Air Quality Monitoring: Joint Report by RBBC and GAL for 2023.

1. The following report presents the results from the 2023 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 11th January 2007[1].

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 2023 is shown in Figure 1.

4. Nitrogen dioxide concentrations in 2023 remained below the UK annual average air quality standard of 40 µg 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 29.2 µg m^{-3} in 2023 (32.5 µg m^{-3} in 2022) compared to 43 µg m^{-3} in 2019.

5. On Victoria Road (RB151) nitrogen dioxide concentrations were 23 µg m^{-3} (25 µg m^{-3} in 2022) compared to 33 µg m^{-3} in 2019, while the highest concentration measured on the Horley Gardens Estate was 20 µg m^{-3} (23 µg m^{-3} in 2022) compared to 26 µg m^{-3} in 2019. At the RB59 'worst case' receptor concentrations were also around 20 µg m^{-3} in 2023 (18 µg m^{-3} in 2022) which compares to the highest concentration in 2019 of 26 µg m^{-3}.

6. Local sources of pollution on the estate remained unchanged throughout 2023, 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 - except RG1 - 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. At the RG1 site demolition work near the monitoring station in 2023 resulted in its closure for a month and so data capture was under 90 %. Therefore data from this site cannot be used for examining compliance with hourly pollution standards, but it can still be used to determine compliance with annual average standards.

8. The results from 2023 are in line with the predicted distribution of nitrogen dioxide concentrations for the Horley Gardens Estate, with concentrations typically around 1 µg m^{-3} lower than they were in 2022, although concentrations in the vicinity of RB59 and RG6 were up slightly on 2022. However concentrations remain 5 to 6 µg m^{-3} lower than in 2019. To put these changes into context, at suburban residential sites elsewhere in the borough nitrogen dioxide concentrations are down by 3 µg m^{-3} in 2023 compared to 2022 and remain 4 to 6 µg m^{-3} lower than in 2019.

9. Nitrogen dioxide concentrations in Charlwood were up slightly on 2022 at 13 µg m^{-3} and in Hookwood were up by 1 µg m^{-3} to 10 µg m^{-3} in 2023. Concentrations in Smallfield were also up by 1 µg m^{-3} to 16 µg m^{-3} in 2023 but remain 3 µg m^{-3} lower than in 2019.

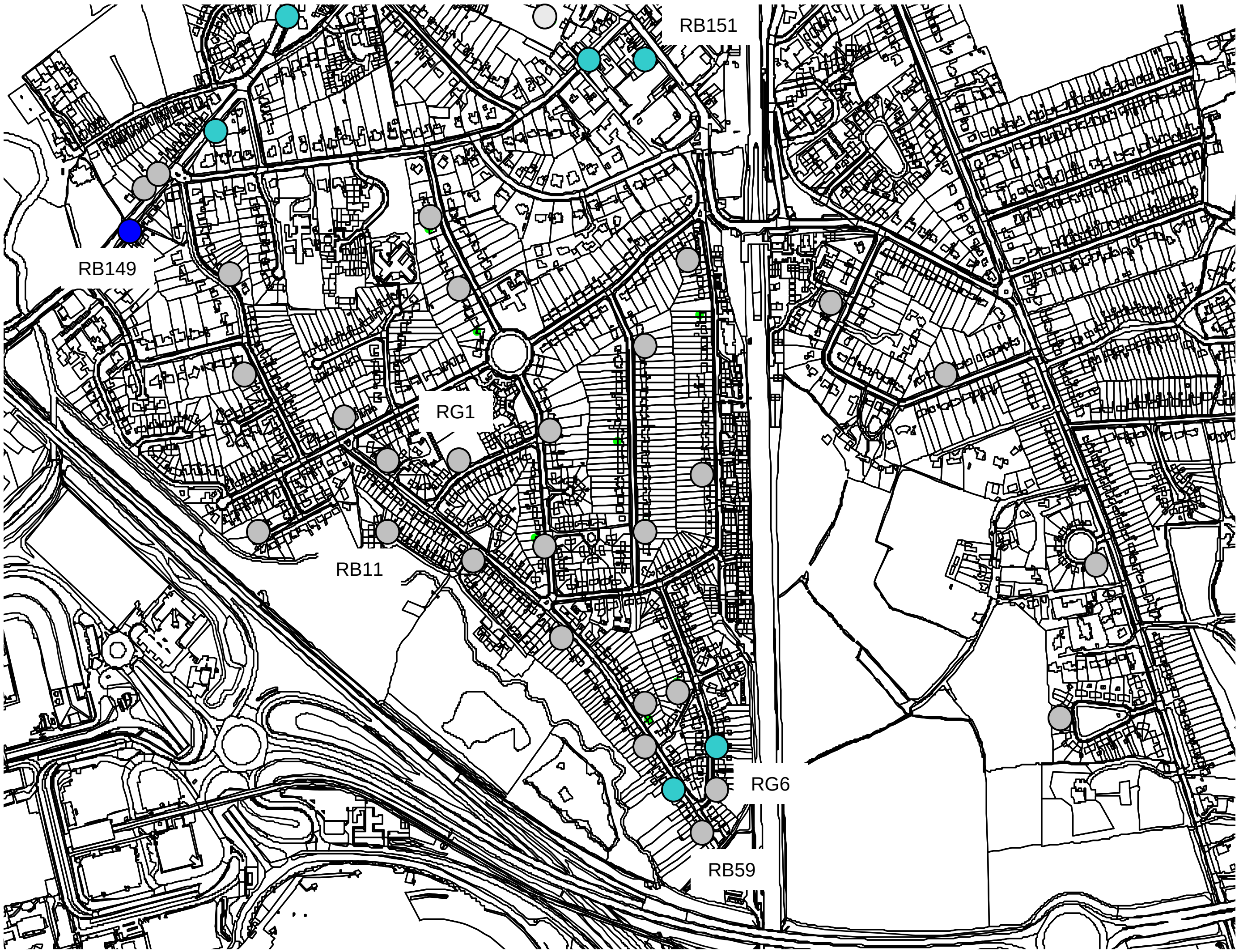
10. Passenger numbers at Gatwick increased by 24.5 % in 2023 compared to 2022 (but are still down 12.2 % on 2019), while aircraft movements increased 18 % over the same period but are still down 9.9 % on 2019 levels (Appendix A).

[1] Contact GATCOM Secretariat for historical reports.

11. Traffic flows on the M23 spur in 2023 are unknown as the traffic counters on the spur appear to be out of order. However based on traffic flows north and south of J9 on the M23 traffic flows in 2023 increased by 23 % compared to 2022.

Annual Monitoring of Compliance with UK air quality objectives – PM_{10}.

12. The PM_{10} air quality objective was met on the Horley Gardens Estate in 2023. Although the VCM corrected data is not yet available, using the TEOM x1.3 metric as a surrogate the annual average concentration at RG1 was 14.9 µg m^{-3} in 2023 (TEOM x1.3 methodology), which is down on 2022 (16.0 µg m^{-3}). Although there is a decrease in PM_{10} this is no greater than that seen normally e.g. due to the impact of weather, and reflects the fact that the majority of the PM_{10} measured on the Horley Gardens estate is from the regional background rather than any specific local source e.g. the airport or road traffic.



Key:

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

North

0 250 m

Other sites in the vicinity of the of the Airport:

Charlwood: (Russ Hill)	13 $\mu g\ m^{-3}$
Hookwood: (Withey Meadows)	10 $\mu g\ m^{-3}$
Smallfield: (Ontario Close)	16 $\mu g\ m^{-3}$

Comparable sites elsewhere within the Borough:

Reigate:	10 $\mu g\ m^{-3}$
Banstead:	11 $\mu g\ m^{-3}$
Redhill:	12 $\mu g\ m^{-3}$
Merstham:	15 $\mu g\ m^{-3}$

Figure 1: Monitoring Results for Nitrogen Dioxide Concentrations across the Horley Gardens Estate in 2023.

Tube Correction Factor = 0.76 (n=11 min).

Trends in Pollutant Concentrations.
Nitrogen dioxide.

13. 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 stopped in 2023, given the ongoing legacy impact of the COVID restrictions on nitrogen dioxide concentrations in 2020 and 2021 no real assessment can be made at this stage on the overall long term trend.

14. At the ‘worst case’ receptors closer to the airport (RG2(6), RB59) again the legacy impact of the restrictions can clearly be seen, with the steeper falls between 2019 and 2022 compared to the RG1 site reflecting the bigger influence that aviation and road traffic emissions have on these two sites, with the increase in nitrogen dioxide in 2023 reflecting the start of the return to ‘normal’.

15. 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).

16. 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.

17. The 2023 data (Figure C1) shows that nitrogen dioxide pollution from the airport and A23 Airport Way increased significantly in 2023 compared to 2022, but levels remain around 21 % lower than in 2019 (21 µg m^{-3} in 2019 compared to 16.8 µg m^{-3} in 2023).

PM_{10}.

18. It is important to note that the airport is not a significant source of PM_{10}, and computer modelling[2,3] consistently indicates that the airport is responsible for no more than 1 – 2 µg m^{-3} of the total PM_{10} concentration at the worst affected properties on the Horley Gardens Estate.

19. The COVID restrictions in 2020 and 2021 in effect confirmed the computer model, as despite the significant reductions in aircraft movements at the airport the PM_{10} concentrations fell by no more than around 1 µg m^{-3} compared to 2019, with far larger changes seen between 2015 and 2017 for example.

20. The main purpose of monitoring PM_{10} on the Horley Gardens Estate is to examine trends in the PM_{10} concentration, as the UK Government is aiming to reduce people’s exposure to particulate matter[4] in the longer term even where the air quality standards are met.

21. 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^{-3} in 2003 and 19.5 µg m^{-3} in 2010 (Figure 3), although much of this improvement in non airport PM_{10} 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.

[2] Air Quality Assessment – 2015 Emissions Inventory and Modelling. ARUP - AQ-02 - 20th November 2017.
[3] Gatwick Air Quality Assessment for 2010 (AEAT/ENV/R/2795/Issue 1 – June 2009)
[4] Specifically $PM_{2.5}$ which is a subset of PM_{10}.

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).

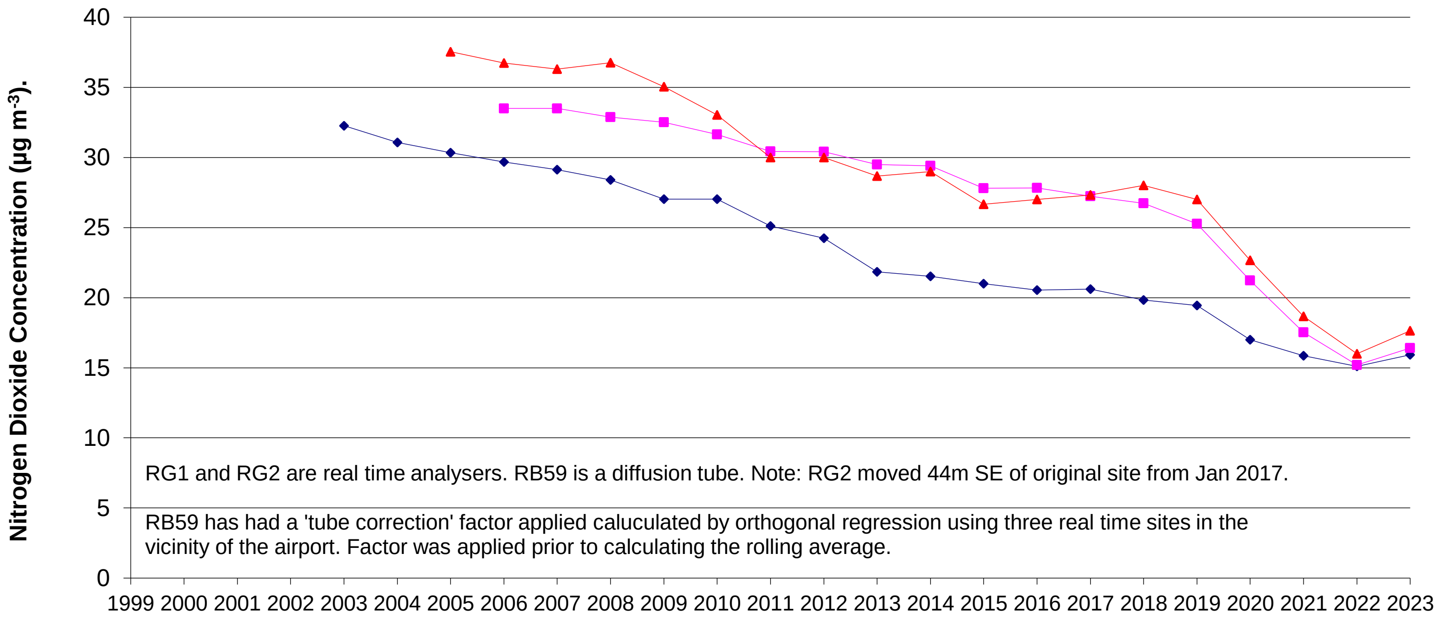
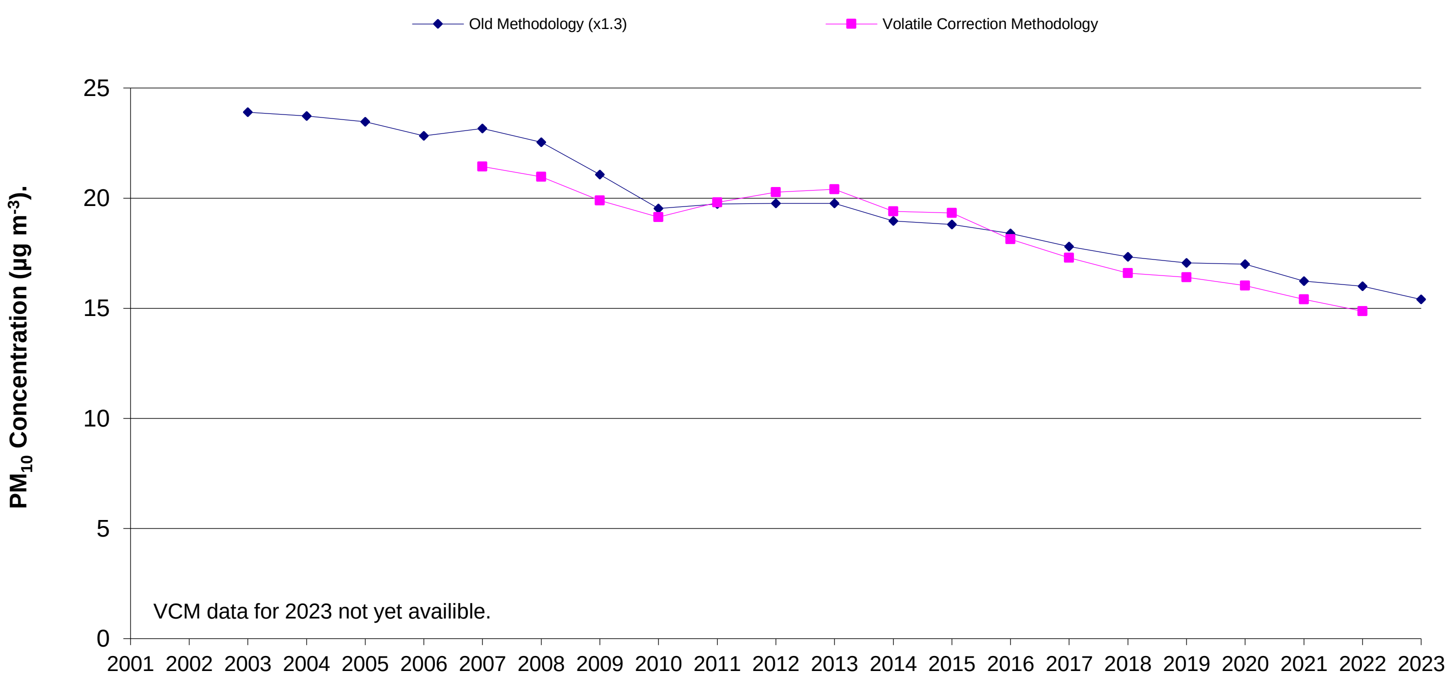


Figure 3: Three Year Rolling Annual Average PM_{10} Concentration at RG1, Michael Crescent, Horley.



On Airport Monitoring.

22. In the absence of relevant receptors[5] at the airport monitoring site, it is largely academic whether or not the air quality objectives are breached. However the monitoring results from 2023 (Table 1) indicate that the standards were met at the LGW3 monitoring station for PM_{10} and nitrogen dioxide.

	On Airport (LGW3)	Objective	Objective Met?
Annual Average nitrogen dioxide Concentration	20.4	40	Yes
Nitrogen Dioxide: No. of hours over 200 µg m^{-3}	0	18	Yes
Annual Average PM_{10} Concentration Using FIDAS instrument*	12.5*	40	Yes
PM_{10}: No. of days over 50 µg m^{-3}	1	35	Yes
All concentrations are in µg m^{-3}. Data Capture: Nitrogen Dioxide 97.8 %, PM_{10} 99.9 %. *GAL replaced the TEOM PM_{10} analyser with a FIDAS instrument in 2019. For comparison purposes this value should be compared to the RG1 VCM value in Appendix B.			

Table 1: Nitrogen Dioxide and PM_{10} Concentrations on Airport in 2023.

23. 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.

24. 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.

25. 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 three years to 2019.

26. As with the residential monitoring the impact of the COVID restrictions is clearly seen in the trend data, with the reduction in annual mean nitrogen dioxide concentration 2019 to 2021 greater at the LGW3 site than any of the residential sites. This reflects the greater contribution that aviation / local road traffic emissions normally make to nitrogen dioxide concentrations at LGW3. As with the residential data, given the ongoing legacy impact of the COVID restrictions no real assessment can be made at this stage of the long term trend at LGW3, despite the slight ‘up tick’ in concentrations in 2023.

[5] ‘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.

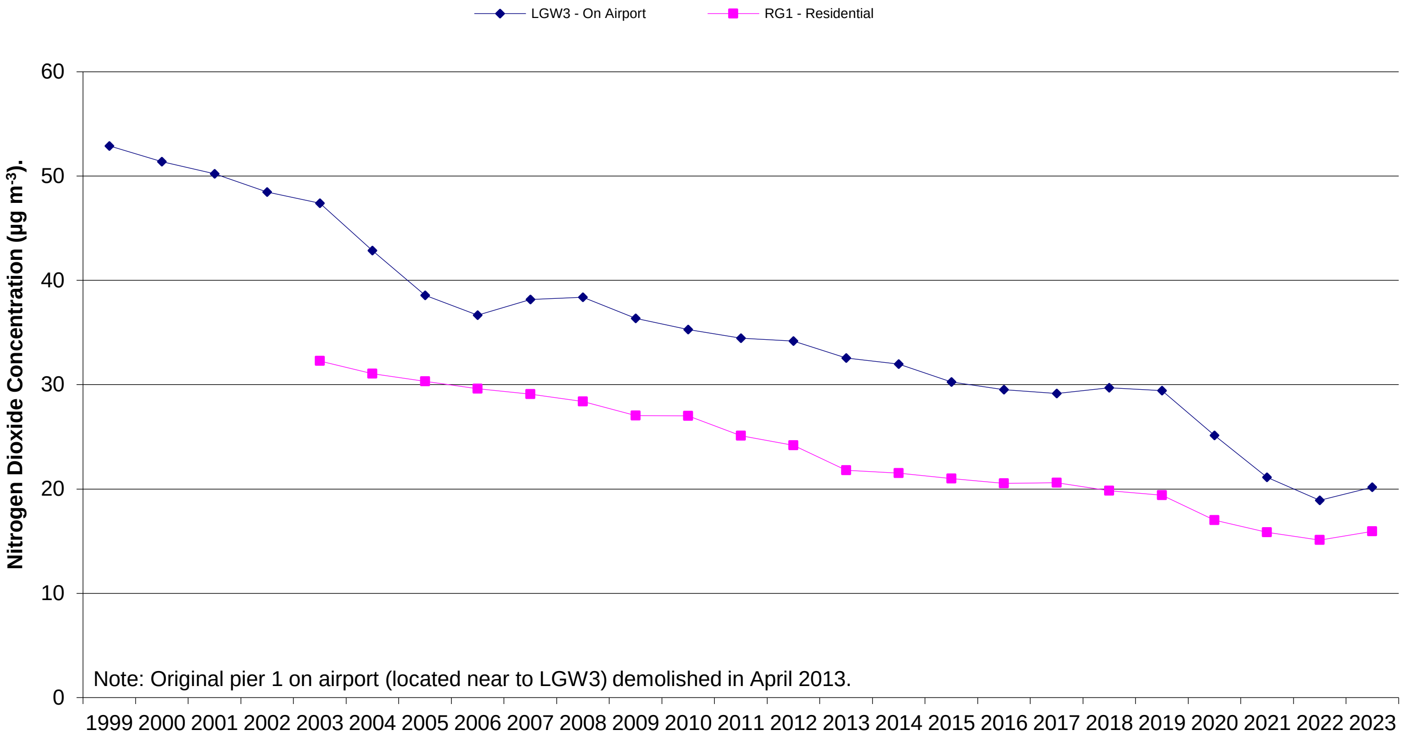
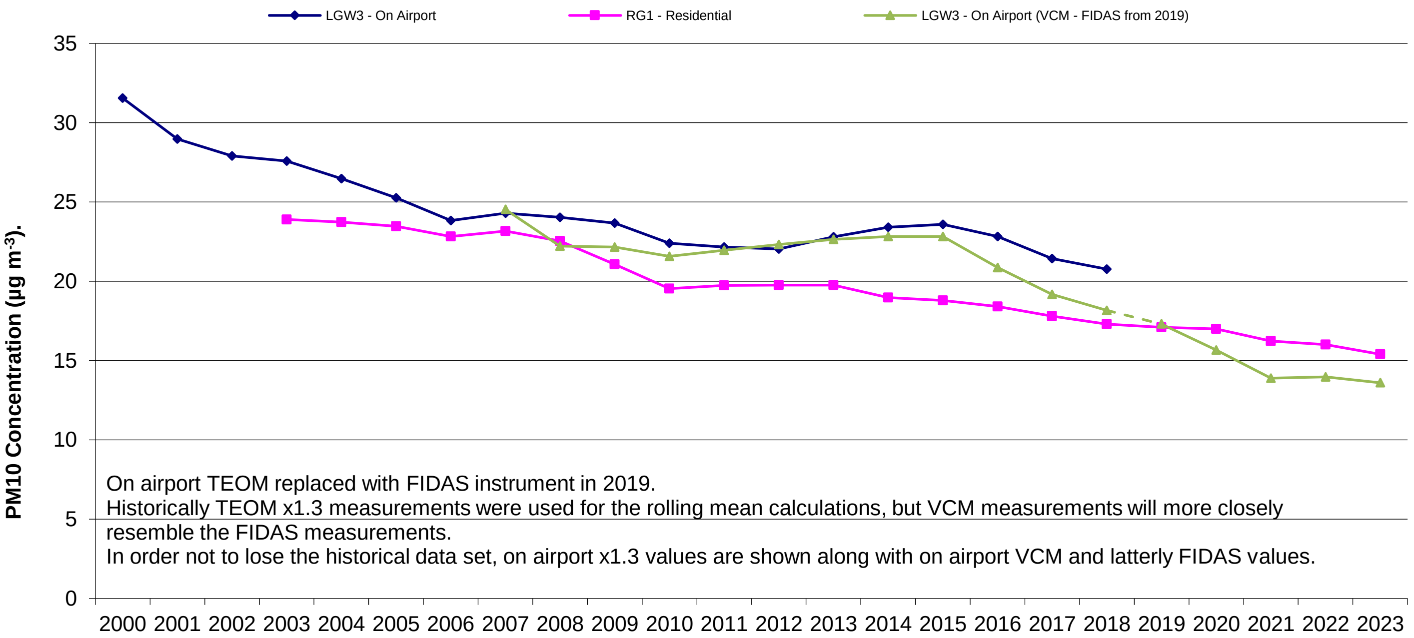


Table 2: Annual and Three Year Annual Average Nitrogen Dioxide Concentrations (µg m^{-3}).

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	2021	2022	2023
Ann. Av.	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	17.8	22.3	20.4
Data Cap.	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	98.1	97.8	94.2
Hours over 200 µg m^{-3}	2	0	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Year 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	21.1	18.9	20.2
3 Year 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	15.9	15.1	15.9

Figure 5: Three Year Rolling Annual Average PM_{10} Concentration at LGW3, Gatwick Airport.



27. Figure 5 shows the three year rolling annual average PM_{10} concentrations at the airport monitor, and PM_{10} data from the residential monitor for comparison. The graph shows a steady improvement in PM_{10} concentrations on airport until 2006, at which point concentrations remained largely static for a few years before resuming a downward trend. In 2013 PM_{10} 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.

28. In 2019 the airport replaced its existing TEOM PM_{10} 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[6] 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.

29. 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_{10} improvement seen at LGW3 (VCM measurement) in Figure 5 and Appendix B between 2018 and 2023 reflects both a genuine fall in PM_{10} concentrations (as also seen at the residential monitor) and also partially reflects the change in the measurement technique.

30. As with the residential PM_{10} monitoring the LGW3 monitoring demonstrated little (if any) impact from the lockdown measures on PM_{10} concentrations, reflecting the very limited contribution from local airport / road traffic sources.

$PM_{2.5}$ Monitoring Data.

31. It is important to note that the airport, as with PM_{10}, is not a significant source of $PM_{2.5}$. While there is an annual average standard for $PM_{2.5}$ of 10 µg m^{-3} to be met by 2040, the main purpose for looking at this pollutant is to begin to examine the long term trend in $PM_{2.5}$ concentrations given the Government's plans to reduce population exposure by 35 % by 2040 compared to the 3 year average concentration between 2016 and 2019.

32. Monitoring of this pollutant takes place on airport at LGW3 and off airport at one residential site (RG1), and as can be seen in Table 3 concentrations measured both on and off airport currently meet the 2040 standard.

	Concentration (µg m^{-3})	Objective (by 2040)	Objective Met?
Annual Average $PM_{2.5}$ Concentration: Residential	8.3	10	Yes
Annual Average $PM_{2.5}$ Concentration: On Airport	7.8	10	Yes
Instruments are FIDAS. Data capture RG1 91.3%, LGW3 96.9 %.			

Table 3: Annual Average $PM_{2.5}$ Concentrations on the Horley Gardens Estate at RG1 and Gatwick Airport (LGW3) in 2023.

33. At present there is insufficient data to examine the trend in $PM_{2.5}$ concentrations but this will be reported as the data set develops.

Benzene Monitoring Data.

34. The concentration of benzene is measured at one residential site (RB11) on the Horley Gardens Estate and on airport at LGW3.

35. As expected measurements met the air quality objectives in 2023 (Table 4). Concentrations were down slightly at the residential site (0.7 µg m^{-3} in 2022 and 0.7 µg m^{-3} in 2019) and up slightly on

[6] GATCOM Steering report: Air Quality Monitoring Report for 2019 – Appendix D (June 2020).

airport compared to 2022 (0.4 µg m^{-3}). 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 2021 (0.6 µg m^{-3}) and 2023 the lowest to date.

	Concentration (µg m^{-3})	Objective	Objective Met?
Annual Average Benzene Concentration: Residential	0.6	5	Yes
Annual Average Benzene Concentration: On Airport	0.5	5	Yes

Table 4: Annual Average Benzene Concentrations on the Horley Gardens Estate at RB11 and Gatwick Airport (LGW3) in 2023 (Non pumped BTEX Tubes).

Additional Monitoring Data.
Ozone.

36. 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.

37. 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.

38. At present there are seventeen 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 µg m^{-3} (data not shown). In 2020 the annual mean ozone concentration jumped to around 56 µg m^{-3} reflecting the general lack of NOx pollution that it would normally react with to form nitrogen dioxide due to COVID restrictions. In 2021 and 2022 the annual average ozone level fell to levels in line with previous years, but in 2023 the annual average concentration returned to 56 µg m^{-3} which had previously only occurred in 2020.

39. The reason for this sudden shift in ozone concentrations in 2023 is unclear but given the background concentrations of nitrogen dioxide are also at a similar level to 2020 it suggests a lack of NOx pollution (which would usually react with ozone to form nitrogen dioxide) may in part be responsible for the elevated annual average ozone concentration.

40. Compared to the air quality standards ozone concentrations failed to meet the UK objective in 2023 for the seventeenth time in 18 years of monitoring (the UK standard was met in 2014), while the EU standard (which is less strict) was met in 2023 (Table 5).

	Number of exceedences.	Standard Met?	
		UK[a]	EU[b]
RG3: Poles Lane Crawley.	19[a] / 6[b]	No	Yes
Standards:			
UK: Daily Max. of running 8 hour mean of 100 µg m^{-3}.	10 max.	-	-
EU: Daily Max. of running 8 hour mean of 120 µg m^{-3} (averaged over 3 years).	25 max.	-	-

[a] in 2023.
[b]The EU standard is averaged over 3 years i.e. 2021, 2022, and 2023.

Table 5: Number of exceedences of the Ozone standard in 2023.

41. The number of exceedences in 2023 was down on 2022 when there were 32 exceedences, with the number of exceedances in 2023 the lowest since 2017.

Summary.

42. In summary:

i) The annual average air quality objective for nitrogen dioxide was met at all sites in the vicinity of the airport during 2023 (Table 6), which was perhaps not unexpected given road traffic and aircraft movements have yet to return to pre COVID levels. The air quality standards were also met for the other pollutants under the local authority air quality management regime (Table 6).

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 2023 at LGW3 meets the UK air quality objective of 40 µg 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 and to a degree in 2021 the return of an upward trend in nitrogen dioxide concentrations both on and off airport was to be expected in 2023 as traffic and aircraft volumes begin to return to normal. However, the extent to which this upward trend 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?
Nitrogen Dioxide:			
Highest measured annual average residential concentration.	29	40	Yes
Annual Average nitrogen dioxide concentration Airport monitor.	20.4	40	Yes
PM_{10}:			
Annual Average PM_{10} Concentration: Residential Monitor. (VCM value)	14.9 (N/A)	40	Yes
PM_{10}: No. of days over 50 µg m^{-3}: Residential Monitor. (VCM value)	0 (N/A)	35	Yes
Annual Average PM_{10} Concentration: Airport Monitor. (FIDAS equivalent to VCM value)	12.5	40	Yes
PM_{10}: No. of days over 50 µg m^{-3}: Airport Monitor. (FIDAS equivalent to VCM value)	1	35	Yes
$PM_{2.5}$:			
Annual Average $PM_{2.5}$ Concentration: Residential Monitor. (FIDAS)	8.3	10*	Yes
Annual Average $PM_{2.5}$ Concentration: Airport Monitor. (FIDAS)	7.8	10*	Yes
Benzene:			
Residential Benzene Monitor (Site RB 11).	0.6	5	Yes
Ozone:			
RG3 Monitor to SW of Airport (Number of exccedences).	19	10	No
All concentrations are in µg m^{-3}. ^ To be met by 2040.			

Table 6: Summary of Air Quality in the Vicinity of Gatwick Airport in 2023.

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

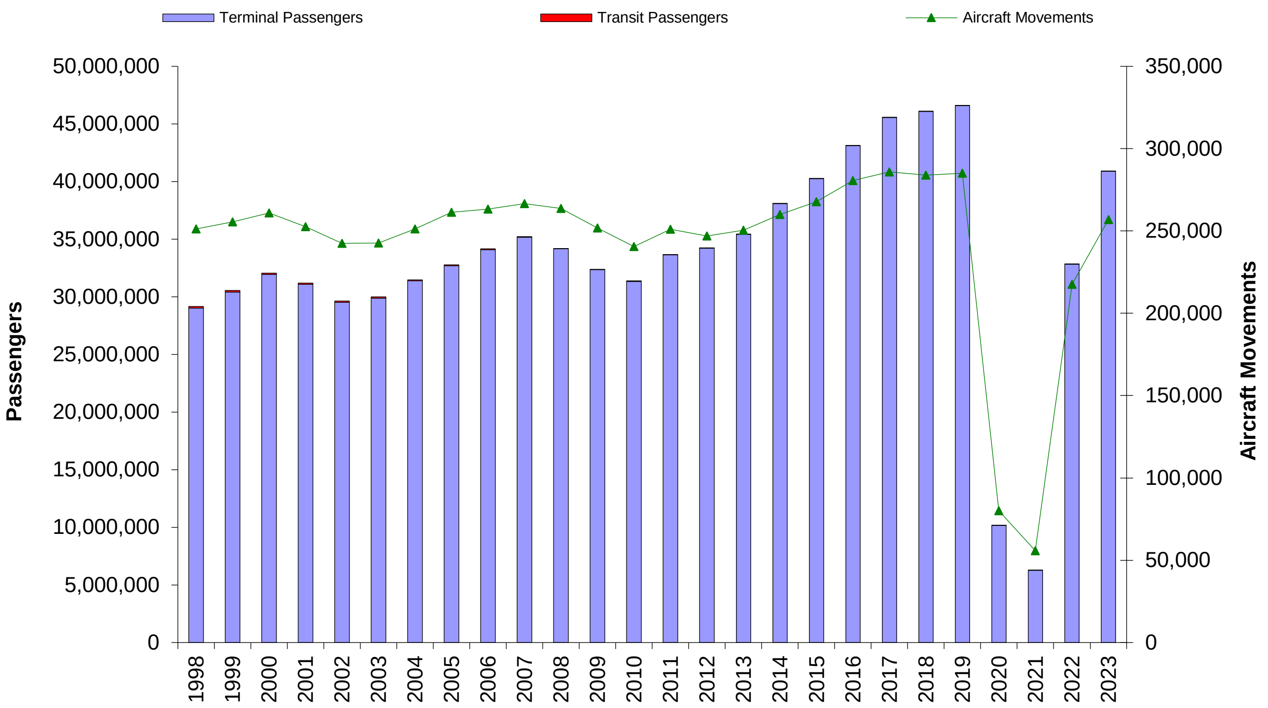


Table A.1: Annual Passenger Numbers and Aircraft Movements at Gatwick Airport.

	Number of Passengers			No. of Aircraft
	Terminal	Transit	Total	Movements
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
2021	6,260,072	1,742	6,261,814	55,817
2022	32,831,088	4,293	32,835,381	217,622
2023	40,894,242	3,414	40,897,656	256,893

Data from Civil Aviation Authority. 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 2022.

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	2021	2022	2023
RG1	Ann. Average (µg 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[e]	21.1	20.3	20.4	18.8	19.1	13.1	15.4	16.8	15.6
RG2	Ann. Average (µg 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[d]	24.9[d]	24.2[d]	14.6[d]	13.8[d]	17.2[d]	18.2[d]
RG3	Ann. Average (µg 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	9.7	11.7	10.6
LGW3	Ann. Average (µg 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[c]	30.6[c]	28.2[c]	29.8[c]	29.5[c]	29.8[c]	29.0	16.6	17.8	22.3	20.4
RB59	Ann. Average (µg m^{-3})	-	-	-	-	40	39	34	37	38	35	32	32	26	32	28	27	25	29	28	27	26	15	15	18	20
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	94.6	92.4	89.9
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	97.3	98.0	98.9
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	97.8	96.0	98.6
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	98.1	97.8	94.2
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	100	91.6	83.3
RG1	Hours Over 200 µg m^{-3}	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0[b]	0	0	0	0	0	0	0	0	0[b]
RG2	Hours Over 200 µg m^{-3}	-	-	-	-	-	0	0	0	0	0	0	0	0[b]	0[b]	0	0	0	0	0	0	0	0	0	0	0
RG3	Hours Over 200 µg m^{-3}	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGW3	Hours Over 200 µg m^{-3}	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RB59	Hours Over 200 µg 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	N/A	N/A	N/A

Particulate Matter (PM_{10})

Site	Parameter	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
RG1	Ann. Average (µg m^{-3})	-	-	22.8	23.2	25.7	22.3	22.4	23.8	23.3	20.5	19.4	18.7[a]	21.1	19.5	18.7	18.7	19.0	17.5	16.9	17.6	16.7	16.7	15.3	16	14.9
	Ann. Av. VCM* (µg 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	15.2	14.3	N/A
LGW3	Ann. Average (µg m^{-3})	31.0	28.7	27.2	27.8	27.8***	23.8***	24.2***	23.3	25.3	23.4	22.3	21.6	22.7	21.9	23.8[c]	24.5[c]	22.5[c]	21.5[c]	20.3[c]	20.5[c]	-	-	-	-	-
	Ann. Av. VCM* (µg m^{-3})								21.1	23.7	21.8	20.9	22.0	23.0	22.0	22.9[c]	23.6[c]	21.6[c]	17.0[c]	18.5[c]	19.0[c]	14.4[f]	13.6[f]	13.7[f]	14.6[f]	12.5[f]
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	99.3	92.0	89.6
	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	99.3	91.8	N/A
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[f]	97.0[f]	99.6[f]	99.9[f]	96.9[f]
RG1	No. days over 50 µg m^{-3}	-	-	6	6	16	0	3	5	9	4	0	0[b]	1	2	1	0	1[b]	1	1	0	0	0	1	0	0[b]
	No. days > 50 µg m^{-3} (VCM)								6	18	5	2	0[b]	9	7	2	4	3[b]	3	2	0	0	0	0	0	N/A
LGW3	No. days over 50 µg m^{-3}	35	28	20	17	31***	10***	9***	7	18	13	0[b]	3	1	6	7[c]	10[c]	5[c]	6[c]	3[c]	0[c]	-	-	-	-	-
	No. days > 50 µg m^{-3} (VCM)								10	23	16	2[b]	4	19	15	11[c]	14[c]	7[c]	7[c]	3[c]	1[c]	4[f]	0[f]	2[f]	1[f]	1[f]

Locations:

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

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. Spreadsheets downloaded 05/05/09 for values to 2009. From 2009 data direct from London Air Website 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.

[a] data capture under 75 %. Therefore these values cannot be compared to the relevant air quality standard.

[b] 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.

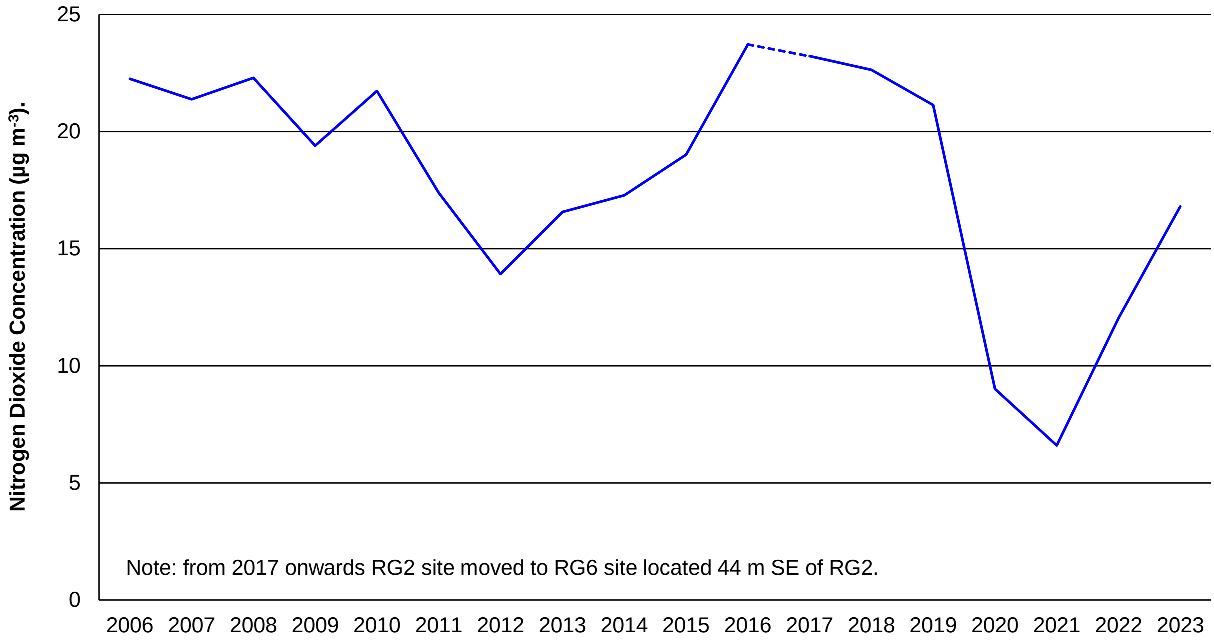
[c] pier 1 on the south terminal closed 8th April 2013 for redevelopment. Thus values from 2013 onwards not necessarily comparable to pre 2013 values.

[d] 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).

[e] 2014 value adjusted from 21.8 to 20.2 based on rescaling of data.

[f] 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.



Abbreviations and Definitions.

AQMA	Air Quality Management Area.
FIDAS	Fine Dust Analysis System.
	Device for measuring PM_{10} (and $PM_{2.5}$) concentrations in real time using optical light scattering.
GAL	Gatwick Airport Limited.
m^3	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_2	Nitrogen Dioxide.
NO_x	Oxides of Nitrogen (mainly NO and NO_2 expressed as NO_2 equivalent).
O_3	Ozone.
PM	Particulate Matter.
PM_{10}	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.
$PM_{2.5}$	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_{10} concentrations in real time).
µg	microgram (1 millionth of a gram).
$µg/m^3$	microgram(s) per cubic metre
$µg\ m^{-3}$	microgram(s) per cubic metre. This scientifically is the correct form to use rather than $µg/m^3$, 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_{10} measurements made using a TEOM. This results in data equivalent to measurements made using the European Union's 'preferred' PM_{10} monitoring technique).