2015 Air Quality Updating and Screening Assessment for Greater Manchester

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

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Executive Summary

An Air Quality Updating and Screening Assessment (USA) has been carried out for the Greater Manchester Combined Authority (GMCA), which covers the following councils: Bolton, Bury, Rochdale, Oldham, Tameside, Stockport, Trafford and Wigan, and the cities of Manchester and Salford. The GMCA covers a population of over 2.5 million.

Air Quality Management Areas (AQMA) have previously been declared in each of the Council areas, where modelled nitrogen dioxide is likely to exceed 35 µg/m^3.

This document presents a screening assessment of recent monitoring data and also potentially significant sources of air pollution that have not previously been assessed.

There are 16 automatic monitoring sites across GM (two of which in Oldham and Bury have been commissioned since the last report) that measure levels of pollutants that include PM_{10}, NO_2, SO_2, $PM_{2.5}$ and O_3. There is also a network of over 200 non automatic monitoring sites which use diffusion tubes to monitor NO_x and benzene. The results from NO_2 non automatic monitoring sites show good correlation with those from the automatic monitoring system. The following exceedences of the air quality objectives were found:

Pollutant	General	Detailed Assessment Required	Objective	Description of Area
NO_2	Monitoring inside AQMA	Yes	Annual Mean 40 µg/m^3	Tameside Mottram, Bury Prestwich, Man Oxford Road, Salford M60
O_3	Monitoring inside AQMA	No*	8 hour mean 100 µgm^3 (>10 times a year)	Glazebury, Man South, Wigan Centre

* Not the responsibility of local authorities so is reported for information only.

There were no other exceedences of any of the air quality objectives.

Most of the road/kerbside automatic and non automatic sites have remained relatively stable over the last few years, whilst concentrations at non-roadside sites have fallen significantly, particularly in comparison to the higher values seen in 2010. The assessment of monitoring data shows that real time monitoring data for the NO_2 annual mean objective broadly confirms the existing AQMA boundaries. Stockport Hazel Grove site, records the lowest concentration within the AQMA with an annual mean of 27 $\mu g/m^3$, however the other sites are consistent with the AQMA boundary. Broadly the monitoring results for NO_2 are consistent with the current AQMA, however the diffusion tube data suggests that there are locations where the AQMA should be revised, and dispersion modelling has been undertaken in support of this.

Real time monitoring data for particulate matter (less than 10 microns) shows that annual average objectives are not exceeded and are relatively stable across the area. No sites had more than 35 occurrences of exceedences of the daily mean particulate objective and therefore this objective was met.

As with previous assessments, there were no exceedences for sulphur dioxide, carbon monoxide and benzene.

New or previously not assessed road traffic sources in GM have been identified but a detailed assessment for these is not required. No new transport sources from airports, trains or ports have been identified. New potential industrial sources have been identified since the last assessment but none of these sources are expected to impact on air quality. Three new biomass sites have been identified within Bury, Manchester and Trafford and a new fugitive source of potential air pollution has been identified in Manchester. These sources are considered unlikely to lead to an exceedence of the air quality objectives and detailed assessment of them is not required.

A Detailed Assessment to identify likely exceedences of nitrogen dioxide objectives is being prepared concurrently with this Update and Screening Assessment, and this will inform the variation of current AQMA where required. The variation is also intended to consolidate the existing individual AQMA for each GM authority into a single AQMA.

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1 Introduction

1.1 Description of Regional Pollution Group

The air quality working group works in partnership to co-ordinate local air quality management for the 10 districts, Association of Greater Manchester Authorities (AGMA) and the Greater Manchester Combined Authority (GMCA).

AGMA consists of 10 districts that work together over a range of statutory and non-statutory duties, where there is an opportunity to improve services across the region. The ten districts are Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford, and Wigan. These are the main members of AGMA.

The GMCA consists of the ten AGMA authorities, with statutory powers for transport, regeneration and economic development across the city region. These powers include Local Air Quality Management (LAQM) under Sections 82 to 84 of the Environment Act 1995.

1.2 Description of Local Authority Areas

Greater Manchester (GM) has a population of over 2.5 million residents over an area of approximately 500 square miles. Within the conurbation there is a mix of high-density urban areas, suburbs, semi-rural and rural locations, and the area is characterised by the strong regional centre of Manchester, The Quays and Trafford Park.

GM is the largest and strongest economic area in the North of the country, with over 40% of the North West's total productivity. However despite this, it contains some of the most deprived areas in the country.

There are over 9,000 km of roads, carrying annual traffic of 13,000 vehicle kilometres[1] on the motorways and A and B roads. Manchester Airport is the largest regional centre outside London. The M62 sits on the edge of the conurbation as it forms the East – West main serving Liverpool and Hull. The M60 orbital route

[1] DSD (Transport for Greater Manchester Data Solutions Department) report, 2015

encompassing GM is over 36 miles in length, annual average weekday traffic flows are over 200,000 and the network is often congested at peak times. Other major motorways include the M6, M56, M61 and M66.

1.3 Purpose of Report

This report fulfils the requirements of the LAQM process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 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 exceedences are considered likely, the local authority must then 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.

The objective of this Updating and Screening Assessment (USA) is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

1.4 Air Quality Objectives

The air quality objectives applicable to LAQM **in England** are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 μg/m^3	Running annual mean	31.12.2003
	5.00 μg/m^3	Running annual mean	31.12.2010
1,3-Butadiene	2.25 μg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 μg/m^3	Annual mean	31.12.2004
	0.25 μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 μg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μg/m^3	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 μg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 μg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 μg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 μg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.5 Summary of Previous Review and Assessments

This is the second single report for the ten GM districts; formerly the local authorities submitted individual reports to Defra to fulfil their duties under the Environment Act 1995. However much of the underlying data used in our reports is held at the regional level by Transport for Greater Manchester (TfGM) and it therefore makes sense to write a joint report. This is consistent with the ethos and duties held by the Combined Authority and AGMA. TfGM undertake transport statistics for the region, manage the

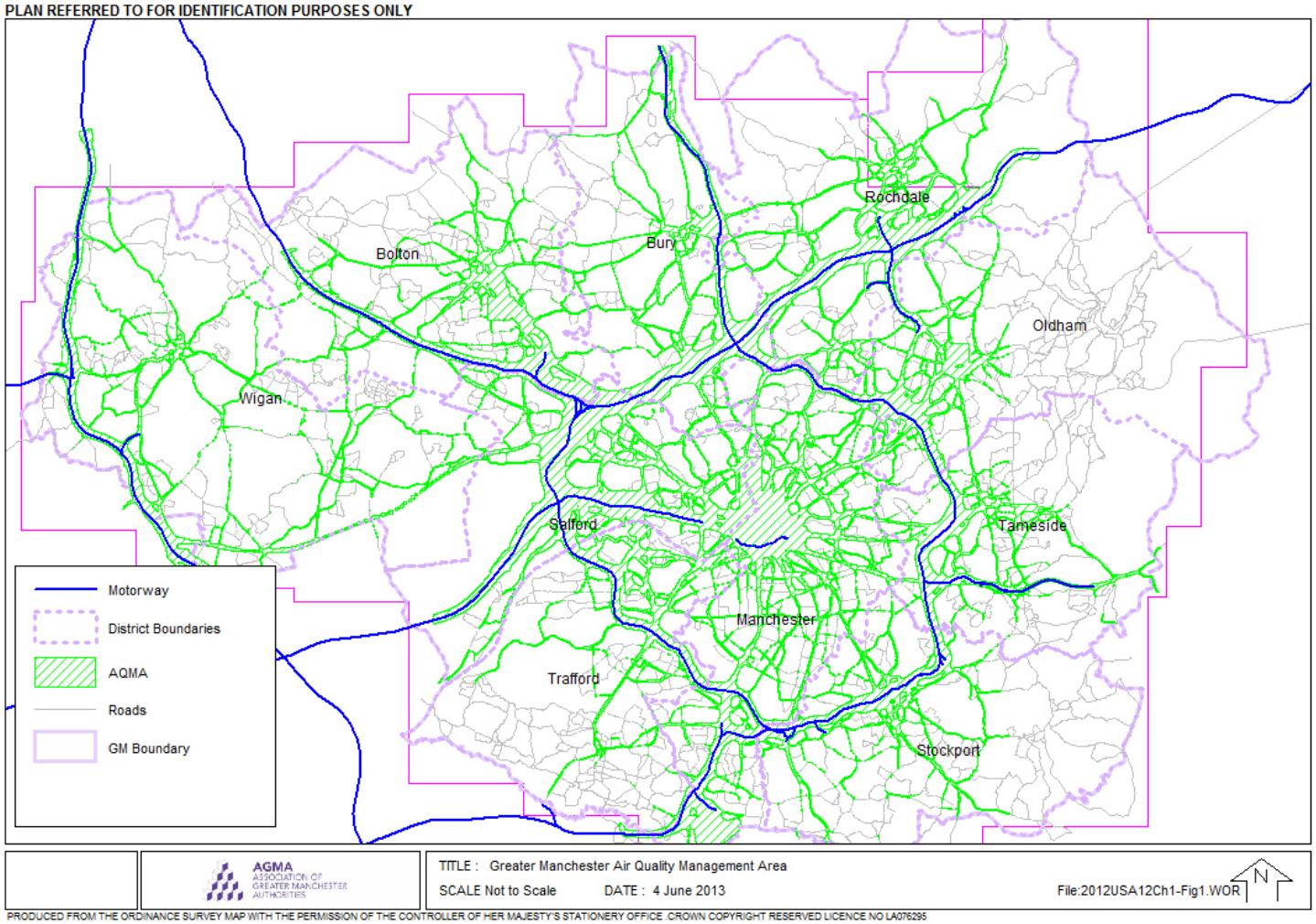
Emissions **I**nventory for **G**reater **Ma**nchester (EMIGMA) and the regional model for the ten districts.

GM has undertaken two previous county-wide modelling studies and the results were used to define the air quality management areas. At the time of these declarations no mechanism existed for declaration of a GM AQMA, and local authorities declared separate AQMA for their areas. Figure 1.1 indicates the existing GM AQMA Boundaries.

A summary of GM work is provided in the table below:

Date	Report / Stage	Outcome
	1st Detailed Assessment Modelling Round	Emissions inventory 1997. Declared AQMA for annual mean NO_2 including areas for daily PM_{10}. AQMA declared: 2001-2002.
2004	2nd Detailed assessment Modelling Round	Modelling Round 2 Based on emissions inventory for: 2001. AQMA NO_2 annual mean declared: 2005-2006. PM_{10} revoked.
2005-6		All LAs re-declared NO_2 AQMA at 35 µg/m^3 and revoked PM_{10}.
2009	USA	Most districts recommended modelling work due to traffic emissions. Salford progressed to detailed assessment for railways, by monitoring and found to be below air quality standard.
	3rd Detailed assessment Modelling Round	Modelling Round 2 Base on emissions inventory for: 2001. AQMA NO_2 annual mean declared: 2005-2006. PM_{10} revoked.
2012	USA	Concluded that the existing boundaries of the AQMA may need adjustment. To complete a Detailed Assessment.

Figure 1.1 Map(s) of AQMA Boundaries



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Local Authorities carry out air quality monitoring programmes as part of their local air quality management responsibilities under the Environment Act 1995. In addition Defra funds a network of air quality monitors as part of the Automatic Urban and Rural Network (AURN) and also partially funds some of the local authority sites by providing calibration and auditing services.

The GM authorities have reviewed the automatic monitoring program to ensure the network meets future monitoring needs, to provide best value and help maintain key sites in the network. The review resulted in the decommissioning of a number of sulphur dioxide monitors, all carbon monoxide instruments, and on the introduction of two new monitoring stations for nitrogen dioxide and particulates. One to the north eastern side of GM, which was commissioned in early 2014 (Oldham Crompton Way), and a new monitoring station in a new location in Bury (Bury Whitefield Roadside) – commissioned into the AURN in February 2015 near the A56.

The GM automatic air quality monitoring network in 2015 comprises sixteen monitoring stations. These monitoring stations do not necessarily measure all pollutants, but the network in general operates with the capacity to monitor PM_{10}, NO_2, SO_2, $PM_{2.5}$ and O_3 at designated sites.

Defra, as part of their services, provide QA/QC checks and data validation for full and partially affiliated sites. Local authority sites have data management services provided by Ricardo Energy & Environment.

The QA/QC unit audits the GM monitoring sites to the same standard as the national network and all published data undergoes a similar validation process. The results for the automatic sites are based on Ricardo Energy & Environment's spreadsheet supplemented: a copy of the spreadsheet is available at:

http://www.greatairmanchester.org.uk/TellMeMore/history.aspx Details of data management are provided in the QA/QC appendix.

Figure 2.1 and Table 2.1 list the Automatic monitoring sites and their locations for GM.

Figure 2.1 Map of Automatic Monitoring Sites

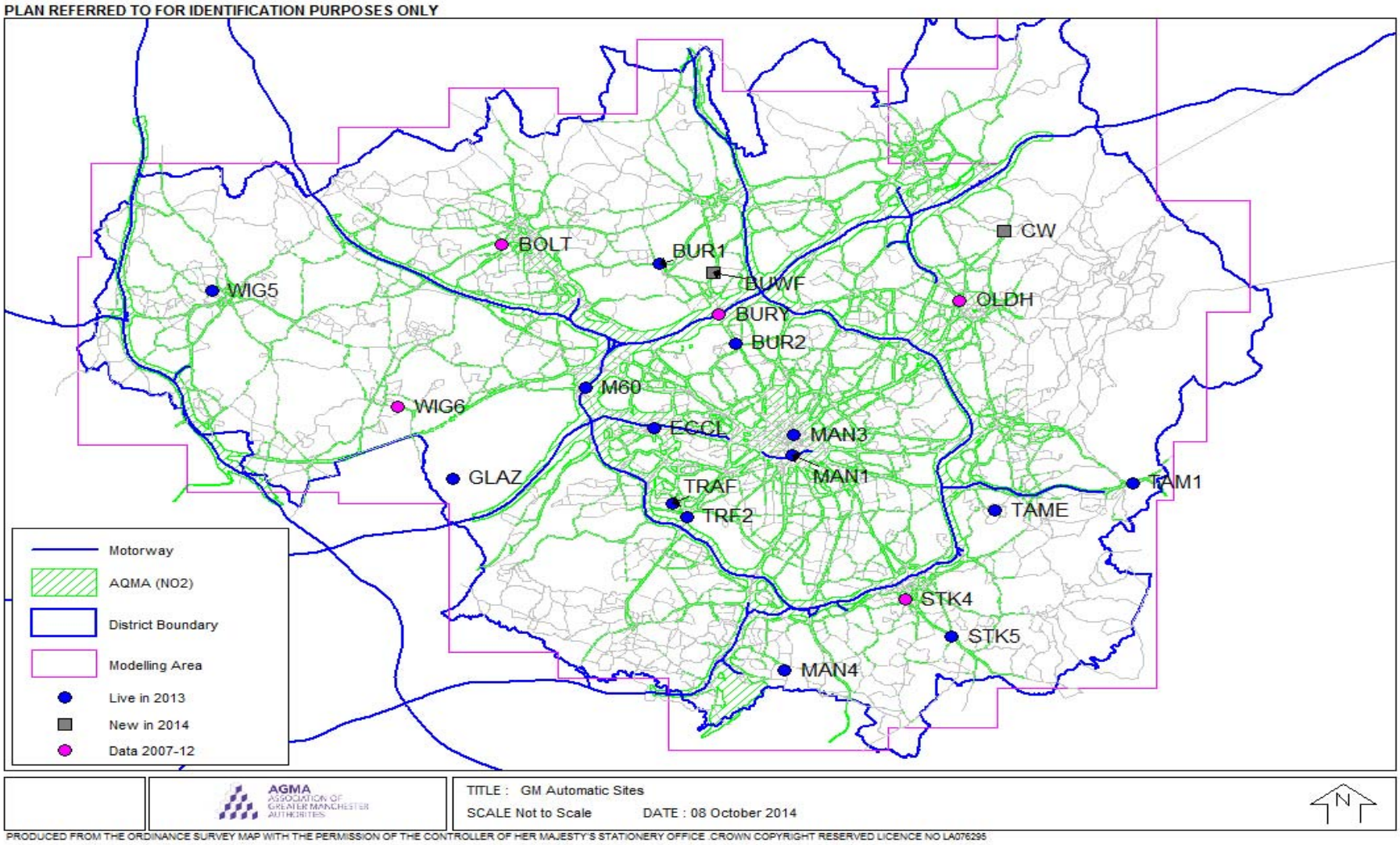


Table 2.1 Details of Automatic Monitoring Sites

LA	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA	Open	Closed
BO	Bolton College	Urban background	371000	408496	CO,NO_2, O_3, PM_{10}, SO_2	N	1998	2011
BU	Bury Roadside	Roadside	380906	404757	CO, NO_2, PM_{10}, $PM_{2.5}$	Y	1997	2012
BU	Bury Whitefield Roadside	Roadside	380637	406976	NO_2, $PM_{2.5}$, PM_{10}	Y	2015	
BU	Bury Prestwich	Roadside	381650	403222	NO_2, PM_{10}	Y	2002	
BU	Bury Radcliffe	Roadside	378190	407480	NO_2, PM_{10}	Y	2002	
SA	Glazebury Site	Rural	368759	396028	NO_2, O_3	N	2004	
MA	Manchester Piccadilly	Urban Centre	384310	398337	NO_2, O_3, $PM_{2.5}$, SO_2, PM_{10}	Y	1995	
MA	Manchester South	Suburban	383904	385818	NO_2, O_3, SO_2	N	1996	
SA	Salford Eccles	Urban Industrial	377926	398728	NO_2, O_3, PM_{10}, PM_{25}, SO_2	Y	1997	
WI	Wigan Centre	Urban Background	357815	406022	NO_2, O_3, $PM_{2.5}$, PM_{10}	N	2004	
MA	Manchester Oxford Road	Kerbside	384233	397287	NO_2, PM_{10}	Y	2010	
OL	Oldham West End House	Urban Centre	391860	405514	CO,NO_2, O_3, PM_{10}, SO_2	Y	1998	2011
OL	Oldham Crompton Way	Roadside	393887	409191	NO_2, PM_{10}	Y	2014	
SA	Salford M60	Roadside	374810	400855	NO_2, O_3, PM_{10}	Y	1999	
ST	Stockport Hazel Grove	Roadside	391481	387637	NO_2, PM_{10}	Y	2005	
ST	Stockport	Urban	389384	389605	NO_2, PM_{10}	Y	2002	2011

LA	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA	Open	Closed
	Shaw Health	Background						
Ta	Tameside Two Trees School	Urban Background	393454	394330	NO_2, O_3, PM_{10}	N	1998	
Ta	Tameside Mottram Mr	Roadside	399719	395804	NO_2, O_3, PM_{10}	Y	2013	
TR	Trafford Moss Park	Urban Background	378783	394726	NO_2, PM_{10}	N	1998	
TR	Trafford A56	Roadside	379413	394014	NO_2, PM_{10}	Y	2004	
WI	Wigan Leigh 2	Urban Background	366290	399861	NO_2, PM_{10}	N	2006	2012

2.1.2 Non-Automatic Monitoring Sites

Since 2011 the diffusion tube data have been processed as a single dataset using the bias adjustment factor for the laboratory that all of the GM authorities use for analysis of the tubes. Table 2.2 and 2.3 summarise the total NO_2 diffusion tube sites by local authority in GM and the benzene monitoring. Figure 2.2 shows the monitoring locations in GM for tubes reported in 2014.

Figure 2.2 Map of Non-Automatic Monitoring Sites

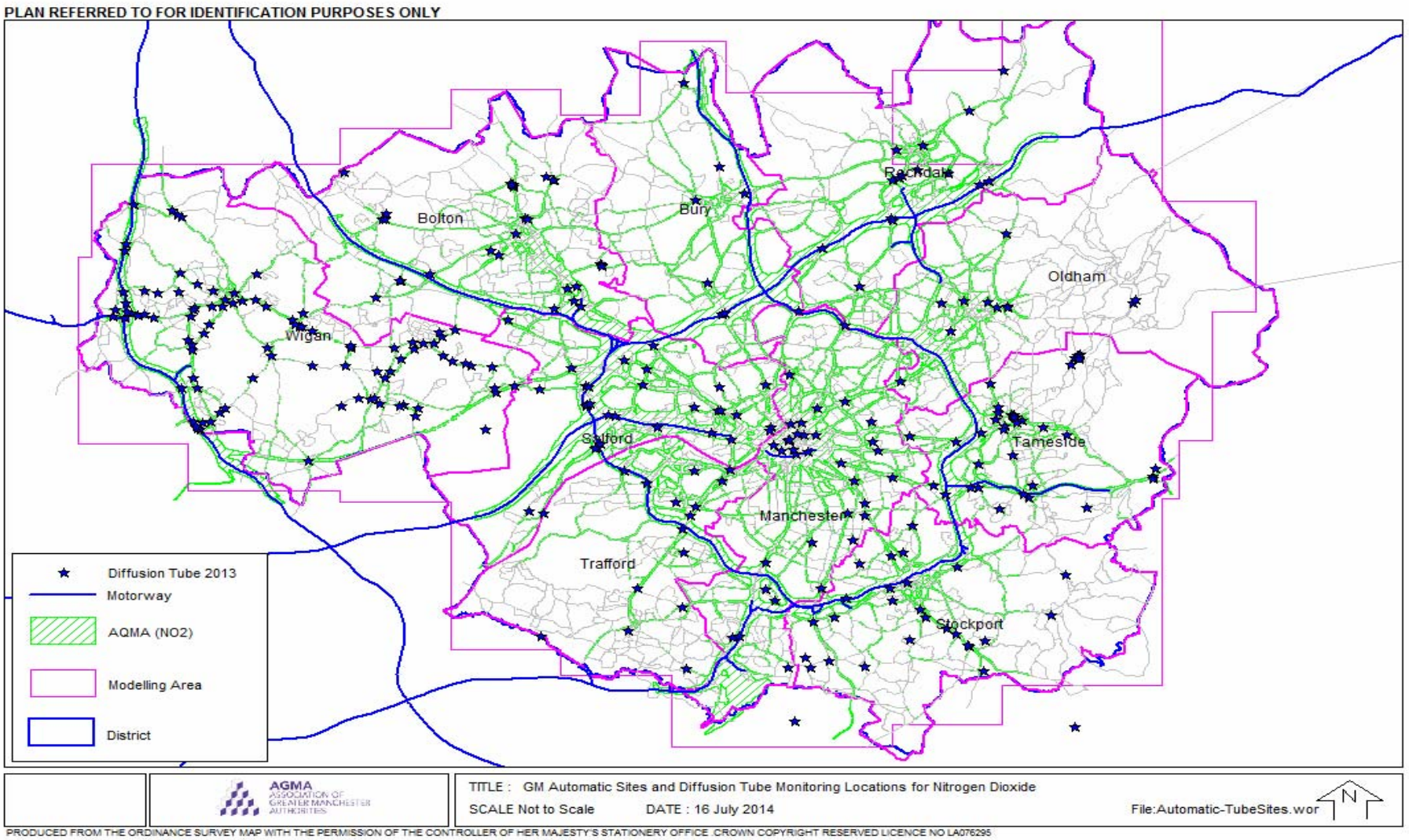


Table 2.2 Details of Non-Automatic Monitoring Sites

District	Totals
Bolton	21
Bury	10
Manchester	35
Oldham	8
Rochdale	13
Salford	51
Stockport	29
Tameside	29
Trafford	12
Wigan	22

Table 2.3 Summary of Non-Automatic other monitoring

Districts	Benzene	
	Number	Name
Bolton	*	-
Bury	1	Bury Roadside 2
Manchester	4	Manchester Piccadilly, Manchester Cheetham Hill Road, Manchester Princess Road, Manchester Princess Parade Service Station
Oldham	1	Middleton Road
Rochdale	0	-
Salford	0	-
Stockport	0	-
Tameside	0	-
Trafford	0	-
Wigan	0	-
*Benzene stopped being monitored in Dec 2013		

2.2 Comparison of Monitoring Results with Air Quality Objectives

The following sections provide information on the results and key statistics.

2.2.1 Nitrogen Dioxide

Two limit values for ambient NO_2 concentrations are set out in the Air Quality Directive (AQD). These have been specified for the protection of human health and came into force from 01/01/2010. These limit values are:

- An annual mean concentration of 40 µg/m^3.
- An hourly concentration of 200 µg/m^3, not to be exceeded more than 18 times a calendar year.

Automatic Monitoring Data

In 2014 the Greater Manchester Air Quality Network (GMAQN) operated 15 NO_2 chemiluminescence monitors. The annual mean NO_2 results are provided in Table 2.4 which details the results from 2010 to 2014 and Figure 2.3 shows the NO_2 trends during the period (2007-2014).

Data from the new monitoring station Bury Whitefield Roadside was not included in the analysis since the station only joined the AURN network in February 2015.

Figure 2.3 clearly shows that most of the site types have remained relatively stable over the period 2007 to 2014. However, four sites continue to present NO_2 annual means above the limit value as follows: air monitoring at the sites of Bury Prestwich (49 µg/m^3), Manchester Oxford Road (68 µg/m^3), Tameside Mottram (49 µg/m^3), and Salford M60 (60 µg/m^3).

At Manchester Piccadilly the average was exactly 40 µg/m^3, the annual mean air quality objective. Eleven sites in the suburban, urban background, urban centre and rural categories are below the air quality objective with concentration ranges from 14 to 32 µg/m^3.

The NO_2 hourly objective is exceeded if there are more than 18 periods above the 200 µg/m^3. In 2014 (see Table 2.5), no site exceeded the air quality objective: Manchester Piccadilly has registered 2 exceedences, Manchester Oxford Road 14, and the recent monitoring station at Tameside Mottram, 13.

Sites with less than preferable data capture (below 90%) present their number of exceedences to the limit value with the 99.8th percentile of hourly means in brackets.

Table 2.4 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 % [a]	Annual Mean Concentration μg/m^3				
					2010* [b]	2011* [b]	2012* [b]	2013* [b]	2014 [b]
BO	Bolton College	Urban background	N	-	28	29	-	-	-
BU	Bury Roadside	Roadside	Y	-	69	**71**	**57**	-	-
BU	Bury Prestwich	Roadside	Y	98	-	**46**	**48**	**45**	**49**
BU	Bury Radcliffe	Roadside	Y	97	-	30	28	26	29
SA	Glazebury Site	Rural	N	90	19	18	19	15	14
MA	Manchester Piccadilly	Urban Centre	Y	97	**45**	**44**	**41**	39	40
MA	Manchester South	Suburban	N	99	28	23	24	22	22
SA	Salford Eccles	Urban Industrial	Y	95	**42**	33	28	30	30
WI	Wigan Centre	Urban Background	N	98	26	23	24	25	22
MA	Manchester Oxford Road	Kerbside	Y	90	**64**	**66**	**62**	**55**	**68**
OL	Oldham West End House	Urban Centre	Y	-	33	31	-	-	-
OL	Oldham Crompton Way	Roadside	Y	69	-	-	-	-	32
SA	Salford M60	Roadside	Y	98	**60**	**64**	**62**	**61**	**60**
ST	Stockport Hazel Grove	Roadside	Y	98	36	24	29	30	27
ST	Stockport Shaw Health	Urban Background	Y	-	31	31	-	-	-
Ta	Tameside Two Trees School	Urban Background	N	98	24	21	19	17	16

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 % [a]	Annual Mean Concentration μg/m^3				
					2010* [b]	2011* [b]	2012* [b]	2013* [b]	2014 [b]
Ta	Tameside Mottram Moor	Roadside	Y	85	-	-	-	35	**49**
TR	Trafford	Urban Background	N	97	33	26	26	22	22
TR	Trafford A56	Roadside	Y	99	**46**	**41**	**49**	39	32
WI	Wigan Leigh 2	Urban Background	N	-	29	25	26	-	-

[a] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[b] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
*Annual mean concentrations for previous years are optional.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measures at Automatic Monitoring Sites

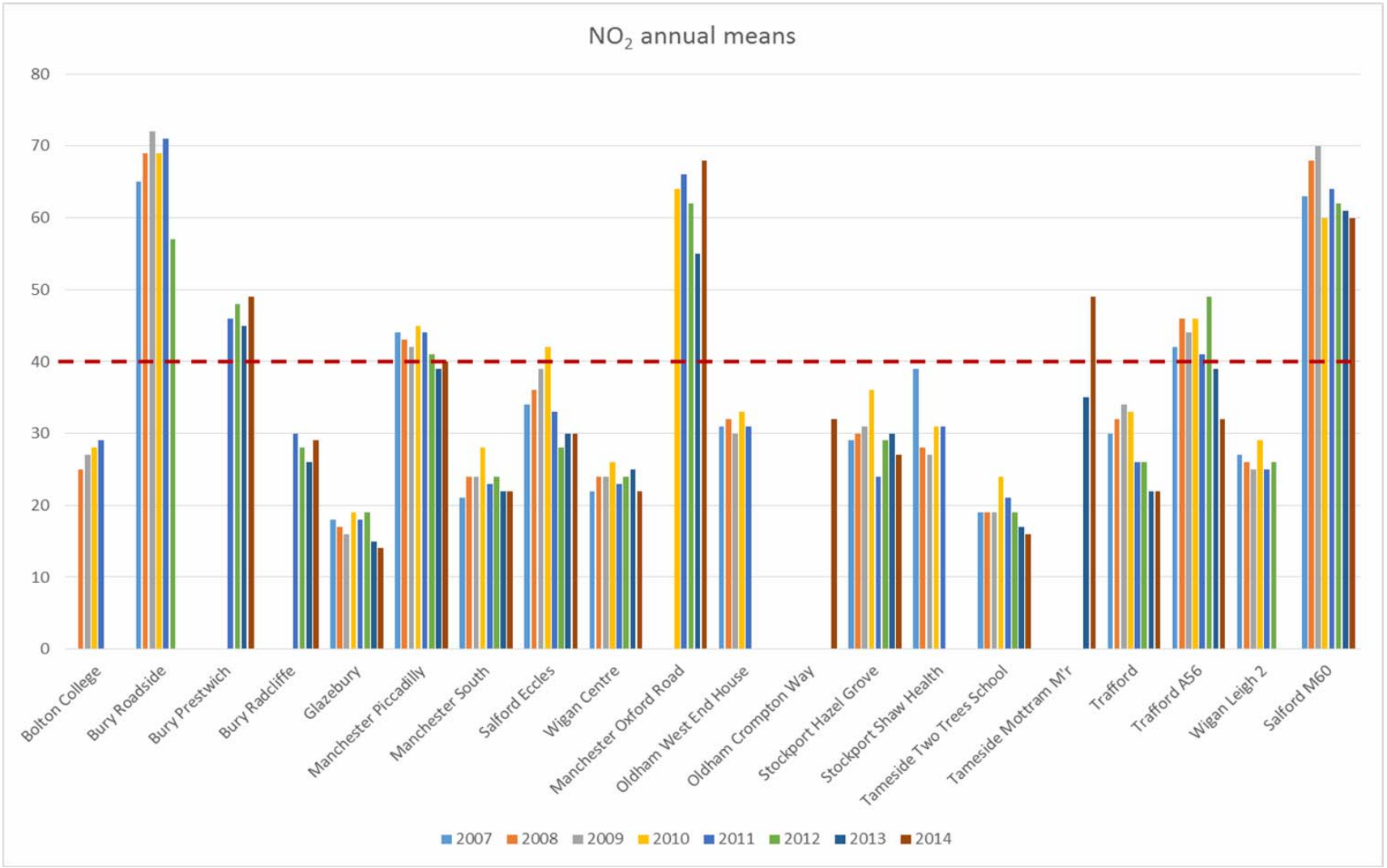


Table 2.5 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 % [a]	Number of Exceedences of Hourly Mean (200 μg/m^3)				
					2010* [b]	2011* [b]	2012* [b]	2013* [b]	2014 [b]
BO	Bolton College	Urban background	N	-	0	-	-	-	-
BU	Bury Roadside	Roadside	Y	-	23	7(189)	10(199)	-	-
BU	Bury Prestwich	Roadside	Y	98	-	-	0(151)	0(126)	0
BU	Bury Radcliffe	Roadside	Y	97	-	-	0(131)	0(114)	0
SA	Glazebury	Rural	N	90	0	0(84)	0(71)	0	0
MA	Manchester Piccadilly	Urban Centre	Y	97	0	0(109)	0(101)	0(97)	2
MA	Manchester South	Suburban	N	99	7	0(101)	0(109)	0(95)	0
SA	Salford Eccles	Urban Industrial	Y	95	15	0(136)	2(151)	0(123)	0
WI	Wigan Centre	Urban Background	N	98	0	0(82)	0(97)	0(86)	0
MA	Manchester Oxford Road	Kerbside	Y	90	2	5(166)	13(181)	0(138)	14
OL	Oldham West End House	Urban Centre	Y	-	0	0(99)	-	-	-
OL	Oldham Crompton Way	Roadside	Y	69	-	-	-	-	0 (301)
SA	Salford M60	Roadside	Y	98	13	13(195)	8(191)	4(187)	0
ST	Stockport Hazel Grove36	Roadside	Y	98	4	0(195)	0(111)	0(109)	0
ST	Stockport Shaw Heath	Urban Background	Y	-	5	-	-	-	-
Ta	Tameside Two Trees School	Urban Background	N	98	0	0(103)	0(78)	0(80)	0

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 % [a]	Number of Exceedences of Hourly Mean (200 μg/m^3)				
					2010* [b]	2011* [b]	2012* [b]	2013* [b]	2014 [b]
Ta	Tameside Mottram M'r	Roadside	Y	85	-	-	-	0(141)	13(199)
TR	Trafford	Urban Background	N	97	18	0(113)	0(117)	0(86)	0
TR	Trafford A56	Roadside	Y	99	12	0(132)	14(195)	7	0
WI	Wigan Leigh 2	Urban Background	N	-	0	0(88)	0(113)	-	-

[a] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[b] If the period of valid data is less than 90%, include the 99.8th percentile of hourly means in brackets
*Number of exceedences for previous years are optional.

Diffusion Tube Monitoring Data

A summary of the diffusion tube results from 2007 to 2014, by local authority, is presented in Table 2.6 and Figure 2.4.

Diffusion tube monitoring is affected by several factors and the NO_2 concentrations are adjusted by comparing results from collocated tubes to a reference using a NO_2 continuous analyser. A bias factor is calculated using a spreadsheet provided by Ricardo Energy & Environment. Bias factors are collated in a national database enabling a large number of factors at a range of different site locations using the same laboratory and analysis method (http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html). There is a choice of using a locally derived bias factor based on local data or using the national dataset. For 2014 the national bias factor was selected as it is based on a larger number of studies. National and locally derived factors are compared below:

National Factor
2014: 0.83 (from national database 15 studies, Version: 09/15)

Greater Manchester (local factor)
2014: 0.85 (from national database 9 studies, Version 09/15)

The national factor was preferred as more studies are used and it was also used in 2013. Table 2.7 presents a resume of the bias factors used since 2007. See Appendices for details of the bias factor.

As it can be observed, Bolton, Stockport and Wigan showed NO_2 annual mean reductions of 1-2 µg/m^3 for 2014, in comparison with the calculated annual means in 2013. Manchester, Rochdale, Salford, Tameside and Trafford saw their annual means increased by 1 µg/m^3. These results show a general stabilised trend over the last few years in the area and, in many districts, concentrations have fallen significantly compared to the higher values seen in 2010.

The only local authorities that have experienced a larger increase of their annual means for NO_2 diffusion data were Oldham and Bury. Oldham had an increase of 19% from an annual mean concentration of 27 µg/m^3 in 2013 to 33 µg/m^3, however this was due to an increase in the number of roadside monitoring locations, which affected the overall annual mean during 2014. Bury had an increase of 12%; this was a change from an annual mean of 37 µg/m^3 in 2013 to 42 µg/m^3 in 2014, for this reason it was the only local authority presenting an annual mean concentration above the annual mean limit value for NO_2 in 2014, however Bury also has a higher proportion of roadside diffusion tube sites. This value is slightly higher from the NO_2 average of the two existing automatic monitoring sites in Bury – Prestwich and Radcliffe (39 µg/m^3), which are also roadside.

Figure 2.5 shows the comparison between the NO_2 annual averages obtained with automatic sampling and passive sampling (diffusion tubes corrected with the bias adjustment factor) for all the local authorities; where comparison was possible. The results show that there is generally good agreement between the two methodologies for all the local authorities. Wigan is the only local authority that presents the biggest difference between automatic monitoring and passive sampling, which is due to the fact that there's only one automatic monitoring station currently in activity, and is catalogued as Urban Background (UB), making the average less representative of Wigan's overall air quality. The average of the four UB tubes is 22.5 µg/m^3, which more closely aligns with Wigan's automatic data.

Measurements from the GM network of diffusion tubes in 2011 showed that over 30% of tubes located within the AQMA had results under 35 µg/m^3. Of the 251 tubes located within the AQMA during 2013, 86 tubes (34%) were less than 35 µg/m^3. A significant number of tubes, whilst in agreement with the model, are therefore located within the AQMA with concentrations less than 40 µg/m^3.

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2014) by Local Authority

(*Average (min–max) Unit: μg/m^3*)

Row Labels	2007	2008	2009	2010	2011	2012	2013	2014
Bolton	31 (18-45)	30 (16-53)	33 (17-52)	31 (17-49)	33 (19-49)	32 (16-45)	31 (16-40)	29 (16-47)
Bury		44 (29-69)	46 (32-71)	50 (33-82)	41 (31-64)	39 (27-59)	37 (26-58)	42 (27-57)
Manchester	51 (22-81)	45 (15-79)	42 (17-71)	46 (19-72)	41 (17-68)	40 (15-66)	37 (14-61)	38 (13-63)
Oldham	38 (20-72)	39 (21-85)	47 (29-66)	33 (21-50)	32 (25-45)	32 (23-39)	27 (18-33)	33 (15-53)
Rochdale		36 (18-54)	34 (11-52)	35 (15-55)	36 (16-56)	35 (19-50)	32 (18-49)	33 (14-46)
Salford	37 (25-58)	40 (25-68)	42 (27-71)	42 (32-64)	36 (22-57)	34 (24-51)	33 (21-50)	34 (20-49)
Stockport	30 (9-60)	27 (8-55)	28 (9-63)	32 (11-66)	30 (10-56)	31 (9-61)	28 (10-51)	27 (8-52)
Tameside	34 (15-66)	37 (17-75)	35 (16-73)	34 (18-60)	36 (17-72)	33 (16-59)	31 (11-68)	32 (15-65)
Trafford	34 (21-45)	34 (20-45)	31 (17-39)	37 (23-46)	26 (17-33)	31 (20-46)	28 (17-39)	29 (19-38)
Wigan	40 (26-57)	41 (26-65)	33 (16-52)	38 (25-57)	37 (25-73)	35 (25-51)	32 (21-43)	31 (18-35)
Average	**33 (9-81)**	**37 (8-85)**	**37 (9-73)**	**38 (11-82)**	**35 (10-73)**	**34 (9-66)**	**32 (10-68)**	**33 (8-65)**

Table 2.7 Bias Factors used by GM (2007 - 2014)

Unit: µg/m^3

Site Type	2007	2008	2009*	2010	2011	2012	2013	2014
Bolton	-	0.83	0.81	0.85	0.883	0.86	0.87	0.834
Bury	-	0.87	0.93	0.99	0.883	0.86	0.87	0.834
Manchester	0.9	0.83	0.79	0.93	0.883	0.86	0.87	0.834
Oldham	0.9	0.83	NA	0.85	0.883	0.86	0.87	0.834
Rochdale	-	-	-	-	0.883	0.86	0.87	0.834
Salford	0.89	0.95	0.97	0.98	0.883	0.86	0.87	0.834
Stockport	0.9	0.7	0.745	0.85	0.883	0.86	0.87	0.834
Tameside	0.776	0.806	0.768	0.782	0.883	0.86	0.87	0.834
Trafford	0.9	0.83	0.9	0.85	0.883	0.86	0.87	0.834
Wigan	0.9	0.94	0.76	0.886	0.883	0.86	0.87	0.834
GM Average Factor	**0.881**	**0.845**	**0.835**	**0.884**	**0.883**	0.86	0.87	0.834

*NO_2 diffusion tubes used by the GM districts up to July 2009 were provided by Bureau Veritas, exposed monthly and are based on 10% TEA (triethanolamine) in water; from August onwards Staffordshire Scientific provided the service using a 20% TEA in water method.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites

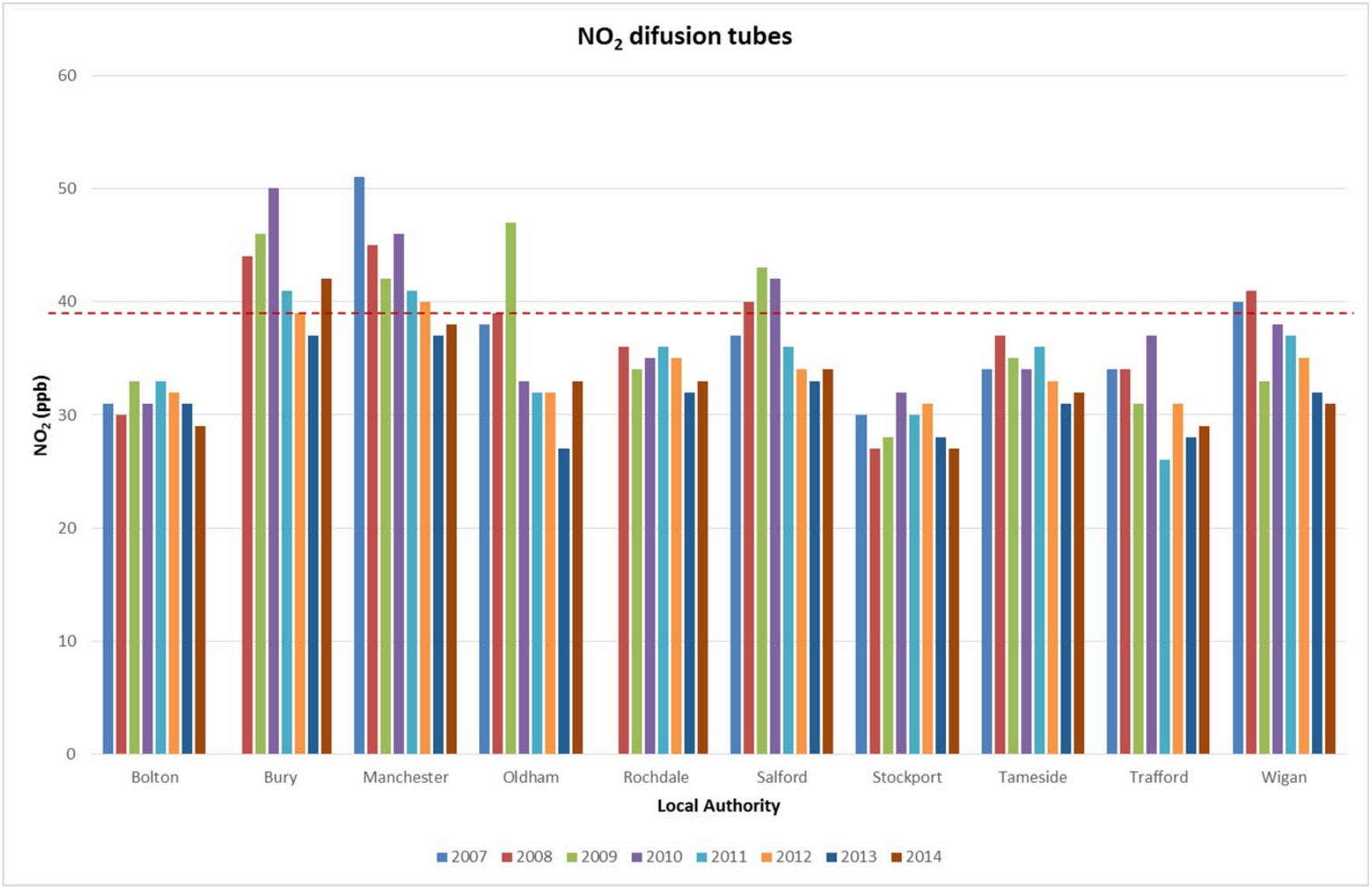
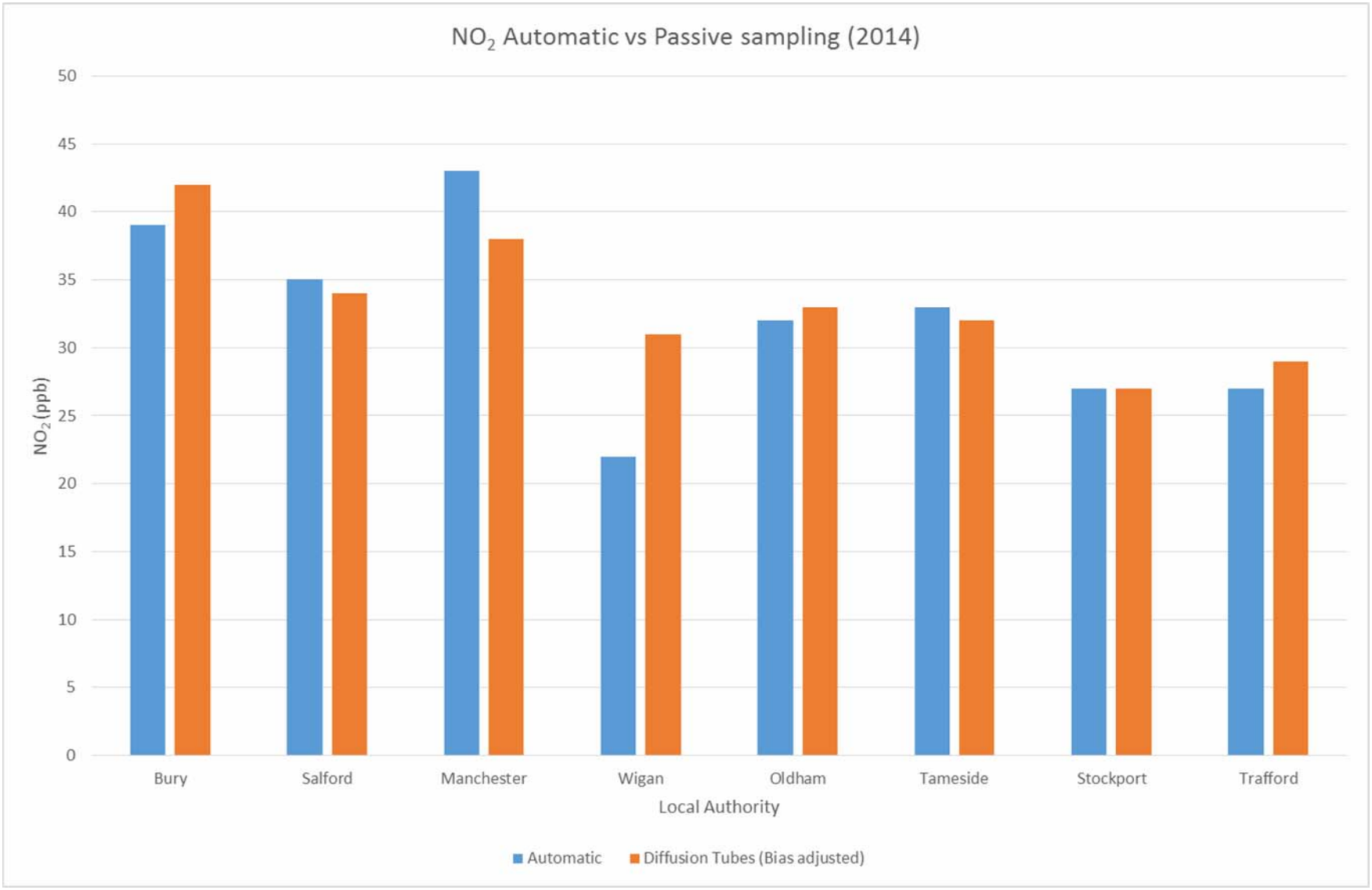


Figure 2.5 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites



2.2.2 PM_{10}

Two limit values for ambient PM_{10} concentrations are set out in the Air Quality Directive (AQD). These have been specified for the protection of human health and were to be achieved by 2005. These limit values are:

- An annual mean concentration of 40 $\mu g/m^3$
- A 24 hour mean concentration of 50 $\mu g/m^3$, not to be exceeded more than 35 times a year.

The annual mean air quality objective for PM_{10} has not been exceeded at any of the GM stations since monitoring commenced in 1995, at the first station in Manchester Piccadilly. However medical evidence links higher PM_{10} concentrations with increased hospital admission and other respiratory illness, therefore reducing exposure with lower ambient concentrations is beneficial to securing a healthier environment. PM_{10} data is reported in gravimetric units, by applying a factor of 1.3 to Tapered Element Oscillating Microbalance (TEOM) data. Manchester Oxford Road, Manchester Piccadilly and Oldham Crompton Way PM_{10} analysers are BAM 1020 with unheated inlets, so the data has been corrected to a gravimetric factor of 0.8333. Filter Dynamics Measurement System (FDMS) data does not require correction.

In GM and the UK the predominant method of measurement is the TEOM which does not meet the EU reference method for particulate measurement. A model developed by Kings College London (KCL) and approved by Defra is available to convert TEOM data to meet the standard. Details of this methodology can be found in Appendix A - QA/QC data.

Table 2.8 shows the annual mean PM_{10} by site type in GM. Tables 2.9 and 2.10 compare the results of PM_{10} monitoring data with the annual and 24 hour mean objectives. Figures 2.6 and 2.7 show PM_{10} trends by site and site type, since 2007.

Table 2.8 Summary of Automatic Monitoring of PM_{10} by site type – Comparison with Annual Mean Objective (µg/m^3)

Sites	2007	2008	2009	2010	2011	2012	2013	2014
RO	27	26	24	26	25	23	24	22
UB	21	20	18	18	18	17	17	17
UC	23	21	20	20	20	21	22	20
Average	**23**	**22**	**20**	**22**	**21**	**20**	**21**	**20**
UB: Urban Background; RO: Roadside; UC Urban Centre								

As can be observed, the annual mean of most of the site types have remained relatively stable over the period 2007 to 2014. In 2014 the average PM_{10} concentration was 20 µg/m^3, marginally lower than 2013 (21 µg/m^3).

The highest concentrations are experienced at roadside locations with the station at Oxford Road in Manchester measuring an annual mean of 28 µg/m^3, which also has the highest number of daily exceedences (18) in 2014. Oxford Road is widely credited with the title of "the busiest bus route in Europe" and is heavily congested during peak hours. The average roadside concentration is 22 µg/m^3, a gradual reduction since 2007.

The Urban background particulate pollution mean concentration in 2014 was 17 µg/m^3. Urban Centre Sites in 2014 were 20 µg/m^3.

Table 2.9 Results of Automatic Monitoring of PM_{10}: Comparison with 40 μg/m^3 Annual Mean Objective

Local Authority	Site ID	Site Type	Method	Within AQMA?	Valid Data Capture 2014 %[a]	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration μg/m^3				
							2010*[b]	2011*[b]	2012*[b]	2013*[b]	2014[b]
BO	Bolton College	Urban background	TEOM	N	-	Y	17	15	-	-	-
BU	Bury Roadside	Roadside	FDMS	Y	-			23	23	-	-
BU	Bury Prestwich	Roadside	TEOM	Y	98	Y		25	23	23	23
BU	Bury Radcliffe	Roadside	TEOM	Y	91	Y		22	20	23	22
MA	Manchester Piccadilly	Urban Centre	BAM	Y	96	Y	21	22	21	22	20
SA	Salford Eccles	Urban Industrial	FDMS	Y	97		19	18	15	19	18
WI	Wigan Centre	Urban Background	TEOM	N	89	Y	18	19	18	19	18
MA	Manchester Oxford Road	Kerbside	BAM	Y	98	Y	31	32	30	31	28
OL	Oldham West End House	Urban Centre	TEOM	Y	-	Y	19	22	-	-	-
OL	Oldham Crompton Way	Roadside	BAM	Y	81	Y	-	-	-	-	17
SA	Salford M60	Roadside	TEOM	Y	86	Y	24	25	23	26	24
ST	Stockport Hazel Grove	Roadside	TEOM	Y	98	Y	23	22	21	23	22
ST	Stockport Shaw Health	Urban Background	TEOM	Y	-	Y	18	18	-	-	-

Local Authority	Site ID	Site Type	Method	Within AQMA?	Valid Data Capture 2014 %[a]	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration μg/m^3				
							2010*[b]	2011*[b]	2012*[b]	2013*[b]	2014[b]
Ta	Tameside Two Trees School	Urban Background	TEOM	N	94	Y	16	17	14	18	17
Ta	Tameside Mottram M'r	Roadside	TEOM	Y	82	Y	-	-	-	-	23
TR	Trafford	Urban Background	TEOM	N	95	Y	17	18	17	15	17
TR	Trafford A56	Roadside	TEOM	Y	95	Y	21	22	19	20	20
WI	Wigan Leigh 2	Urban Background	TEOM	N	-	Y	17	19	17	-	-

[a] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[b] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
* Optional

Table 2.10 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour mean Objective

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 %[a]	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 μg/m^3)				
						2010*[b]	2011*[b]	2012*[b]	2013*[b]	2014[b]
BO	Bolton College	Urban background	N	-	Y	0	0	-	-	-
BU	Bury Roadside	Roadside	Y	-		2	14	14	-	-
BU	Bury Prestwich	Roadside	Y	98	Y	-	19	14	8	4
BU	Bury Radcliffe	Roadside	Y	91	Y	-	15	11	9	4
MA	Manchester Piccadilly	Urban Centre	Y	96	Y	1	8	11	7	5
SA	Salford Eccles	Urban Industrial	Y	97		3	13	6	6	6
WI	Wigan Centre	Urban Background	N	89	Y	2	3	3	1	1(26)
MA	Manchester Oxford Road	Kerbside	Y	98	Y	17	33	28	21	18
OL	Oldham West End House	Urban Centre	Y	-	Y	1	0	-	-	-
OL	Oldham Crompton Way	Roadside	Y	81	Y					5(28)
SA	Salford M60	Roadside	Y	86	Y	8	12	16	19	4(35)
ST	Stockport Hazel Grove	Roadside	Y	98	Y	15	23	20	12	11
ST	Stockport Shaw Health	Urban Background	Y	-	Y	0	0	-	-	-
Ta	Tameside Two Trees School	Urban Background	N	94	Y	0	2	1	3	0

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 %[a]	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 μg/m^3)				
						2010*[b]	2011*[b]	2012*[b]	2013*[b]	2014[b]
Ta	Tameside Mottram M'r	Roadside	Y	82	Y	-	-	-	0	3
TR	Trafford	Urban Background	N	95	Y	3	2	2	0	1
TR	Trafford A56	Roadside	Y	95	Y	3	6	3	1	3
WI	Wigan Leigh 2	Urban Background	N	-	Y	2	4	0	-	-

[a] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[b] if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets
* Optional

Figure 2.6 Trends in Annual Mean PM_{10} Concentrations

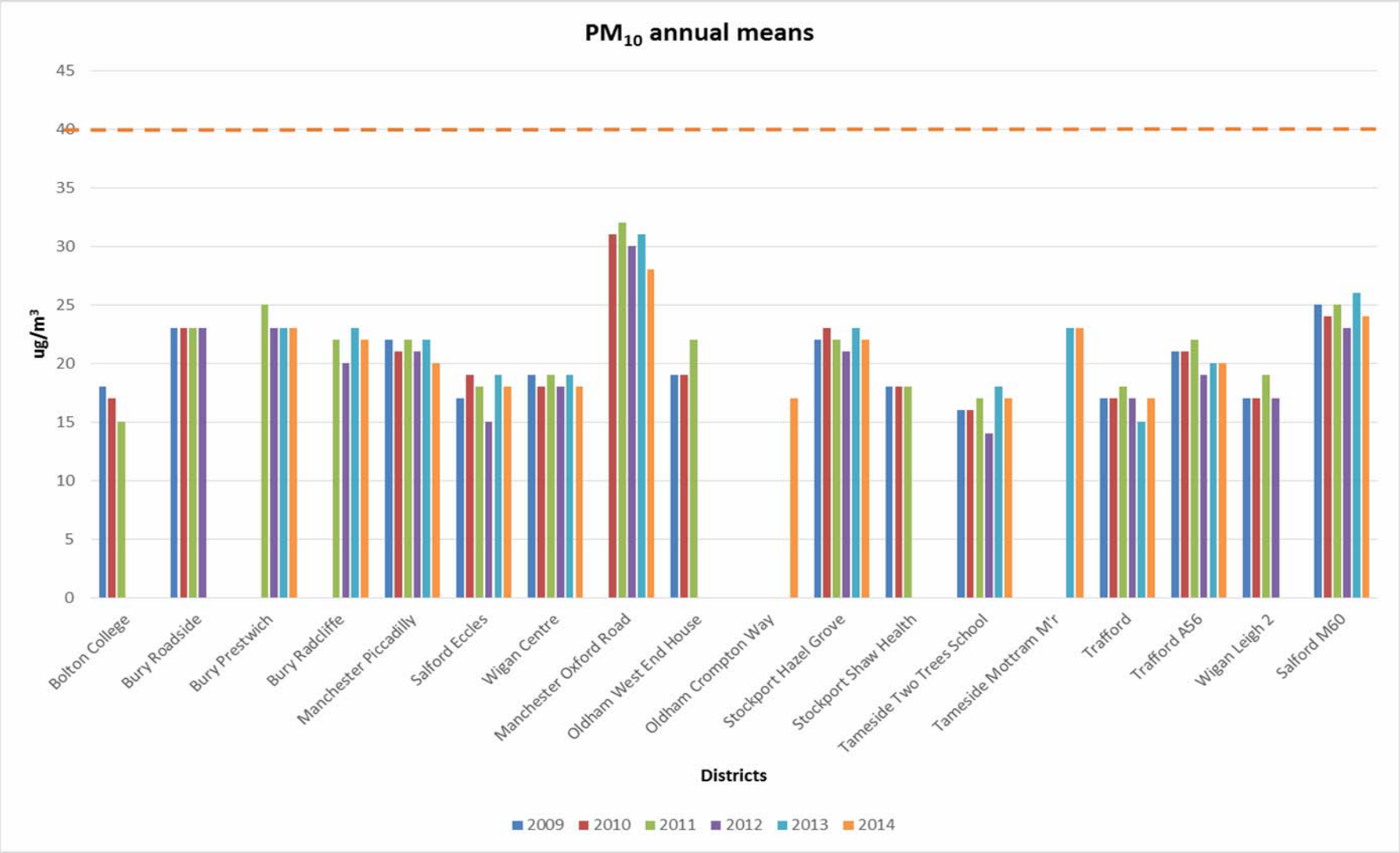
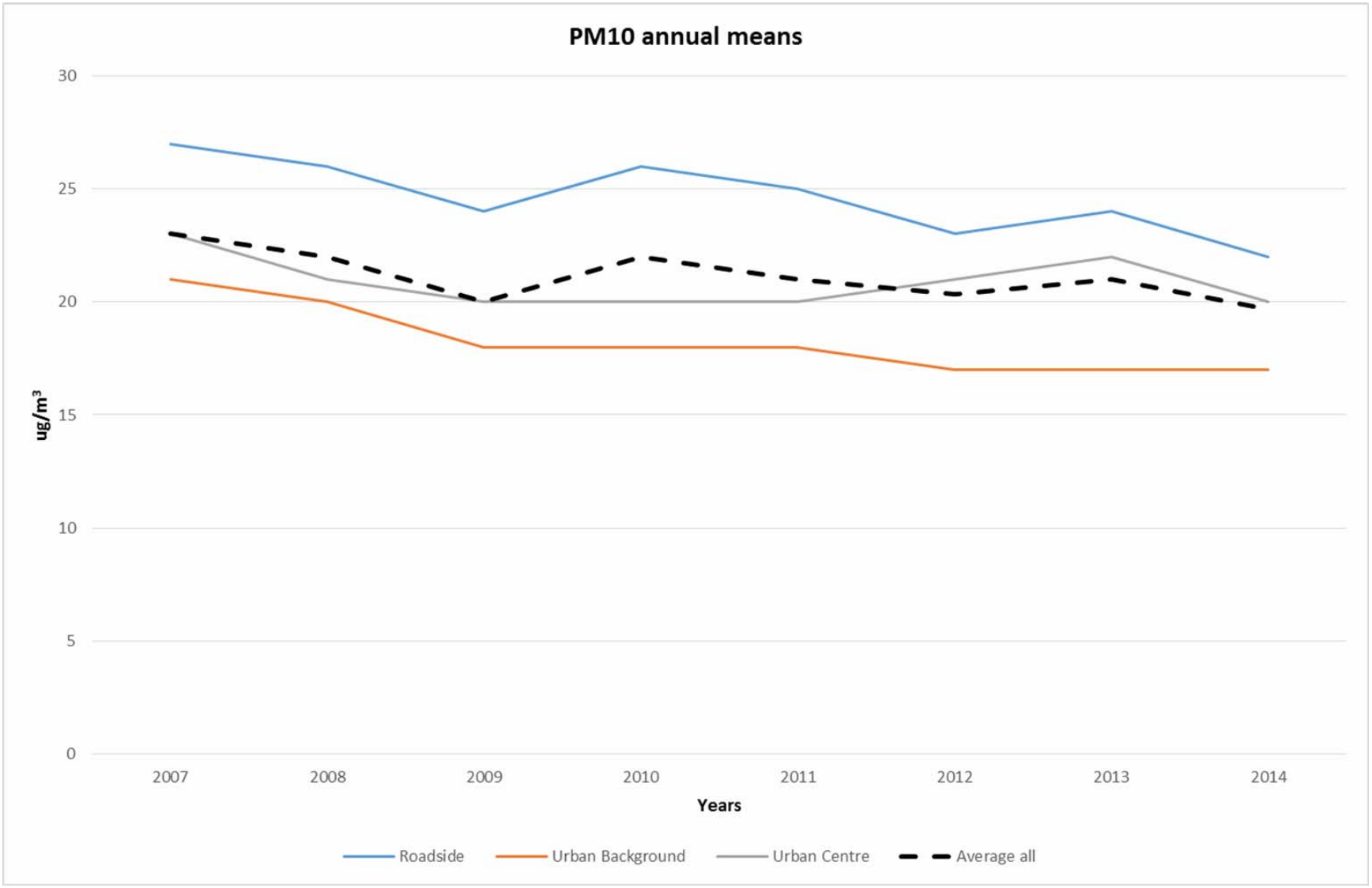


Figure 2.7 Trends in Annual Mean PM_{10} Concentrations (by Site type)



2.2.3 Sulphur Dioxide

The main source of sulphur dioxide (SO_2) emissions is from combustion in energy production and transformation (52% in 2013), followed by combustion in manufacturing industries (28% in 2013) (Defra, 2014).

In 2014, SO_2 was measured in GM in two monitoring stations: Manchester Piccadilly and Manchester South, since Trafford ceased monitoring SO_2 in 2013 and Salford Eccles in the end of 2012.

In 2014, both stations recorded an annual mean of 2 µg/m^3 for this pollutant, and there were no exceedences of the three UK air quality objectives: annual mean, 15 minute not to exceed 266 µg/m^3 and one daily not to exceed 125 µg/m^3. Table 2.11 shows the results.

Table 2.11 Results of Automatic Monitoring of SO_2: Comparison with Annual Mean Objectives

Local Authority	Site ID	Site Type	Within AQMA?	Valid Data Capture 2014 %[b]	Annual Mean 2014	Number of Exceedences (percentile in bracket μg/m³)[c]		
						15-minute Objective (266 μg/m³)	1-hour Objective (350 μg/m³)	24-hour Objective (125 μg/m³)
MA	Manchester Piccadilly	Urban Centre	Y	76	**2**	0(18)	0(10)	0
MA	Manchester South	Suburban	N	99	**2**	0	0	0

[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[c] if data capture is less than 90%, include the relevant percentile in brackets

2.2.4 Benzene

Benzene is a hydrocarbon of greatest concern, as it is a known human carcinogen. The major source of benzene in ambient air is the evaporation and combustion of petroleum-based fuels, therefore elevated levels may be expected at roadside locations. Background concentrations are less than 0.5 μg/m^3 over much of the UK with slightly higher concentrations in urban areas.

A European limit value has been set of 5 μg/m^3 as an annual mean. Below this value the risk of health effects is very small.

During 2014, benzene was measured in four sites in Manchester (Piccadilly, Cheetham Hill Road, Princess Road and Princess Parade Service Station), one site in Bury (Bury Roadside 2) and one site in Oldham (Middleton Road).

All the Manchester sites have registered a decrease on annual mean benzene concentrations in 2014. The smallest decrease was observed in Cheetham Hill Road, with a 12% benzene reduction. The highest decrease was at Princess Parade Service Station, where the concentration in 2014 was half the value registered in 2013 (4.01 to 2.04 μg/m^3).

The station at Bury Roadside 2 started measurements in 2014 and registered an annual mean value of 0.77 μg/m^3 for benzene, a value similar to that which was measured in Piccadilly, and to that which had been measured in 2011 and 2012 at the old Bury roadside site.

The only monitoring station where benzene annual mean increased in 2014 was Middleton Road. The annual mean calculated for 2013 in this station was 0.66 μg/m^3, and the one for 2014 was 0.79 μg/m^3 (17% increase).

None of the running annual mean concentrations are greater than 5 μg/m^3.

Results from the last 6 years for the network of benzene diffusion tubes across the region are shown in Table 2.12.

Table 2.12 Results of Benzene Diffusion Tube Monitoring: Comparison with Annual Objectives

Site	Site type	AQMS	Annual mean benzene concentrations (μg/m^3) Adjusted for bias *Data capture for the year is included in brackets*					
			2009	2010	2011	2012	2013	2014
Manchester Piccadilly	Urban Centre	Y	0.86 (100%)	0.89 (100%)	0.69 (100%)	0.73 (95%)	0.85 (100%)	0.75 (100%)
Manchester Cheetham Hill Road	Kerbside	Y	1.07 (100%)	1.14 (92%)	0.94 (100%)	0.83 (100%)	1.06 (100%)	0.92 (100%)
Manchester Princess Road	Roadside	Y	0.96 (100%)	1.10 (92%)	0.55 (92%)	0.82 (100%)	1.12 (100%)	0.82 (100%)
Manchester Princess Parade Service Station	Urban Industrial/ Roadside	Y	8.34 (100%)	6.63 (92%)	5.43 (92%)	2.66 (100%)	4.01 (100%)	2.04 (92%)
Bury (AURN)	Roadside	Y	-	-	0.78 (100%)	0.72 (100%)	0.84 (63%)	-
Bury Roadside 2	Roadside	Y	-	-	-	-	-	0.77 (48%)
Middleton Road	-	-	-	-	-	0.70 (100%)	0.66 (83%)	0.79 (75%)
A627 Roundabout	-	-	-	-	-	0.37 (92%)	0.69 (75%)	-
Norfolk Street	-	-	-	-	-	0.50 (83%)	1.10 (100%)	-
Terrace Street	-	-	-	-	-	0.47 (100%)	0.75 (75%)	-

2.2.5 Other pollutants monitored

In 2013, Carbon monoxide (CO) was still being monitored at Salford M60 and Salford Eccles. Those instruments were removed in 2014, so at the time, no CO measurements are being taken in the GM network.

Ozone is being measured at five monitoring stations part of the GM network. The UK Air Quality Strategy (Defra, 2007) confirmed an ozone air quality objective, which applied from the end of 2005, of 100 µg/m^3, measured as the daily maximum of a running 8-hour mean ozone concentration, not to be exceeded more than 10 times a year. The standard applies to the UK and is not the responsibility of local authorities so is reported for information only.

In 2014, there were ozone exceedences in Glazebury, Manchester South and Wigan Centre, results are given in table 2.13

Table 2.13 Ozone Results for GM network (2014)

Site	Site type	Number of days moderate	8h daily max running avg (µg/m^3)	Data capture (%)
Glazebury	Rural	5	110	99
Manchester South	Suburban	3	115	95
Wigan Centre	Urban Background	8	114	97
Manchester Piccadilly	Urban Centre	0	89	99
Salford Eccles	Urban Industrial	0	77	41*
* O_3 stopped being measured in Salford Eccles in 2014 and was transferred to Salford M60 in 2015				

The results of the air quality measurements for $PM_{2.5}$ for three sites in GM are summarised in Table 2.14. PM2.5 is monitored using FDMS. No corrections are required. All results are within the Stage 2 limit value (20 µg/m^3 to be achieved by 1st Jan 2020).

Table 2.14 Results of automatic monitoring for PM2.5: Annual mean result

Sites	Method	DC(%)	2008	2009	2010	2011	2012	2013	2014
Manchester Piccadilly	FDMS	96	-	12	18	14	14	12	12
Salford Eccles	FDMS	95	**20**	14	15	16	13	15	15
Wigan Centre	FDMS	80	-	14	**20**	-	9	13	14

2.2.6 Summary of Compliance with Air Quality Strategy Objectives

The automatic sites of Great Manchester show good correlation with the air quality management area (AQMA).

Stockport Hazel Grove site, records the lowest concentration in the AQMA with an annual mean of 27 µg/m^3, however the other sites are consistent with the AQMA boundary.

The NO_2 annual mean exceed the UK air quality objective of 40 µg/m^3 in 4 stations in 2014: Bury Prestwich, Manchester Oxford Road, Salford M60 and Tameside Mottram. All these sites are roadside locations in GM and in built areas with a high density of roads. Away from busy roads (urban, suburban and rural), annual mean NO_2 concentrations are much lower.

The results from NO_2 non automatic monitoring show good correlation with automatic monitoring. The results also show that Bury is the only local authority that presents an annual mean NO_2 average above the limit value (42 µg/m^3). The other GM local authorities show similar NO_2 annual mean values to the ones obtained in 2013.

PM_{10}, $PM_{2.5}$, SO_2 and Benzene measured levels in the GM area for 2014 are all significantly below their limit value objectives.

Table 2.15 and the box below summarise GM's outcomes against the Air Quality Strategy (AQS) Objectives.

Table 2.15 Summary of Compliance with AQS Objectives

Pollutant	General	Exceedences identified?	Detailed Assessment Required	Objective	Description of Area
NO_2	Monitoring outside AQMA	No	No	Annual Mean and 24h mean	No detailed assessment required
	Monitoring inside AQMA	Yes	Yes	Annual Mean	Tameside Mothram M'r, Bury Prestwich, Man Oxford road, Salford M60
PM_{10}	New monitoring outside AQMA	No	No	Annual Mean and 24h mean	No detailed assessment required
	New monitoring inside AQMA	No	No	Annual Mean and 24h mean	No detailed assessment required
SO_2, $PM_{2.5}$,Benzene	Monitoring outside AQMA	No	No	Annual Mean ($PM_{2.5}$, Benzene), 1 hour mean, 24h mean and 15 min mean (SO_2)	No detailed assessment required
	Monitoring inside AQMA	No	No	Annual Mean ($PM_{2.5}$, Benzene), 1 hour mean, 24h mean and 15 min mean (SO_2)	No detailed assessment required

O_3	Monitoring outside AQMA	No	No	8 hour mean	No detailed assessment required
O_3	Monitoring inside AQMA	Yes	Yes	8 hour mean	Glazebury, Man South, Wigan Centre

3 Road Traffic Sources

The previous update and screening assessment identified that a detailed assessment would be carried out. Detailed dispersion modelling had taken place in 2002, since then there had been significant improvements to EMIGMA, and the last USA identified a number of road links that had not previously been assessed. In addition it was identified that monitoring at many background sites within the AQMA were well below the annual mean air quality objective for nitrogen dioxide.

Detailed dispersion modelling[2] has now been undertaken. In relation to road sources 9584 road links were modelled across GM. All major roads in the conurbation were modelled as discrete line sources. As the conurbation is large in geographic area it was split into 49 modelling areas, the majority of which were 5km^2 in size. Pollutant concentrations were calculated using a receptor grid with a grid spacing of 50m x 50m. Close to roads intelligent gridding was used to increase the number of receptors to improve the resolution where the gradient of concentrations may change significantly over a short distance.

Road traffic emissions data was based on the 2010 EMIGMA update[3]. This made use of traffic speed and flow data from the 2010 GM SATURN model. Road source emissions were forecast for 2016[4] and pollutant concentrations were calculated across the conurbation for 2010 and 2016.

As a result of the detailed air quality assessment the GM authorities are considering amending the AQMA.

Work has been undertaken by TfGM to identify any new roads or roads where there have been significantly changed traffic flows and were not listed in the last updating and screening assessment. The detailed assessment considered all roads in GM, and included forecast flows for 2016. Although the roads set out in this report had not been identified in the previous updating and screening assessment, and therefore

[2] Detailed Air Quality Assessment for Greater Manchester, September 2015, Haskoning DHV Ltd and Transport for Greater Manchester Emissions Dispersion Model – 2010 Model Year, HFAS Report 1786
[3] Transport for Greater Manchester, June 2013, The Greater Manchester Emissions Inventory 2010 Update, HFAS Report 1750
[4] TfGM (February 2014), The Greater Manchester Emissions Dispersion Model – 2016 Model Year HFAS Report 1794

can be regarded as new / newly identified sources, all roads were modelled for the detailed assessment and no further assessment is required.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Air quality is often higher in locations where there is congestion along narrow streets, and where there are buildings to reduce dispersion. Councils are asked to identify roads where the daily traffic AADT flow is greater than 5,000 vehicles per day and the average speed is less than about 25 kph (15 mph). Where these conditions exist and there are residential properties within 2 metres away from the edge of the kerb, with buildings both side of the road to reduce dispersion, a detailed assessment should be carried out for nitrogen dioxide unless the road has been considered previously.

Narrow congested roads have been assessed previously, and were included in the dispersion modelling. No new narrow congested streets have been identified in GM.

The **Greater Manchester Combined Authority** confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

An assessment should be made to identify any new areas where individuals may spend 1-hour or more, for example streets with many shops and streets with outdoor cafes and bars. This does not include locations where people would only be occupationally exposed as the air quality regulations only apply to non-residential exposure. The assessment only needs to consider nitrogen dioxide.

A busy street is regarded as one where the flow of traffic is greater than 10,000 vehicles per day, where individuals may be exposed within 5 metres of the kerb for 1-hour or more.

Locations have been identified previously where there are shops and streets with outdoor cafes where people may be exposed. These locations would include the city centre and some town and district centres. These locations have all been considered previously and all these locations were included in the dispersion modelling report.

The **Greater Manchester Combined Authority** confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

There is a possibility that some street locations where traffic flows are not necessarily high (fewer than 20,000 vehicles per day), but there is an usually high proportion (greater than 20%) of buses and/or HGVs. If the flow of HDV vehicles is greater than 2,500 a detailed assessment should be completed. Where these conditions exist an assessment for both NO_2 and PM_{10} should be carried out.

For the last updating and screening assessment TfGM identified 507 roads with a two–way AADT flow less than 20,000 vpd and an HDV proportion greater than 20 percent. Of these, 27 links had a HDV flow greater than 2,500 vpd. All of these links had previously been assessed and were included in the current AQMA. The roads have all been re-assessed and modelled as part of the detailed assessment. No new roads, or roads with new exposure, that are likely to have traffic flows below 20,000 vpd, with HDV vehicles greater than 2,500 have been identified. There is therefore no need to carry out any additional work in relation to roads with a high flow or buses and/or HGVs.

The **Greater Manchester Combined Authority** confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

Concentrations are usually higher close to junctions, due to the combined impact of traffic emissions on two roads and to the higher emissions due to stop start driving.

Any new junctions with flows greater than 10,000 vehicles per day where there is relevant exposure within 20 metres of the kerb should be assessed for both nitrogen dioxide and PM_{10}.

There are a total of 8,139 junctions in GM. Junctions outside the current AQMA with flows over 10,000 vehicles per day in 2015, that had flows less than 10,000 in 2012 when the previous Updating and Screening Assessment was carried out have been identified by TfGM. A total of 47 junctions were identified in GM. This is a small proportion of the total number of junctions in the area. The number of junctions in each district are listed in the table below:

Table 3.1 Busy junctions outside the AQMA

District	Number of Nodes (junctions)
Bolton	9
Bury	0
Manchester	12
Oldham	3
Rochdale	3
Salford	3
Stockport	4
Tameside	3
Trafford	2
Wigan	8
Total	**47**

Although these junctions had not been identified in the previous updating and screening assessment as requiring further assessment the dispersion modelling study for 2016 considered all roads and junctions in the conurbation. As such the junctions will have been modelled and included in the detailed assessment following the last update and screening assessment. There is therefore no need to undertake further assessment for these junctions.

Bury confirms that there are no new/newly identified busy junctions.

Bolton, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan have assessed new/newly identified junctions meeting the criteria in Section A.4 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

Any new roads constructed or proposed since the last review and assessment should be assessed for nitrogen dioxide and PM_{10}.

There are three new relevant roads in GM that have been completed since the last updating and screening assessment. These are:

- The Saddle Link Road, Southgate (Wigan)
- The realignment of the Manchester Inner Relief Road at the new Co-op HQ (Miller Street / Angel Street, Manchester)
- Leighbrook Way, Parsonage Retail Park, Leigh (Wigan)

The Saddle Link Road, Southgate (Wigan)

This provides a new link between Wallgate and Saddle Junction together with other associated route improvements at existing junctions. The road was constructed to relieve congestion in the area, particularly due to a lack of road space under Wallgate Bridge. The road has been constructed to ease congestion on the surrounding roads and will have reduced flows in the area. An air quality assessment was carried out as part of the planning application for the Road.[5] It concluded that there would be no exceedences of the air quality objectives. There is therefore no need to carry out a further assessment of air quality in the area.

The realignment of the Manchester Inner Relief Road at the new Co-op (Miller Street / Angel Street, Manchester)

This location is on the outskirts of Manchester city centre. It is well within the current AQMA. Diffusion tube monitoring has taken place since the road re-alignment took place. The results are shown in the table below.

Table 3.2 Diffusion tube monitoring results at Angel Street, Manchester

Year	Annual mean nitrogen dioxide concentration (bias adjusted)
2013 (10 months from March)	43 µg/m^3
2014	53.5 µg/m^3

[5] Saddle Relief Road, Environmental Information Report, Report No. LE10563, Wardell Armstrong, September 2009

The diffusion tube monitoring results show that the air quality objectives close to Angel Street location are likely to be exceeded. Dispersion modelling was undertaken following the last USA, the co-operative development and rerouting of traffic from Miller Street was included in the forecasts for 2016[6]. The predicted air quality concentrations in the area are above 40µg/m^3. The road has been included in the detailed assessment produced following the dispersion modelling and it is therefore not necessary to carry out a further assessment.

Leighbrook Way, Parsonage Retail Park, Leigh (Wigan)

Leighbrook Way is a link road between Atherleigh Way and Parsonage Way, serving Parsonage Retail Park in Leigh. There is no relevant exposure within 20 metres of the road. Flows on surrounding roads have been previously assessed and were found to be less than 36 µg/m^3 at relevant receptor locations. Forecast traffic flows were derived for the 2016 modelling projections which predicted changes in traffic flows taking account of employment and population projections as well as planning and Local Development Framework datasets. The impact of the retail park will therefore have been considered in the 2016 modelling projections and the most recent detailed assessment and therefore no further assessment is required.

Bolton, Bury, Oldham, Rochdale, Salford, Stockport, Tameside and Trafford confirm that there are no new/proposed roads.

Manchester and Wigan have assessed new/proposed roads meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

An assessment is required for both nitrogen dioxide and PM_{10} to identify roads with significantly changed traffic flows. Roads with flows over 10,000 vehicles per day, where there has been an increase in traffic greater than 25% should be assessed.

[6] The GM emissions dispersion model - 2016 model year, HFAS Report 1794, February 2014

TfGM have identified road links with a two-way 2015 AADT flow greater than 10,000 vpd, where there has been an increase in traffic flow between 2012 and 2015 greater than 25%. A total of 46 links in GM have been identified, of which 20 were either partly or entirely outside the current AQMA. Table 3.3 lists the number of links in each district.

Table 3.3 Roads with significantly changed traffic flows identified since the last update and screening assessment

District	Number of Links[7]
Bolton	1 **(1)**
Bury	0 **(0)**
Manchester	16 **(9)**
Oldham	2 **(1)**
Rochdale	0 **(0)**
Salford	8 **(1)**
Stockport	4 **(2)**
Tameside	0 **(0)**
Trafford	3**(2)**
Wigan	12 **(4)**
Total	46 **(20)**

The AQMA was declared where the annual mean was predicted to be above 35 µg/m^3 in 2010. The roads were all included in the dispersion modelling exercise which led to the declaration of the AQMA. A road is regarded as being 'at risk' of exceeding the air quality objective and should be considered in more detail if it has previously been identified with an annual mean above 36 µg/m^3, as the AQMA was declared at a level of 35 µg/m^3 the roads outside the AQMA would not be regarded as 'at risk', particularly as pollution trends show there has been a slight improvement in air pollution concentrations since 2010 which was the base year for the AQMA declaration.

In addition the roads were all included in the dispersion model projections for 2016. Traffic flows were forecast for 2016 taking account of population and employment growth forecasts. It is therefore concluded that there is no need to undertake further air quality assessment in relation to these roads.

[7] Notes: Some links may lie in more than one district, **(n)** = number of links outside the current AQMA

Bury, Rochdale and Tameside confirm that there are no new/newly identified roads with significantly changed traffic flows.

Bolton, Manchester, Oldham, Salford, Stockport, Trafford and Wigan have assessed new/newly identified roads with significantly changed traffic flows, and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.7 Bus and Coach Stations

Locations near to bus and/or coach stations that have not previously been considered in earlier air quality reviews should be assessed against the annual mean and the 1-hour NO_2 objectives.

There is one new bus station that has been identified since the last review and assessment:

Rochdale bus station

The new bus station is off Smith Street, Rochdale, adjacent to the River Roch, Faulkener Street and River Street. Further assessment of concentrations are required if there is relevant exposure within 20 metres of the bus station and there are more than 2,500 bus movements per day.

There is no residential exposure within 20 metres of the bus station. The 1-hour objective has also been assessed, and it is considered that passengers are unlikely to be waiting at bus stops or for over an hour and people are unlikely to be in the vicinity of the bus station for long periods for any other reason.

As a precaution the number of bus movements was checked. Information was obtained from TfGM on the bus routes using the new station.[8] The bus timetables for each route were checked to obtain the number of bus movements using the station. Using this information a total of 733 bus journeys start from the bus station on Monday – Friday, on weekends there are significantly fewer movements. A bus coming into the bus station and going out again should be treated as two

[8] Rochdale Interchange Your guide to using the new interchange, www.tfgm.com, January 2016

movements, therefore the maximum number of timetabled bus movements would be 1,466, although there may be some double counting as many of the bus journeys start and end at the station. Stand C at the station provides a service for National Express, Ring and Ride and School buses, timetables were not obtained for these services but it is unlikely that these services would be in excess of 1,000 bus movements per day.

There are therefore less than 2,500 bus movements per day at the station and there is unlikely to be any relevant exposure, either residential or from people in the area for over an hour. There is therefore no need to do any further assessment for the bus station.

Bury, Bolton, Manchester, Oldham, Salford, Stockport, Tameside, Trafford and Wigan confirm that there are no relevant bus stations in the Local Authority area.

Rochdale has assessed new/newly identified bus stations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.8 Road Traffic Sources Summary

The assessment has concluded that a detailed assessment for road traffic sources in GM is not required. Table 3.4, below, summarises the road traffic chapter.

Table 3.4 Summary of Road Traffic Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Narrow congested Streets with Residential Properties Close to the Kerb	All 10 GM authorities	No	No	N/A	N/A
Busy Streets Where People May Spend 1 hour or More Close to Traffic	All 10 GM authorities	No	No	N/A	N/A
Roads with a High Flow of Buses and/or HGVs	All 10 GM authorities	No	No	N/A	N/A
Junctions	Bolton, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford, Wigan	Yes	No	N/A	N/A
	Bury	No	No	N/A	N/A
New Roads Constructed or Proposed Since the Last Round of Review and Assessment	Bolton, Bury, Oldham, Rochdale, Salford, Stockport, Tameside	No	No	N/A	N/A
	Manchester and Wigan	Yes	No	N/A	N/A

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Roads with Significantly Changed Traffic Flows	Bolton, Manchester, Oldham, Salford, Stockport, Trafford, Wigan	Yes	No	N/A	N/A
	Bury, Rochdale, Tameside	No	No	N/A	N/A
Bus and Coach Stations	Bolton, Bury, Manchester, Oldham, Salford, Stockport, Tameside, Trafford, Wigan	No	No	N/A	N/A
	Rochdale	Yes	No	N/A	N/A

4 Other Transport Sources

4.1 Airports

Aircraft are potentially significant sources of nitrogen oxides (NO_X) emissions, especially during takeoff. Airports should be considered in the review and assessment process to determine the likelihood of exceedences of the NO_2 objectives.

Technical Guidance LAQM.TG (09) recommends using the following criteria:

- Relevant exposure within 1000 metres of the airport boundary.
- An equivalent passenger throughput greater than 10 million passengers per annum (mppa).
- An existing background NO_X concentration of above 25 µg/m^3.

If these criteria are met, it is necessary to proceed to a Detailed Assessment for nitrogen dioxide.

A review of airports in GM has produced the results presented in the following table:

Table 4.1 Summary of Airport Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Airport	All 10 GM authorities	No	N/A	N/A	N/A

The **Greater Manchester Combined Authority** confirms that there are no airports in the regional area that constitute new or previously not assessed sources.

4.2 Railways (Diesel and Steam Trains)

A requirement of the review and assessment process is to consider diesel and steam locomotives, mainly in stations and depots, and also alongside some busy lines that have high numbers of these types of train movements.

4.2.1 Stationary Trains

Stationary locomotives (both diesel and coal fired), can give rise to high levels of SO_2 close to the point of emission.

Technical Guidance LAQM.TG (09) recommends using the following criteria to determine if it will be necessary to proceed to a Detailed Assessment for SO_2 for certain locations (e.g. signals, goods loops, depots or stations):

- 3 or more occasions per day when there might be a diesel or coal fired locomotive stationary with its engine running for 15 minutes or more; and
- Potential for exposure of individuals for periods of 15-minutes or more within 15 metres of the stationary locomotives. The exposure needs to be 'outdoors' in the general sense of the word.

A review of stationary trains in GM has produced the results presented in the following table:

Table 4.2 Summary of Railway (Stationary Trains) Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Railways – Stationary Trains	All 10 GM authorities	No	N/A	N/A	N/A

The **Greater Manchester Combined Authority** confirms that there are no locations not previously assessed where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

Moving diesel locomotives, in sufficient numbers, can give rise to high NO_2 concentrations close to the track - the emissions can be equivalent to those from a busy road.

Technical Guidance LAQM.TG (09), Table 5.1, lists both the Manchester Piccadilly to Wigan and Manchester to Crewe lines as having a substantial number of diesel passenger trains per day, and recommends using the following criteria to determine if it will be necessary to proceed to a Detailed Assessment for NO_2 for certain locations:

- A background mean NO_2 concentration of greater than 25 µg/m^3; and
- Potential for long-term exposure (e.g. residential accommodation) within 30 metres of the edge of the track.

A review of moving trains in GM has produced the results presented in the following table:

Table 4.3 Summary of Railway (Moving Trains) Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Railways – Moving Trains	All 10 GM authorities	No	N/A	N/A	N/A

The **Greater Manchester Combined Authority** confirms that there are no locations not previously assessed with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

If there are significant movements of large ships that burn oils with a high sulphur content in a port, then there is a risk of exceedences of the 15-minute sulphur dioxide objective.

A review of shipping in GM has produced the results presented in the following table:

Table 4.4 Summary of Port (Shipping) Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Port	All 10 GM authorities	No	N/A	N/A	N/A

The **Greater Manchester Combined Authority** confirms that there are no ports or shipping that meet the specified criteria within the regional area.

5 Industrial Sources

Industrial sources in England are controlled by the Environment Agency (EA) and by local authorities under the Pollution Prevention and Control regulations. Local authorities also have controls over smaller industrial and commercial sources, largely through the Clean Air Act, with its associated control of the stack heights. As a result of these controls, there are relatively few sources that may be relevant to local authorities under the LAQM regime. Many of these sources will have been addressed during previous rounds of Review and Assessment. The focus should thus be on new installations and those with significantly changed emissions.

While the number of sources that may be significant is limited, there is a wider range of pollutants to be considered.

For the purpose of this Review and Assessment we will divide industrial sources into four sections:

- Industrial installations;
- Major fuel (petrol) storage depots;
- Petrol stations; and
- Poultry farms.

The latter is a new area for consideration which was introduced as a result of a small number of local authorities identifying potential exceedences of the PM_{10} objectives associated with emissions from poultry farms (defined as chickens (laying hens and broilers), turkeys, ducks and guinea fowl).

5.1 Industrial Installations

Industrial sources are unlikely to make a significant local contribution to annual mean concentrations, but could be significant in terms of the short-term objectives. The approach to the assessment will depend on whether an assessment has been carried out as part of the planning or permitting process. The assessment should consider all of the regulated pollutants although those most at risk of requiring further work are SO_2, NO_2, PM_{10} and benzene.

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

A review of industrial processes in GM has produced the results presented in the following table:

Table 5.1 Summary of New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Industrial (New / Proposed Installations with Air Quality Assessment)	All 10 GM authorities	No	N/A	N/A	N/A

N/A: Not Applicable

Bury

Bury Council has received a planning application for an Anaerobic Digester at Fletcher Bank Quarry which is currently at appeal.

The application is for an Anaerobic Digester and two Combined Heat and Power engines, at Fletcher Bank Quarry Ramsbottom. The process is to use organic materials and generate renewable energy in the form of electricity and heat which would be made available for the concrete products manufacturing facility, and surplus electricity being supplied to the local grid. The facility would handle 45 tonnes per annum of by-products from the food industry and agricultural wastes.

Detailed dispersion modelling found that the impacts were considered to be insignificant with the exception of Annual Mean NO_2 where a minor adverse impact may be experienced at one receptor. Impacts on local air quality from traffic emission have been screened out of further assessment as traffic generated by the proposed development is not predicted to change and would be below the criteria prescribed in relevant guidance.

The **Greater Manchester Combined Authority** has assessed any new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

The review and assessment process recommends that Local Authorities determine whether any industrial sources identified during previous rounds of review and assessment have either:

a) experienced substantially increased emissions (greater than 30%); or

b) received new relevant exposure in their vicinity.

A review of industrial process in GM has produced the following table:

Table 5.2 Summary of Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Industrial where Emissions have Increased Substantially or New Relevant Exposure has been Introduced	All 10 GM authorities	No	N/A	N/A	N/A

N/A: Not Applicable

The **Greater Manchester Combined Authority** confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within their area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

A review of new or significantly changed installations in GM with no previous air quality assessment has produced the results presented in the following table:

Table 5.3 Summary of New or Significantly Changed Installations with No Previous Air Quality Assessment

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Industrial (New Installation / Increased Emissions without Air Quality Assessment)	Bury Manchester Oldham Rochdale Salford Stockport Tameside Trafford Wigan	No	N/A	N/A	N/A
	Bolton	Yes	No	N/A	N/A

N/A: Not Applicable

Bolton

Installation Process	Process Type	Location	New/ changed	Exceedence predicted?
Booth Ventures	Mobile crusher	Brookfold Lane, Harwood Bolton	New	No
Tumble Dwyers	Dry Cleaners	Longcauseway Farnworth Bolton	New	No

The **Greater Manchester Combined Authority** has assessed any new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

5.2 Major Fuel (Petrol) Storage Depots

There is evidence to suggest that major fuel depots could emit benzene which may give rise to a local exceedence of the 2010 UK Air Quality Objective.

An assessment to identify any fuel depots within GM has produced the results presented in the following table:

Table 5.4 Summary of Major Fuel (Petrol) Storage Depot Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Major Fuel Storage Depot	All 10 GM authorities	No	N/A	N/A	N/A

N/A: Not Applicable

The **Greater Manchester Combined Authority** confirms there are no major fuel (petrol) storage depots within their areas or new major fuel (petrol) petrol storage depots that have not been considered in previous reports.

5.3 Petrol Stations

There is some evidence that petrol stations could emit sufficient benzene to put the 2010 objective at risk of being exceeded, especially if combined with higher levels from nearby busy roads. To ascertain if a detailed Assessment is required local authorities are required to identify petrol stations with:-

- an annual throughput of more than 2000 m^3 (2 million litres) of petrol.
- a nearby busy road that has traffic flows of greater than 30,000 vehicles per day.
- relevant exposure within 10 metres of the petrol pumps that have not been covered by previous review and assessments.

An assessment of appropriate petrol stations in GM has produced the results presented in the following table:

Table 5.5 Summary of Petrol Stations Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Petrol Stations	Bury Manchester Oldham Rochdale Salford Stockport Tameside Trafford Wigan	No	N/A	N/A	N/A
	Bolton	Yes	No	N/A	N/A

N/A: Not Applicable

Bolton

Installation Process	Process Type	Location	New/ changed	Exceedence predicted?
Bolton Dawes	Petrol Station	Blackhorse St. Farnworth Bolton	New	No

The **Greater Manchester Combined Authority** confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

A small number of local authorities have identified potential exceedences of the PM_{10} objectives associated with emissions from poultry farms.

Technical Guidance LAQM.TG (09) recommends using the following criteria to determine if it will be necessary to proceed to a Detailed Assessment for PM_{10} for certain locations:

- Farms housing in excess of:
  a) 400,000 birds if mechanically ventilated; or
  b) 200,000 birds if naturally ventilated; or
  c) 100,000 birds for any turkey unit; and
- Relevant exposure within 100 metres of the poultry units.
- Farms not covered by previous review and assessments

An assessment of poultry farms in GM has produced the results presented in the following table:

Table 5.6 Summary of Poultry Farm Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Poultry Farms	All 10 GM authorities	No	No	N/A	N/A

N/A: Not Applicable

The **Greater Manchester Combined Authority** confirms that there are no poultry farms meeting the specified criteria**.**

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Biomass combustion is increasing across the GM conurbation however this is from a very low base and many of the installations are in public buildings often providing only part of the heating load. It is normal practice in GM that chimney height approval is sought and air quality issues are considered at that time, hence there is no need for further detailed assessment.

Tables 6.1 to 6.3 below set out the findings for Commercial and Domestic sources in GM against the air quality objectives.

Table 6.1 Summary of Biomass Combustion (Individual) Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Biomass Combustion (Individual)	Bolton Oldham Rochdale Salford Stockport Tameside Wigan	No	N/A	N/A	N/A
	Bury Manchester Trafford	Yes	No	N/A	N/A

N/A: Not Applicable

Bury Council has confirmed that planning permission has been granted for a new 1200kW biomass combustion plant in an Air Quality Management Area within the Local Authority area. A Screening Assessment has been carried out for the boiler and it has been found that a Detailed Assessment is not required.

As per normal practice in GM, chimney height approval is sought and air quality issues are considered at that time, hence there is no need for further detailed assessment.

Trafford Council dealt with a planning application at: the Land To The South Of Manchester Ship Canal And West Of Barton Bridge Trafford Way Trafford Park for the Erection of a 20 megawatt biomass fuelled renewable energy plant with associated access, car parking, internal roads, canal side mooring and landscaping. The application was refused by Trafford Council on 5th December 2011 and was reported as refused in the last Updating and Screening Assessment. The application was granted on appeal on the 15th May 2013. The decision to grant permission was upheld by High Court on the 24th February 2014. In September 2015 a further application was received by the Council to vary the approved plans to allow alterations to the design, layout, access arrangement and the specification of plant including further details relating to the development's use as a Combined Heat and Power Plant.

The **Greater Manchester Combined Authority** has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

While there has been an increase in the use of Biomass across the whole of the GM conurbation, this is from a very low base and at the present time there is not an issue with regards the combined effects of such appliances as they tend to be in separate locations. Work undertaken by Manchester City Council (district with highest concentration of commercial buildings) for previous assessments indicates that is unlikely to exceed the threshold emission density set out the monograph in Figure 5.22 of TG(09). Furthermore, EMIGMA records all points sources over 2 MW, aggregating emissions to a 1 km by 1 km grid and along with other emissions data is used in GMEDIS (the Greater Manchester Emission Dispersion model). It is therefore highly unlikely that exceedences from biomass combustion are likely to occur.

Table 6.2 Summary of Biomass Combustion (Combined) Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Biomass Combustion (Combined)	All 10 GM authorities	No	N/A	N/A	N/A

N/A: Not Applicable

Manchester City Council has confirmed that in 2009, the maximum density of domestic solid fuel burning appliances was found to be 8 in a 500m^2 area (Chorlton). For a large town in England (e.g. Manchester), within an area where the background PM_{10} concentration was 16 µg/m^3 (in 2010), approximately 250 households burning wood with this type of appliance in a 500m x 500m area would be needed to trigger a Detailed Assessment. (Ref. Figure 1 of the Defra LAQM support FAQs, http://laqm.defra.gov.uk/laqm-faqs/faq36.html and Background maps file '155_pm10_2010.csv' at 2010 Based Background Maps for NO_x, NO_2, PM_{10} and PM2.5: http://laqm.defra.gov.uk/maps/maps2010.html)

As it is highly unlikely that a 30-fold increase in domestic solid fuel burning appliances has occurred since the last R&A in 2009, it can be concluded that a Detailed Assessment will not be required to assess PM_{10} emissions from the combined impacts of biomass combustion from domestic properties in Manchester.

The **Greater Manchester Combined Authority** has assessed the biomass combustion plant within its area, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

The use of solid fuels for domestic heating declined significantly with the introduction of the Clean Air Act in the 1950's, alternative fuels such as gas and electricity are now most commonly used. Almost all of GM is now covered by smoke control areas,

the only exceptions being some sparsely populated areas in the moorlands and rural areas on the periphery of the conurbation.

While there has been an increase in the use of solid fuel across the whole of the conurbation over recent times, due to the increasing popularity of 'real fires' in the majority of properties this is as a secondary source of heating, the increase is from a very low base and is more prevalent in the semi-rural areas with less dense housing. Previous assessments have concluded that there is not an issue.

Table 6.3 Summary of Domestic Solid-Fuel Burning Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Domestic Fuel Burning	All 10 GM authorities	No	N/A	N/A	N/A

N/A: Not Applicable

The **Greater Manchester Combined Authority** confirms that there are no areas of significant domestic fuel use in the Local Authority area, and concluded that it will not be necessary to proceed to a Detailed Assessment.

7 Fugitive or Uncontrolled Sources

Dust emissions from a range of fugitive and uncontrolled sources can result in elevated PM_{10} concentrations. Such sources may include quarrying and mineral extraction, landfill sites, major construction works and waste management sites.

One potential fugitive dust source has been identified within the area. The source was assessed in accordance with the screening criteria detailed in LAQM.TG(09), Box 5.10, the results of which are presented in Table 7.2.

Table 7.1 Summary of Fugitive or Uncontrolled Sources

Source Type	Local Authority	New or previously not assessed sources identified?	Detailed Assessment required?	Description of Area to be assessed	Pollutants and objectives to be assessed
Fugitive Emissions	Bolton Oldham Rochdale Salford Stockport Tameside Trafford Wigan Bury	No	No	N/A	N/A
	Manchester	Yes	No	N/A	N/A

N/A: Not Applicable

Table 7.2 Fugitive dust source identified

Local Authority	Source Location (grid ref)	Source Type	Relevant Exposure	Recent Complaints	Dust Emissions/dust tracked out of site onto public roads	Detailed Assessment Needed
Manchester	Industrial estate, Ashton Old Road/Rondin Road (386289,397543)	Multiple waste transfer sites	Yes	Yes	Yes	No

The source sites are regulated by the Environment Agency under the Environmental Permitting (England and Wales) Regulations 2010, and the EA has worked informally with the operators to ensure compliance with their permits. This has addressed the dust issue and a detailed assessment is therefore not needed at this time.

The **Greater Manchester Combined Authority** has assessed potential sources of fugitive particulate matter emissions within its area, and concluded that it will not be necessary to proceed to a Detailed Assessment.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Nitrogen Dioxide

Nitrogen dioxide is measured by fifteen automatic continuous analysers operated across GM (excluding one analyser that joined the AURN towards the end of 2014). Four of these analysers presented annual means in excess of the air quality limit value of 40 µg/m^3. These four analysers are located within the existing AQMA.

A further four analysers located within the existing AQMA presented annual means below 40 µg/m^3, whilst one analyser recorded an average of exactly 40 µg/m^3. The automatic sites of Great Manchester show good correlation with the air quality management area. Stockport Hazel Grove site, records the lowest concentration in the AQMA with an annual mean of 27 µg/m^3, however the other sites are consistent with the AQMA boundary.

The remaining analysers are located outside the AQMA and presented averages that were below 40 µg/m^3.

Most of the road/kerbside automatic and non automatic sites have remained relatively stable over the last few years, whilst concentrations at non-roadside sites have fallen significantly, particularly in comparison to the higher values seen in 2010.

The limit value of an hourly concentration of 200 µg/m^3, not to be exceeded more than 18 times a calendar year, was complied with.

There are over two hundred NO_x tubes across GM which have operated over a long period of time. Broadly the monitoring results for NO_2 are consistent with the current AQMA, however the diffusion tube data suggests that there are locations where the AQMA should be revised. GM has undertaken dispersion modelling in support of this.

Particulate Matter

Particulate matter of less than 10 microns (PM_{10}) is monitored at thirteen locations across GM; all locations presented data that showed both air quality objectives were being complied with.

8.2 Conclusions from Assessment of Sources

The assessment has concluded that although new or previously not assessed road traffic sources in GM have been identified, a detailed assessment for these is not required.

No new or significantly changed sources that could lead to potential exceedences of the air quality limit values for NO_2 or PM_{10} have been identified from other transport sources, industrial sources, commercial sources or fugitive emissions.

8.3 Proposed Actions

A Detailed Assessment is being prepared concurrently with this Update and Screening Assessment which will inform the variation of the current AQMA where required. The variation is also intended to consolidate the existing individual AQMA for each GM authority into a single AQMA.

9 References

Department of Environment, Food and Rural Affairs (2014). Emissions of Air Pollutants in the UK 1970 to 2013, Statistical release 18 December 2014.

Appendix A: QA/QC Data

Diffusion Tube Bias Adjustment Factors

The national site database held by National Physical Laboratory (NPL) is used to compare factors from national and locally calculated studies. For 2014 the national bias factor was selected as it is based on a larger number of results, is compatible with results in 2013 and as shown below there is minimal difference between the two sets. For a local calculated factor the Manchester sites are selected, extracted and the average factor calculated as advised by the NPL[1].

NPL recommends, in the National diffusion tube Bias adjustment factor spreadsheet 2015 (http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html), that "to obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression as used in this spreadsheet, but will be reasonably close)."

Table A1.1- 2014 Summary of 2012-2014 Bias Factors (applied in bold)

	2012	2013	2014
National	0.86	0.87	0.83
GM only	0.869	0.90	0.85
Version	Spreadsheet version number 07/13	Spreadsheet version number 03/14	Spreadsheet version number 09/15

[1]There are no filters on the NPL sheet to select individual Las to form a local factor

Annualisation:

Data obtained from the diffusion tubes with less than 9 months data capture was annualised to a projected annual mean for 2014 following a similar approach to that described in LAQM TG(09) (Defra, 2009). The period mean is calculated for matched periods using diffusion tubes for the years 2014. A monthly mean for each exposure period using tubes with 100% data capture at urban centre suburban and background sites is calculated. A period mean, Pm, is calculated matching the tube

exposure period and compared with the 12 month annual mean, Am. A factor Am/Pm is applied to the tube. A spreadsheet is used to derive and apply factors to the data. The period mean was calculated using the exposure dates from the national NO_2 calendar but some tubes exposure period will be slightly different by up to a week. No adjustment was made for these tubes.

PM Monitoring Adjustment

A number of different instruments are used in GM for the measurement of particles. Historically TEOM have been used, but Defra recently replaced and number of instruments with TEOM FDMS and some sites use the BAM.

The reference method for the UK PM_{10} Objectives (and EU limit values) is based upon measurements from a gravimetric sampler. This samples over a 24 hour period and the particulate proportion less than 10 microns (PM_{10}) is measured by the mass difference before and after exposure. It is labour intensive and the UK, and European Counties have invested heavily in the TEOM. The TEOM readings have been historically adjusted by a factor of 1.3 to make them gravimetric equivalent. However to further improve the technique; the measurement was modified by lowering the sampling temperature from 50 C to 30 C and adding a dryer to remove water vapour. This system is referred to as FDMS and is equivalent to EU reference method.

Due to widespread use of the TEOM, its reliability and the need to report to the EU using an ‘equivalent method’, The Volatile Correction Model (VCM) was developed by Kings College London, to adjust the TEOM data. Studies have shown that FDMS sites within 200 kilometres can be used to correct the TEOM data as it assumes that the sample lost by the heating is the same over this geographical area. Sufficient FDMS sites have only been available since 1998/9 for the correction to be applied. The BAM Met one (Beta Attenuation Method) meets the EU equivalence after applying the correction factor.

Particulate data collected is corrected as follows:

- All TEOM data reported as gravimetric, corrected by 1.3
- FDMS results - no correction required

- BAM data (Manchester Piccadilly, South and Oldham Crompton way) 0.8333
- VCM corrected data- available in spreadsheet. (King's college website: http://www.volatile-correction-model.info/)

Short-term to Long-term Data Adjustment

No data was adjusted for 2014 as all the sites measuring PM_{10} have registered percentages of Data capture above 81%.

QA/QC of Automatic Monitoring

Automatic air quality analyzers in GM area are subject to a high level of quality assurance/ quality control. Most analyzers are either operated as part of the national Automatic Urban and Rural Network (AURN) or are run by Ricardo Energy & Environment to provide accurate and robust data.

Ricardo Energy & Environment operates air quality monitoring stations within a tightly controlled and documented quality assurance and quality control (QA/QC) system. These procedures are documented in the AURN QA/QC manual.

Elements covered within this system include: definition of monitoring objectives, equipment selection, and site selection, protocols for instrument operation calibration, service and maintenance, integrity of calibration gas standards, data review, scrutiny and validation.

All gas calibration standards used for routine analyzer calibration are certified against traceable primary gas calibration standards at the Gas Standards Calibration Laboratory at Ricardo Energy & Environment. The calibration laboratory operates within a specific and documented quality system and has UKAS accreditation for calibration of the gas standards used in this survey.

An important aspect of QA/QC procedures is the regular six-monthly inter calibration and audit check undertaken at every monitoring site. This audit has two principal functions: firstly to check the instruments and the site infrastructure, and secondly to recalibrate the transfer gas standards routinely used on-site, using standards recently checked in the calibration laboratory. Ricardo's audit calibration procedures are UKAS accredited to ISO 17025.

In line with current operational procedures within the Defra AURN, full inter calibration audits take place at the end of winter and summer. At these visits, the essential functional parameters of the monitors such as noise, linearity and, for the NOx monitor, the efficiency of the NO_2 to NO converter are fully tested. In addition, the on-site transfer calibration standards are checked and re-calibrated if necessary, the air intake sampling system is cleaned and checked and all other aspects of site infrastructure are checked.

All air pollution measurements are reviewed daily by experienced staff at Ricardo Energy & Environment. Data are compared with corresponding results from AURN monitoring stations and with expected air pollutant concentrations under the prevailing meteorological conditions. This review process rapidly highlights any unusual or unexpected measurements, which may require further investigation. When such data are identified, attempts are made to reconcile the data against known or possible local air pollution sources or local meteorology, and to confirm the correct operation of all monitors. In addition, the results of the daily automatic instrument calibrations are examined to identify any possible instrument faults. Should any faults be identified or suspected, arrangements are made for Ricardo Energy & Environment personnel or equipment service contractors to visit the site as soon as possible.

At the end of every quarter, the data for that period are reviewed to check for any invalid values and to apply the best daily zero and sensitivity factors, and to account for information which only became available after the initial daily processing. At this time, any data gaps are filled with data from the data logger back-up memory to produce as complete a data record as possible.

Finally, the data are re-examined on an annual basis, when information from the six-monthly inter calibration audits can be incorporated. After completion of this process, the data are fully validated and finalized, for compilation in the annual report.

QA/QC of Diffusion Tube Monitoring

The tubes are prepared and analyzed by Staffordshire Scientific Services using the 20% triethanolamine (TEA) in water method. The laboratory method is UKAS

accredited. Results from the quality control schemes published on the LAQM website give the laboratory a good precision rating.

NO_2 diffusion tubes are affected by several factors, which may cause them to have bias (over-read), or negative bias (under-read) relative to the reference technique. In order to compare with the AQS objectives it's important that tubes are corrected (adjusted) by comparing with a chemiluminescent analyser reference method for NO_2.