Officially defined as the size fraction below 10µm in aerodynamic diameter, which has a cut off point at 50% of the particles which are 10µm in aerodynamic diameter.
PM <sub>2.5</sub>	Essentially particles under 2.5 µm in diameter.
ppb	part(s) per billion.
ppm	part(s) per million.
TEOM	Tapered Element Oscillating Microbalance. (Device for measuring PM <sub>10</sub> concentrations in real time).
µg	microgram (1 millionth of a gram).
µg/m <sup>3</sup>	microgram(s) per cubic metre
µg m <sup>-3</sup>	microgram(s) per cubic metre. This scientifically is the correct form to use rather than µg/m <sup>3</sup> , though either can be used.
Ultrafines	Essentially particles under 0.1 µm or 100 nm in diameter.
µm	micrometre (1 millionth of a metre or 1 thousandth of a millimetre)
VCM	Volatile Correction Method. (used to correct PM <sub>10</sub> measurements made using a TEOM. This results in data equivalent to measurements made using the European Union's 'preferred' PM <sub>10</sub> monitoring technique).