



# Air quality

## Belfast City Council Air Quality Progress Report 2019

In fulfillment of the  
Environment (Northern Ireland) Order 2002  
Local Air Quality Management

June 2019

<b>Local Authority Officer</b>	Eliza Barszczewska-Lyner
<b>Department</b>	City and Neighbourhood Services
<b>Address</b>	The Cecil Ward Building 4-10 Linenhall Street Belfast BT2 8BP
<b>Telephone</b>	028 9027 0428
<b>E-mail</b>	envhealth@belfastcity.gov.uk
<b>Date</b>	June 2019

## **Executive Summary.**

Belfast City Council has completed this 2019 Air Quality Progress Report in accordance with the provisions of the Environment (Northern Ireland) Order 2002 and the Northern Ireland Local Air Quality Management Policy Guidance document LAQM.PGNI (09).

In undertaking this report, we have completed a review of recent ambient air quality monitoring data across the city in order to identify locations where new or existing exceedences of Air Quality Strategy Objectives and European Commission Limit Values are occurring. The review has also identified locations where ambient air quality has improved and exceedences are no longer occurring.

Belfast City Council has declared four Air Quality Management Areas across the city for exceedences of the nitrogen dioxide annual mean Air Quality Strategy objective. A review of the monitoring data for these Air Quality Management Areas indicates that there have been some recent improvements in nitrogen dioxide levels across the city. As a result, Belfast City Council considers that there may be an opportunity for revocation of the Air Quality Management Area along the Ormeau Road, where monitoring data demonstrates recent sustained improved annual mean nitrogen dioxide concentrations, with levels consistently below the annual mean objective. Accordingly, the council will liaise with the Department for Agriculture, Environment and Rural Affairs, Department for Infrastructure and other relevant competent authority partners regarding the revocation process.

Monitored levels of benzene and sulphur dioxide remain well below the objectives and show no reason for concern.

There have been no monitored exceedences of Air Quality Strategy Objectives for any other ambient pollutant in recent years across the city, and no new sources have been identified which would have the potential to change this position. No other air quality pollutants will therefore be considered within this 2019 Progress Report.

Several new developments have occurred throughout Belfast since the 2017 Progress Report was published. These developments were identified during the Planning application process and where necessary, an Air Quality Impact Assessment was requested. The air quality impacts of these developments were then assessed and any necessary development specific mitigation measures were identified and requested as part of the planning process.

In December 2015, the council, along with relevant partner organisations launched a new Air Quality Action Plan (AQAP) 2015-2020 for the city that draws upon all forms of air quality and transport planning activities, including sustainable transport options as well as engineering solutions. The aim of this AQAP is to improve road vehicle operations and to promote and enable a shift onto more sustainable modes of transport to achieve compliance with the EU limit value for nitrogen dioxide (NO<sub>2</sub>) by 2020.

# Table of Contents

- Executive Summary ..... i**
- 1 Introduction ..... 1**
  - 1.1 Description of Local Authority Area..... 1
  - 1.2 Purpose of Progress Report ..... 2
  - 1.1 Air Quality Objectives ..... 3
  - 1.2 Summary of Previous Review and Assessments..... 5
- 2 New Monitoring Data ..... 10**
  - 2.1 Summary of Monitoring Undertaken ..... 10
  - 2.2 Comparison of Monitoring Results with Air Quality Objectives ..... 21
- 3 New Local Developments ..... 45**
  - 3.1 Road Traffic Sources ..... 45
  - 3.2 Other Transport Sources ..... 45
  - 3.3 Industrial Sources ..... 46
  - 3.4 Commercial and Domestic Sources..... 46
  - 3.5 New Developments with Fugitive or Uncontrolled Sources ..... 47
- 4 Planning Applications ..... 48**
- 5 Air Quality Planning Policies. .... 56**
- 6 Implementation of Action Plans..... 57**
- 7 Conclusions and Proposed Actions..... 66**
  - 7.1 Conclusions from New Monitoring Data..... 66
  - 7.2 Conclusions relating to New Local Developments ..... 68
  - 7.3 Proposed Actions..... 68

In conclusion, the 2018 Progress Report has not identified the need to proceed to a Detailed Assessment for any pollutant under consideration..... 68

Furthermore, Belfast City Council has already highlighted that it operates an expansive air quality monitoring network across the city for nitrogen dioxide and other ambient pollutants. On this basis, the council is content that existing monitoring locations provide a detailed representation of pollution levels the city and, as a consequence, does not need to be expanded at this time..... 68
- 8 References ..... 70**

## List of Tables

- 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Northern Ireland.
- 1.2 Historical Belfast City Council Air Quality Reports.
- 2.1 Details of Automatic Monitoring Sites.
- 2.2 Details of Non-Automatic Monitoring Sites.
- 2.3 Results of Automatic Monitoring for Nitrogen Dioxide NO<sub>2</sub>: Comparison with annual mean objective.
- 2.4 Results of Automatic Monitoring for Nitrogen Dioxide NO<sub>2</sub>: Comparison with 1-hour mean objective.
- 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2018.
- 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2014 to 2018).
- 2.7 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with Annual Mean Objective.
- 2.8 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour mean Objective.
- 2.9 Results of Automatic Monitoring for SO<sub>2</sub>: Comparison with Objectives.
- 3.0 Results of monitoring for benzene: Annual mean levels for the Belfast Centre site 2014 – 2018.
- 4.1 Major New Developments that had a potential to have a negative impact on air quality in the 2018 period.
- 6.1 Belfast Air Quality Action Plan Progress.

## List of Figures

- 1.1 Maps of AQMA Boundaries.
- 2.1 Location Map of Automatic Monitoring Sites across Belfast.
- 2.2 Location Maps of Non-Automatic Monitoring Sites.
- 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Automatic Monitoring Sites.
- 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites.
- 2.5 Trends in Annual Mean PM<sub>10</sub> concentrations at Belfast monitoring sites 2014-2018

**Appendices**

Appendix A: Quality Assurance and Quality Control Data.

Appendix B: Defra NO<sub>2</sub> Distance Calculator Results.

# 1 Introduction.

## 1.1 Description of Local Authority Area.

Belfast is the capital of Northern Ireland and as such, the city, and its wider metropolitan area, is the largest settlement in the region and the second largest city on the island of Ireland with a population of around 339,579. The city lies at the head of Belfast Lough in the lower reaches of the Lagan Valley and is flanked by the Black Mountain to the west and Castlereagh Hills to the east. The Belfast City Council district area sits at the heart of the growing population of the wider Belfast Metropolitan Urban Area, which also comprises part of the surrounding district council areas of Castlereagh and Lisburn, Ards and North Down, Antrim and Newtownabbey and Mid and East Antrim.

In terms of historical air quality issues, Belfast used to experience sustained elevated levels of sulphur dioxide (SO<sub>2</sub>) and particulate matter (PM<sub>10</sub>), associated principally with the widespread use of solid fuel for domestic heating. However, through the introduction of the council's smoke control programme in the late 1960s, the Clean Air (Northern Ireland) Order 1981 and the more recent availability of natural gas to domestic, commercial and industrial sectors, levels of particulate matter and sulphur dioxide have declined substantially over recent years to the extent that we do not experience exceedences of any air quality strategy objectives, or indeed European Commission limit values, for either of these pollutants. Accordingly, the number of locations where we monitor these ambient pollutants has been reduced over recent years in accordance with the government's risk and exposure based approach to local air quality management.

As levels of sulphur dioxide and particulate matter have declined across the city over recent years, so emissions of nitrogen oxides, associated principally with road transport, have become more prominent. This is a similar situation to that experienced in many other major cities and conurbations across the United Kingdom. Accordingly, as a result of the first round of the review and assessment process, which was completed in 2004, Belfast City Council opted to declare four Air Quality Management Areas across the city. We published our first Air Quality Action Plan for the city back in 2006 and it was completed substantially in 2010, with around 90% of



planned actions delivered to schedule. Of the outstanding 10% of actions, it was considered that the majority of these would have had limited additional impact within our Air Quality Management Areas.

Although Belfast City Council is directed to comply with the provisions of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland via Part III of the Environment (Northern Ireland) Order 2002, the council is aware also of the pressing need to achieve European Commission air quality limit values at national level in accordance with the schedules prescribed in Directive 2008/50/EC in respect of ambient air quality and cleaner air for Europe and the 4<sup>th</sup> Daughter Directive. It should be noted that the deadline for achieving limit values for nitrogen dioxide was 1<sup>st</sup> January 2010 but unfortunately this was not achieved at all locations across the city.

In order to address the remaining ‘hot spot’ areas of elevated nitrogen dioxide, the council along with relevant partners developed a new Air Quality Action Plan for the city that contains a manageable number of proven air quality mitigation measures. The new Air Quality Action Plan, covering the period 2015-2020, was published in December 2015.

## **1.2 Purpose of Progress Report.**

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment (Northern Ireland) Order 2002, 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 exceedances 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 objectives.

For Local Authorities in Northern Ireland, Progress Reports are required in the intervening years between three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity of the LAQM process.

Progress Reports are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if a Progress Report identifies the risk of exceedance of an Air Quality Objective, the Local Authority (LA) is required to undertake a Detailed Assessment immediately, and not to wait until the next scheduled round of Review and Assessment.

## **1.1 Air Quality Objectives.**

The air quality objectives applicable to LAQM in Northern Ireland are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  for carbon monoxide) together with the number of exceedences in each year that are permitted.

**Table 1.1 – Air Quality Objectives included in Regulations for the purpose of LAQM in Northern Ireland.**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
	3.25 µg/m <sup>3</sup>	Running annual mean	31.12.2010
1,3-butadiene	2.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m <sup>3</sup>	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m <sup>3</sup>	Annual mean	31.12.2004
	0.25 µg/m <sup>3</sup>	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m <sup>3</sup>	Annual mean	31.12.2005
Particulate matter (PM <sub>10</sub> ) (gravimetric)	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m <sup>3</sup>	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## 1.2 Summary of Previous Review and Assessments.

As part of the review and assessment process, Belfast City Council completed a 2<sup>nd</sup> and 3<sup>rd</sup> stage review and assessment of air quality throughout the city in early 2004. This assessment concluded that modelled and monitored exceedences of short and longer-term objectives for both nitrogen dioxide and particulate matter were occurring in the city and would be likely to continue to do so in some locations beyond 2010. Consequently, in August 2004 the council, in consultation with other relevant authorities, declared four Air Quality Management Areas (AQMA), comprising the M1 Motorway and Westlink corridor, Cromac Street to the junction of Short Strand, Woodstock Link and the Albertbridge Road, the Upper Newtownards Road and the Ormeau Road.

The M1-Westlink AQMA was declared on the basis that annual and hourly-mean nitrogen dioxide concentrations would exceed the 2005 Air Quality Strategy objectives. In addition, particulate matter annual and 24-hour mean concentrations were predicted also to exceed relevant objectives at this location. The three other Air Quality Management Areas were declared on the grounds that the annual mean nitrogen dioxide objective would be exceeded at these locations during 2005 and beyond. A subsequent source apportionment study, completed for the Air Quality Management Areas, indicated that the principal cause of the exceedences was emissions emanating from road transport.

**Current Air Quality Management Areas are described and depicted in more detail as follows:**

1. The M1 / Westlink corridor from the Belfast City boundary at Sir Thomas and Lady Dixon Park to the end of the Westlink at the junction with Great George's Street and York Street including Stockmans Lane and Kennedy Way. This area was declared for predicted exceedences of both the nitrogen dioxide and particulate material annual mean air quality strategy objectives as well as exceedences of the particulate matter 24-hour mean objective and the nitrogen dioxide 1-hour mean objective. The boundary of the Air Quality Management Area is denoted in blue and has been set to take account of dispersion modelling uncertainties. This

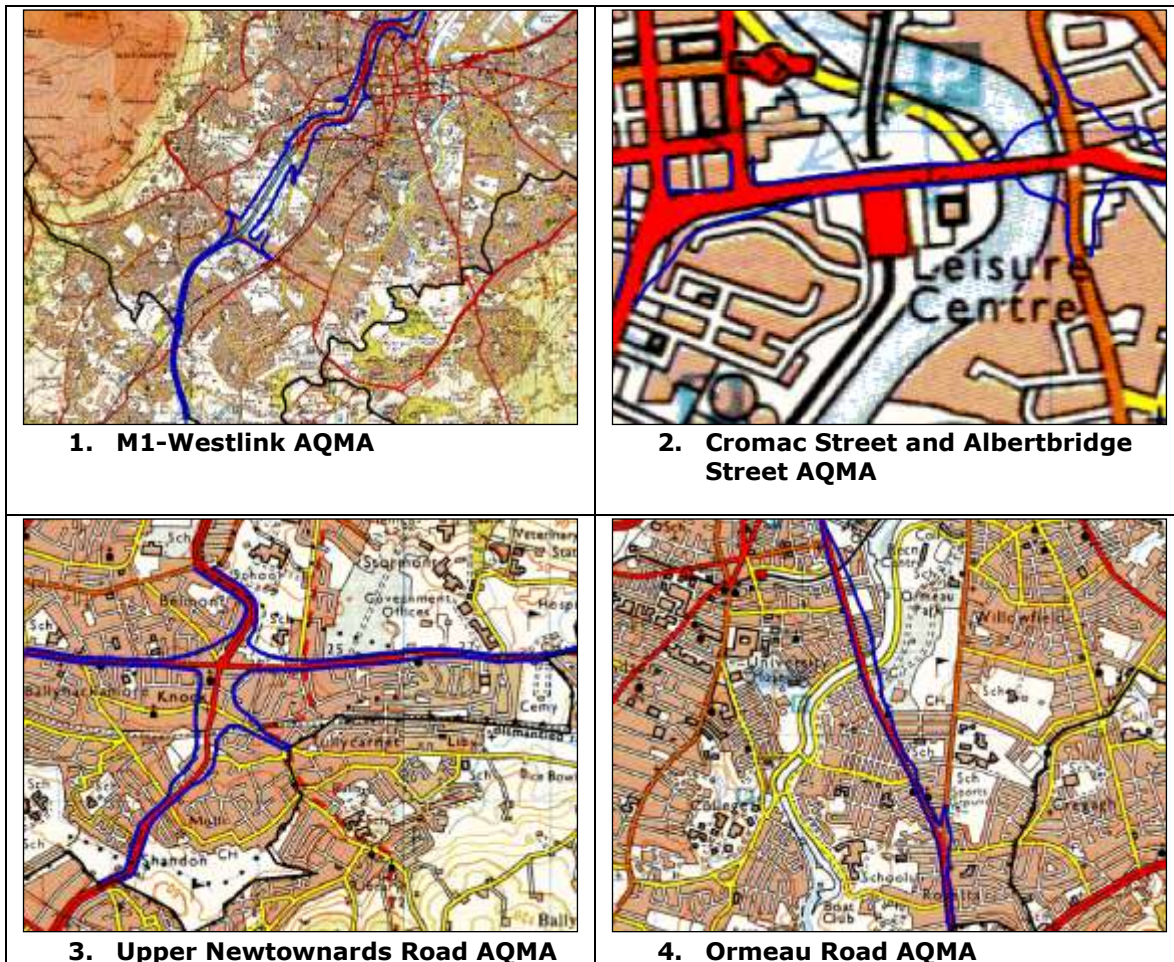
## **Belfast City Council – Northern Ireland**

Area was revoked for exceedences of particulate matter objectives in September 2015, but it continues to exceed the air quality objectives for nitrogen dioxide.

2. Cromac Street to the junction with East Bridge Street and then from East Bridge Street to the junction with the Ravenhill and Albertbridge Roads and Short Strand. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.
3. The Upper Newtownards Road from the North Road junction to the Belfast City boundary at the Ulster Hospital, incorporating the Knock Road to the City boundary at Laburnum Playing Fields and Hawthornden Way. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.
4. The Ormeau Road from the junction with Donegall Pass to the 1993 City boundary at Galwally. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.

It should be noted that the Belfast City Council boundary is denoted by a solid black line within the following Air Quality Management Area maps, although it should also be noted that the council's 1993 boundary was revised and in some cases enlarged during 2015 under the reform of local government.

Figure 1.1 – Maps of AQMA Boundaries.



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A further detailed air quality review and assessment was completed by Belfast City Council in 2010, informed by the outcome of the 2009 Updating and Screening Assessment. Accordingly, the 2010 Detailed Assessment considered the potential for exceedences of nitrogen dioxide objectives at a number of further locations across the city, including the junction of the Sydenham Bypass with the Lower Newtownards Road, Shaftesbury Square, Donegall Road and Albertbridge Road, and at locations throughout the city centre. Although atmospheric dispersion modelling studies, undertaken as part of the detailed review and assessment process, did suggest exceedences of the nitrogen dioxide annual mean objective at some of the above-mentioned locations, the review and assessment identified also that there was no relevant public exposure at these locations during 2010. As a result, the 2010

## **Belfast City Council – Northern Ireland**

Detailed Air Quality Review and Assessment for Belfast City Council concluded that there was no need to declare further Air Quality Management Areas or to expand or revoke the existing AQMAs. This view was accepted by government.

Ambient air quality monitoring results, as presented in previous annual progress and update and screening assessment reports, identified sustained improvements in particulate matter concentrations within the M1 Motorway / A12 Westlink Air Quality Management Area, confirming that it had been in compliance with the particulate matter objectives for a number of years. This resulted in the Westlink / M1 AQMA being revoked for the particulate matter 24 hour and annual mean objectives in September 2015.

The current stage in the Review and Assessment process requires that a Progress Report be completed. This report therefore addresses the requirements of the Defra LAQM.TG(16) technical guidance publication in identifying any significant changes that have occurred since the previous round of Review and Assessment, which may have the potential to affect the local air quality.

For reference and additional background information, historical Belfast City Council air quality review and assessment reports are listed in the following table, and are available to download from the Department of Agriculture, Environment & Rural Affairs for Northern Ireland 'Northern Ireland Air Quality' website.

Table 1.2 Historical Belfast City Council Air Quality Reports.

Title	Publication date
2018 Updating and Screening Assessment	June 2018
2017 Progress Report	June 2017
2016 Progress Report	April 2016
2015 Updating and Screening Assessment	April 2015
2014 Progress Report	April 2014

\*Historical Belfast City Council Air Quality Reports are available at:  
<http://www.airqualityni.co.uk/laqm/district-council-reports#item511>



## **2 New Monitoring Data.**

### **2.1 Summary of Monitoring Undertaken.**

#### **2.1.1 Automatic Monitoring Sites.**

Belfast City Council operates a number of automatic monitoring stations across the city in order to inform its air quality management processes and to provide real time information to the public in relation to air pollution levels across the city centre and within our Air Quality Management Areas.

Accordingly, to ensure that the data from our sites is both accurate and representative, the monitors at each site are calibrated on a biweekly (Stockmans Lane AURN site) or on a four-weekly basis by the council's technical staff in accordance with the procedures detailed in the Defra Automatic Urban and Rural Network (AURN) local site operators' manual. In addition, data management, quality assurance and quality control and service and maintenance support are all provided by appointed contractors. The data from our sites is made available to the Department of Agriculture, Environment and Rural Affairs and is reported on the 'Northern Ireland Air' website in near real time. For consistency, all automatic monitoring data reported in this progress report has been obtained from the 'Northern Ireland Air Quality' website. Automatic data reported in this report relates to the calendar year (i.e. January – December) and data capture levels exceed substantially the Department's 75% data capture threshold for the calculation of annual statistics at all sites. Further information regarding our QA/QC procedures and processes can be obtained in Appendix A to this report.

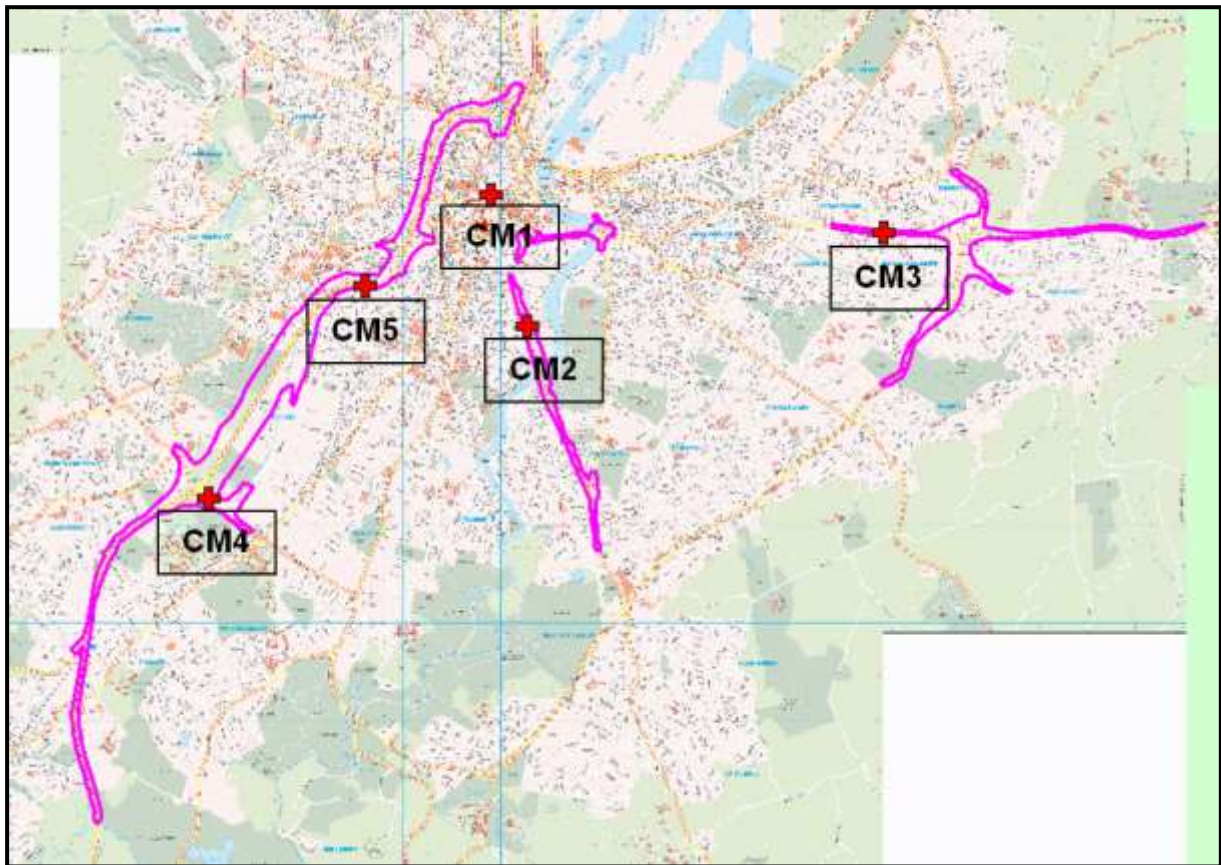
In relation to correction of our automatic monitoring data, this process is generally of principal concern with regard to the treatment of particulate matter monitoring data. The Belfast Centre site uses Filter Dynamics Measurement System (FDMS) equipped Tapered Element Oscillating Microbalances (TEOMs) for particulate matter (PM<sub>10</sub>) monitoring. Government equivalence tests have determined that this equipment meets the equivalence criteria and on that basis, no correction factor needs to be applied to this monitoring data.

## **Belfast City Council – Northern Ireland**

However, the Stockmans Lane site is equipped with a Beta Attenuation Monitor (BAM) with an unheated inlet for monitoring particulate matter. Government technical guidance highlights that a BAM, equipped with an unheated inlet, meets the equivalence criteria for PM<sub>10</sub> monitoring, provided that the results are corrected for slope. This correction involves dividing measured concentrations by a factor of 1.21. It should be noted that the data presented on the Northern Ireland Air website and in this report has already been corrected to the reference equivalent.

A location map showing automatic monitoring site locations across the Belfast City Council area is presented in the following Figure 2.1, with further site-specific monitoring details provided in Table 2.1.

Figure 2.1 – Location Map of Automatic Monitoring Sites across Belfast.



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Table 2.1 – Details of Automatic Monitoring Sites.

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
CM1	Belfast Centre AURN site Lombard Street	Urban Background	333898	374358	4.0	Nitrogen dioxide, sulphur dioxide, carbon monoxide, ozone and particulate matter (PM <sub>10</sub> and PM <sub>2.5</sub> )	N	Chemiluminescence, UV Fluorescence, IR Absorption, UV Absorption, TEOM (Tapered Element Oscillating Microbalance) with FDMS (Filter Dynamics Measurement System) Sharp Cut Cyclone for PM <sub>2.5</sub>	Y (monitoring site is located in a city centre pedestrian precinct)	30 m	Y
CM2	Belfast Ormeau Road	Roadside	334272	373012	1.3	Nitrogen dioxide	Y	Chemiluminescence	Y (6 m)	3 m	Y
CM3	Belfast Ballyhackamore	Roadside	337911	373972	1.3	Nitrogen dioxide	Y	Chemiluminescence	Y (7 m)	1.5 m	Y
CM4	Belfast Stockmans Lane	Roadside	331010	371252	3.5	Nitrogen dioxide and Particulate matter (PM <sub>10</sub> )	Y	Chemiluminescence Beta Attenuation Monitor	Y (8 m to façade of housing)	2 m	Y
CM5	Belfast Westlink Roden Street	Roadside	332617	373431	2.6	Nitrogen dioxide	Y	Chemiluminescence	Y (20 m)	5 m	Y

### **2.1.2 Non-Automatic Monitoring Sites.**

The government's risk and exposure-based approach to local air quality management means that Belfast City Council's principal focus has been on addressing citywide ambient nitrogen dioxide levels over recent years. Accordingly, in order to understand how nitrogen dioxide levels are varying across the city and in addition to our automatic analysers, the council operates a range of passive diffusion tubes for nitrogen dioxide at a range of both background and roadside locations across the city. These locations are detailed in Figure 2.2 and Table 2.2.

Diffusion tubes comprise a small clear plastic tube containing a chemical reagent supported on stainless steel grids that absorbs the pollutant directly from the surrounding ambient air. In this case, triethanolamine is used as the reagent to monitor levels of ambient nitrogen dioxide. Belfast City Council's diffusion tubes are exposed for successive four or five week periods, in general accordance with the Defra Diffusion Tube Monitoring Calendar and, as a result, they provide a good general indication of average nitrogen dioxide concentrations, thereby allowing a comparison with the annual mean objective.

To ensure that experimental error is minimised in the preparation and analysis of its nitrogen dioxide diffusion tubes, Belfast City Council has appointed Gradko to supply, analyse and report data for its diffusion tubes. Gradko employs a 20% triethanolamine solution for monitoring ambient nitrogen dioxide and adheres to the requirements of the government's 'Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for Laboratories and Users' publication.

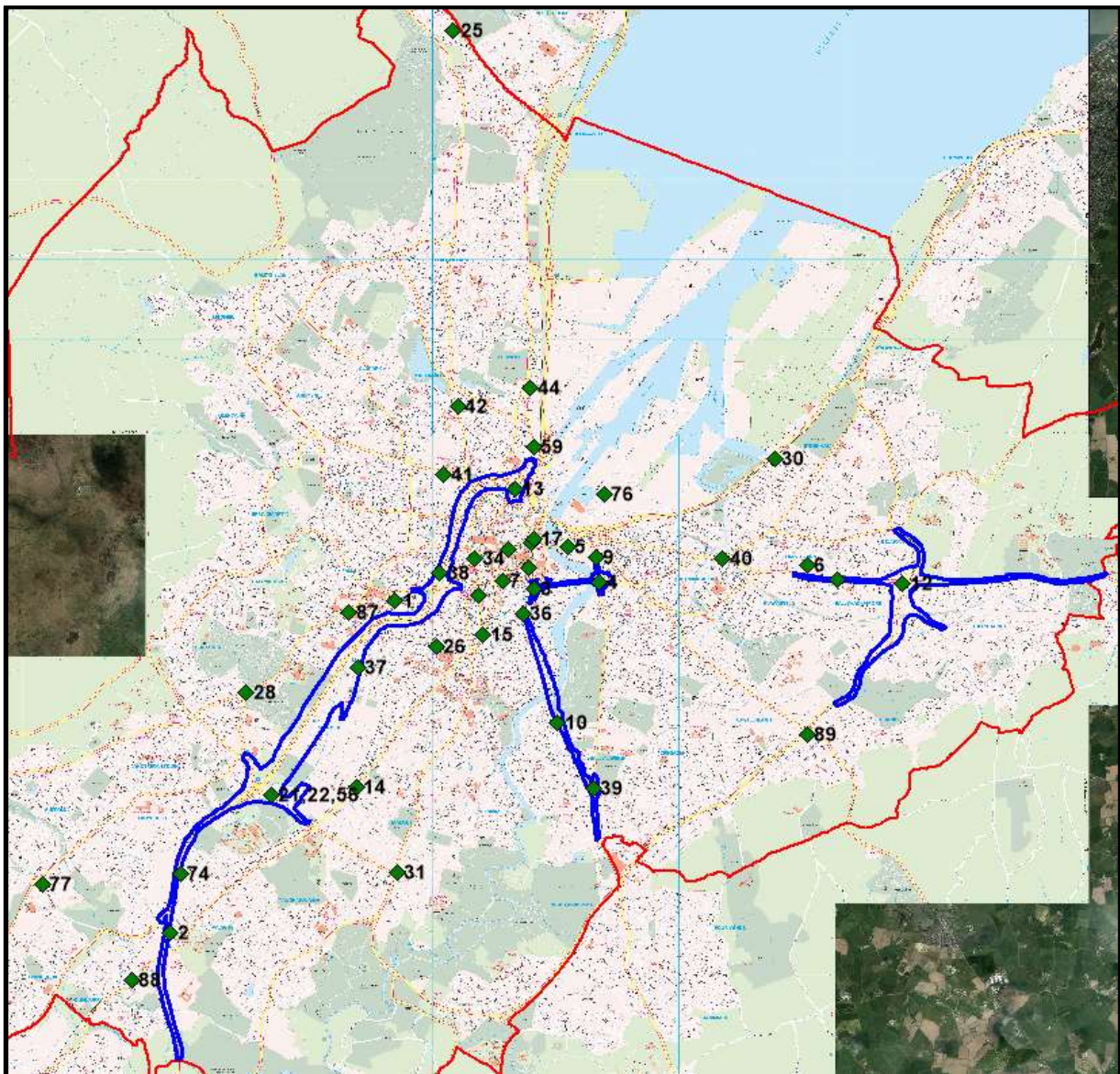
To further ensure that its diffusion tube monitoring data is as accurate as possible, the council co-locates a number of diffusion tubes with reference method compliant chemiluminescent nitrogen dioxide analysers at the Lombard Street, Newtownards Road and Stockmans Lane monitoring sites. This process allows a bias adjustment factor (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor) to be calculated that can be used to correct the diffusion tube monitoring data. In the case of diffusion tube data presented in this report and for consistency with previous Updating and Screening and Progress Reports, the



monitoring data has been corrected using a bias adjustment factor derived only from the co-location study at the Belfast Centre Lombard Street AURN site. The bias calculation and data scaling was undertaken using Defra's 'Bias Adjustment Factor Calculation' Spreadsheet Version 4. Outputs from the spreadsheet for treatment of Belfast City Council's 2018 data are included in Appendix A to this report. The outputs also show monthly nitrogen dioxide monitoring data for each diffusion tube site for 2018 where available.

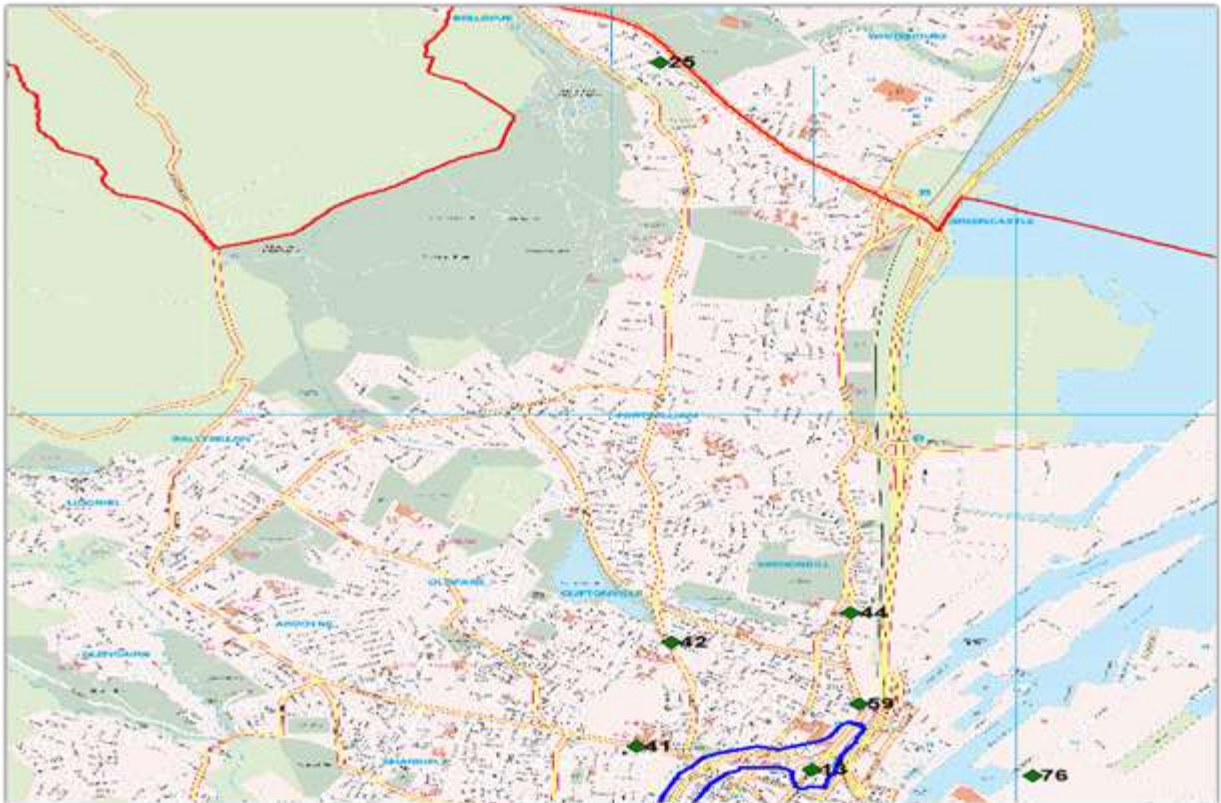
**Figure 2.2 – Location Maps of Non-Automatic Nitrogen Dioxide Monitoring Sites overlaid on the council's Air Quality Management Areas.**

**Belfast City.**

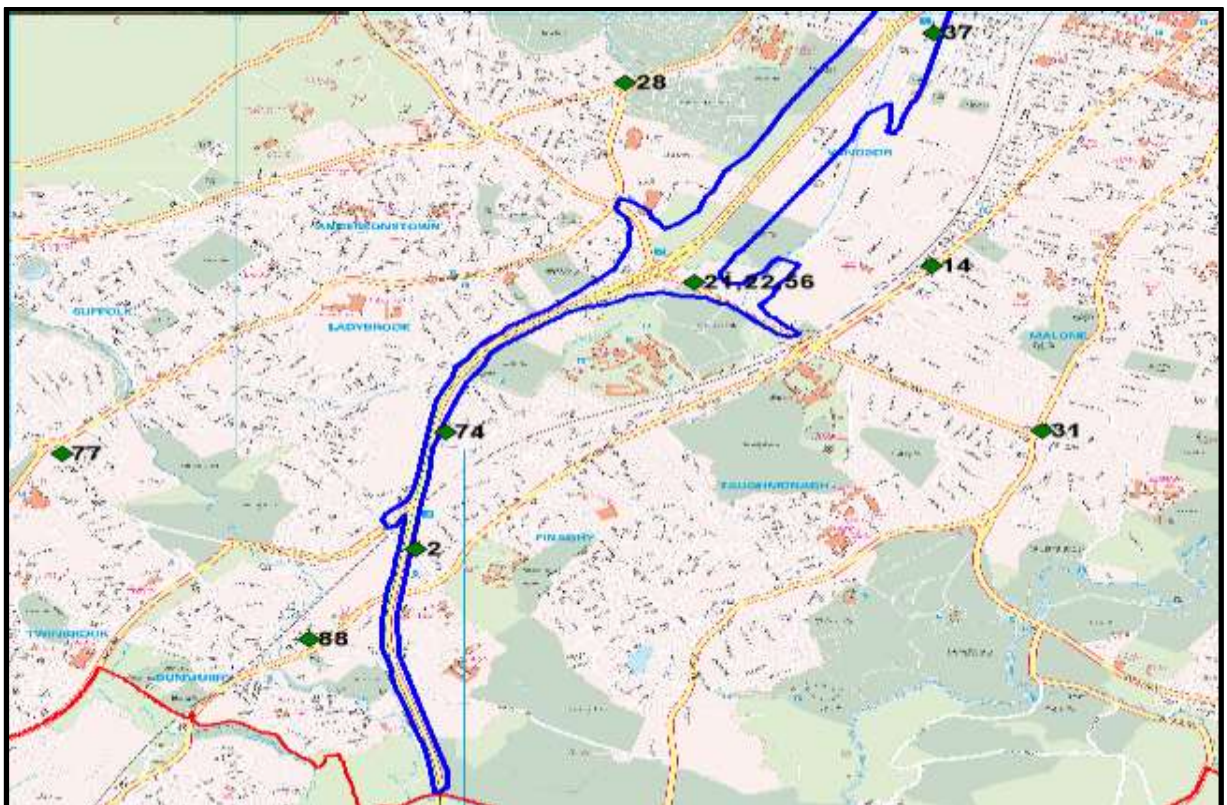




North Belfast.

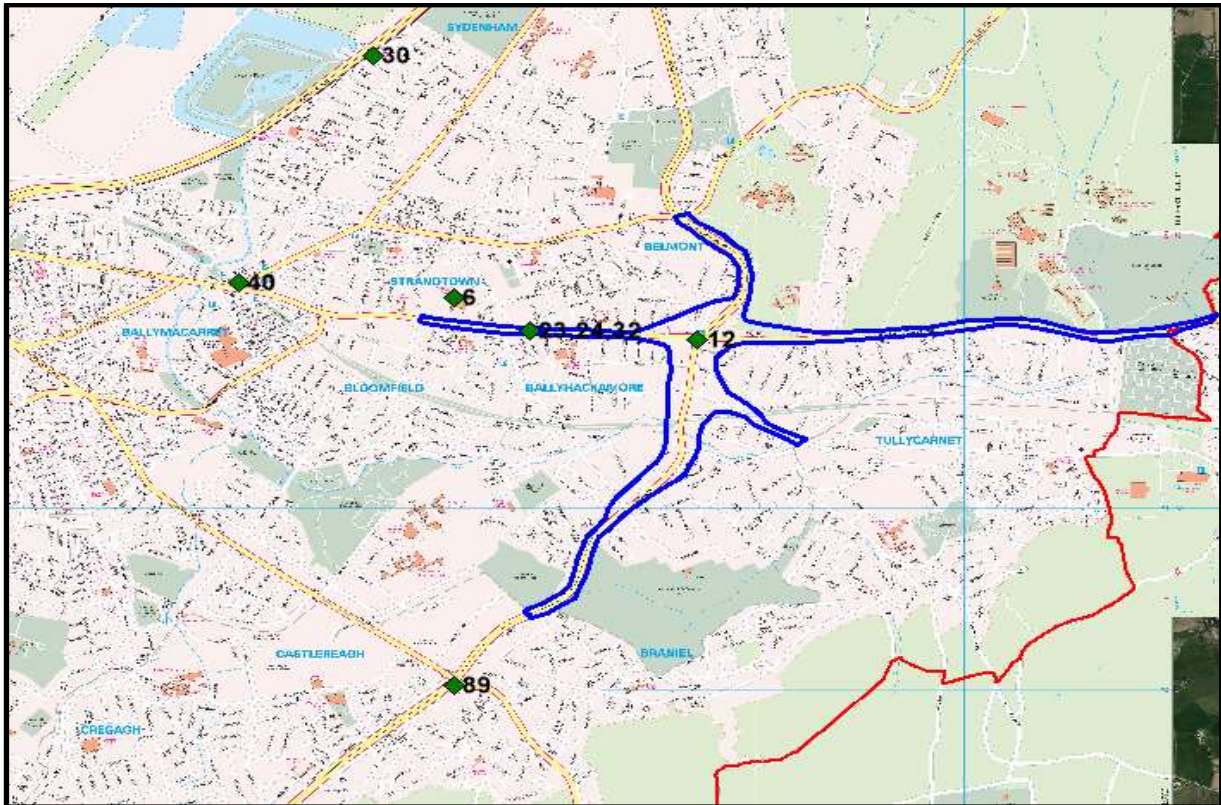


South and West Belfast.

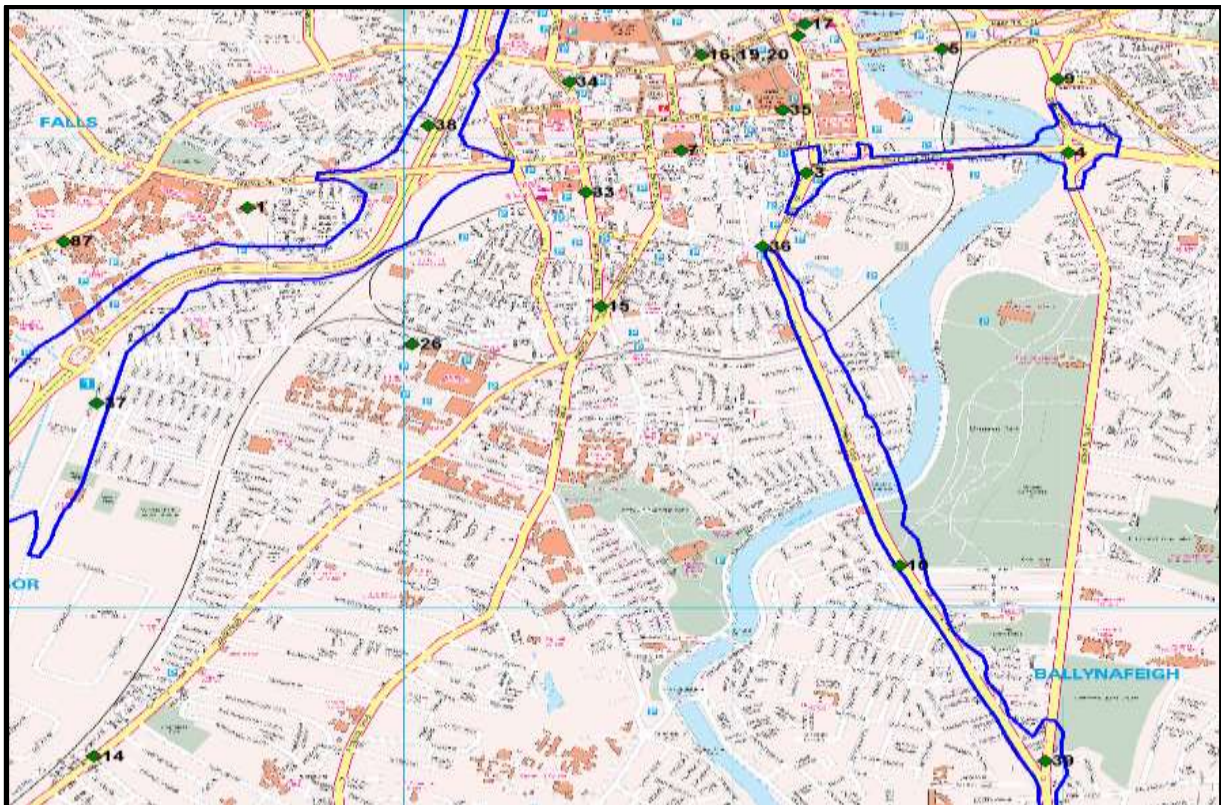




East Belfast.



Belfast City Centre.



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Table 2.2 – Details of Non- Automatic Monitoring Sites.

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
1	Royal Victoria Hospital	Urban Background	332522	373708	3.8	NO <sub>2</sub>	N	N	>70	>80	N/A
2	Black's Road	Roadside	329782	369522	2.7	NO <sub>2</sub>	Y	N	30	2	Y
3	61 Cromac Street	Roadside	334220	373853	3.0	NO <sub>2</sub>	Y	N	10	3	Y
4	Ravenhill Road	Roadside	335014	373942	3.0	NO <sub>2</sub>	Y	N	45	5	Y
5	Queen's Bridge	Roadside	334630	374385	3.0	NO <sub>2</sub>	N	N	10	1	Y
6	North Road	Urban Background	337551	374151	3.0	NO <sub>2</sub>	N	N	On School Wall	135	N/A
7	Donegall Square South	Roadside	333837	373950	3.5	NO <sub>2</sub>	N	N	N	4	Y
9	Short Strand	Roadside	334980	374254	3.2	NO <sub>2</sub>	N	N	21	1	Y
10	301 Ormeau Road	Roadside	334503	372176	3.0	NO <sub>2</sub>	Y	N	1	6	Y
12	Knock Road	Roadside	338718	373918	2.5	NO <sub>2</sub>	Y	N	17	1.5	Y
13	Great George's Street	Kerbside	333981	375102	3.0	NO <sub>2</sub>	Y	N	5	0.5	Y
14	Lisburn Road	Roadside	332056	371364	2.7	NO <sub>2</sub>	N	N	8	1.5	Y
15	Shaftesbury Square	Kerbside	333594	373283	2.7	NO <sub>2</sub>	N	N	N	2	Y
16,19,20	Lombard Street	Urban Background	333898	374358	3.5	NO <sub>2</sub>	N	Y	N	26	Y

**Belfast City Council – Northern Ireland**

<b>Site ID</b>	<b>Site Name</b>	<b>Site Type</b>	<b>X OS Grid Reference</b>	<b>Y OS Grid Reference</b>	<b>Site Height (m)</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Is Monitoring Co-located with a Continuous Analyser (Y/N)</b>	<b>Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)</b>	<b>Distance to Kerb of Nearest Road (m) (N/A if not applicable)</b>	<b>Does this Location Represent Worst-Case Exposure?</b>
17	Albert Clock	Roadside	334212	374489	3.1	NO <sub>2</sub>	N	N	3.5	2.5	Y
21,22,56	Stockmans Lane	Roadside	331007	371254	3.0	NO <sub>2</sub>	Y	Y	8	2	Y
23,24,32	Ballyhackamore	Roadside	337911	373972	3.0	NO <sub>2</sub>	Y	Y	36	1.5	Y
25	Whitewell Road	Roadside	333230	380877	2.7	NO <sub>2</sub>	N	N	5	1	Y
26	Donegall Road	Kerbside	333022	373122	2.7	NO <sub>2</sub>	N	N	2	1	Y
28	Falls Road and Andersonstown	Roadside	330707	372547	3.0	NO <sub>2</sub>	N	N	5	2	Y
30	Station Road	Roadside	337160	375482	2.7	NO <sub>2</sub>	N	N	20	2	Y
31	Malone Road	Roadside	332544	370283	3.0	NO <sub>2</sub>	N	N	18	2	Y
33	Great Victoria Street	Roadside	333548	373772	3.2	NO <sub>2</sub>	N	N	N	1.5	Y
34	College Square East	Roadside	333498	374241	3.0	NO <sub>2</sub>	N	N	3	3	Y
35	Chichester Street	Roadside	334147	374123	3.5	NO <sub>2</sub>	N	N	3	2	Y
36	Cromac & Ormeau Avenue	Kerbside	334085	373542	2.5	NO <sub>2</sub>	Y	N	3	1	Y
37	Glenmachan Street	Roadside	332063	372871	3.0	NO <sub>2</sub>	Y	N	1	2	Y
38	Crèche on M1/Westlink	Roadside	333069	374055	3.0	NO <sub>2</sub>	Y	N	7	1.5	Y

**Belfast City Council – Northern Ireland**

<b>Site ID</b>	<b>Site Name</b>	<b>Site Type</b>	<b>X OS Grid Reference</b>	<b>Y OS Grid Reference</b>	<b>Site Height (m)</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Is Monitoring Co-located with a Continuous Analyser (Y/N)</b>	<b>Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)</b>	<b>Distance to Kerb of Nearest Road (m) (N/A if not applicable)</b>	<b>Does this Location Represent Worst-Case Exposure?</b>
39	Ormeau Road (junction with Ravenhill Road)	Roadside	334943	371342	3.0	NO <sub>2</sub>	Y	N	3	2	Y
40	Upper Newtownards Road & Hollywood Road	Roadside	336519	374233	3.0	NO <sub>2</sub>	N	N	40	7	Y
41	Crumlin Road	Roadside	333116	375292	3.5	NO <sub>2</sub>	N	N	10	2	Y
42	228 Antrim Road	Roadside	333288	376143	2.7	NO <sub>2</sub>	N	N	3	2	Y
44	Shore Road (Ivan Street end)	Roadside	334174	376384	3.0	NO <sub>2</sub>	N	N	2.5	3.5	Y
59	York Street	Roadside	334214	375638	2.7	NO <sub>2</sub>	Y	N	5	2	Y
63	Queens Square	Kerbside	334192	374441	2.7	NO <sub>2</sub>	N	N	Building Façade	5	Y
74	Ardmore Park	Roadside	329908	370278	2.7	NO <sub>2</sub>	N	N	6	1.5	Y
76	Titanic Quarter	Roadside	335073	375049	2.7	NO <sub>2</sub>	N	N	3	1.5	Y
77	Poleglass	Roadside	328214	370138	2.7	NO <sub>2</sub>	N	N	5	1.5	Y
87	RVH Falls Road	Roadside	331962	373560	2.7	NO <sub>2</sub>	N	N	12	2	Y
88	Dunmurry Lane	Roadside	329305	368931	2.7	NO <sub>2</sub>	N	N	3	2	Y
89	Upper Knockbreda Rd	Kerbside	337547	372019	2.5	NO <sub>2</sub>	N	N	18	1	Y

## 2.2 Comparison of Monitoring Results with Air Quality Objectives.

### 2.2.1 Nitrogen Dioxide (NO<sub>2</sub>).

Automatic Monitoring Data.

Tables 2.3 and 2.4 summarise recent monitoring data from the council's nitrogen dioxide automatic analysers for 2018 and preceding years from 2014. In all cases, exceedences of the Air Quality Strategy Objectives are highlighted in bold. In addition, trends in annual mean monitoring data for nitrogen dioxide are summarised in Figure 2.3.

Annual mean concentrations at the Belfast Centre AURN site remain below the 40  $\mu\text{g}/\text{m}^3$  annual mean objective for nitrogen dioxide as denoted by the solid red line on the graph.

The Belfast Ormeau Road site experienced extensive problems with air conditioning during 2012 and 2013, which prevented the monitoring equipment from working to full capacity. As this was a recurring problem, a decision was made towards the end of 2013 to upgrade the site infrastructure. Taking account of procurement requirements and liaison with NIE, this upgrade took a considerable length of time, to the point that data capture from this site was such that it was considered unreliable to report for 2013. In addition, we would express some reservations about the reliability of the 2012 monitoring data, as it does not appear to follow any established trends. Following the site upgrade however, the annual mean concentration has remained reasonably constant at 27  $\mu\text{g}/\text{m}^3$  in 2014, 27  $\mu\text{g}/\text{m}^3$  in 2015, 28  $\mu\text{g}/\text{m}^3$  in 2016, 25  $\mu\text{g}/\text{m}^3$  in 2017 and 26  $\mu\text{g}/\text{m}^3$  in 2018.

On the basis of this data, which demonstrates nitrogen dioxide concentrations significantly below the annual mean air quality objective, the council will now consider the case for revoking the Ormeau Road Air Quality Management Area for exceedence of the nitrogen dioxide annual mean objective. Accordingly, the council will liaise with the Department for Agriculture, Environment and Rural Affairs and Department for Infrastructure regarding the potential revocation, although it is noted that monitoring data from the Ormeau Road site forms part of the calculation of the

Draft Programme for Government Framework 2016 – 2021 Indicator 37: Improve air quality.

From the data in Table 2.3, it can be seen that annual mean concentrations of nitrogen dioxide along the Upper Newtownards Road have remained in the range 29 – 35  $\mu\text{g}\text{m}^{-3}$  since 2014, meaning that the nitrogen dioxide annual mean objective is now being consistently achieved along the Upper Newtownards Road.

However, the Knock Road non-automatic roadside diffusion tube, located at the junction of the Upper Newtownards Road, Hawthornden Way and the Knock Road has recorded exceedences of the annual mean objective in previous years up until 2017. The 2017 calendar year was the first year when the annual mean concentration at the Knock Road junction was below the air quality objective (36  $\mu\text{g}\text{m}^{-3}$ ), which is also the case in 2018 (35  $\mu\text{g}\text{m}^{-3}$ ). The council will therefore continue to monitor nitrogen dioxide concentrations along the Upper Newtownards Road and at the junction with the Knock Road for a few further years in order to determine whether this improvement in ambient conditions is sustained and what implications it may have for the Air Quality Management Area.

Moreover, it should be noted that the Belfast Rapid Transit Glider commenced operation along this route from September 2018. In order to facilitate operation of the Glider, a bus lane has been established on the Upper Newtownards Road, Albertbridge Road and East Bridge Street, which operates from 07.00 to 19.00, Monday to Saturday. Glider operations together with introduction of the bus lane is likely to have had a beneficial impact on traffic movements and pollution levels along the Upper Newtownards Road, Albertbridge Road and East Bridge Street.

Unfortunately though, despite the completion of significant structural improvements to the M1 Motorway and A12 Westlink corridor, nitrogen dioxide concentrations along Stockmans Lane continue to significantly exceed the 40  $\mu\text{g}\text{m}^{-3}$  annual mean objective, with levels typically averaging around 50  $\mu\text{g}\text{m}^{-3}$  over the last three years. There are a number of residential premises located directly adjacent to the carriageway at Stockmans Lane necessitating continuation of the Air Quality Management Area at this location.

## Belfast City Council – Northern Ireland

Although the nitrogen dioxide annual mean objective has not been exceeded at the Westlink Roden Street since 2011, concentrations monitored during 2018 increased slightly, resulting in an annual mean of  $40\mu\text{g}\text{m}^{-3}$ .

Therefore, the council will continue its monitoring within the Westlink Corridor / M1 Air Quality Management Area until a more definitive understanding of nitrogen dioxide concentrations and trends emerges.

Historically, modelled and monitored exceedences of the 1-hour mean objective for nitrogen dioxide were encountered only in the vicinity of the M1 Motorway / A12 Westlink corridor. As a result, this is the only Air Quality Management Area within Belfast that has been declared on the basis of exceedences of the 1-hour objective.

From ambient monitoring data for Stockmans Lane, as summarised in Table 2.4, it can be seen that the number of exceedences of the hourly objective has substantially decreased over recent years, now demonstrating compliance with the  $200\mu\text{g}\text{m}^{-3}$  objective, not to be exceeded more than 18 times per year - since 2013. As there are residential properties located directly adjacent to the carriageway at Stockmans Lane and most of these properties have gardens facing onto the roadway, thereby providing for short-term relevant public exposure, we will continue to monitor at this location in order to identify any further exceedences and establish trends.

**Table 2.3 – Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with annual mean Objective.**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2018 % <sup>b</sup>	Annual Mean Concentration (µg/m <sup>3</sup> )				
					2014* <sup>c</sup>	2015* <sup>c</sup>	2016* <sup>c</sup>	2017* <sup>c</sup>	2018 <sup>c</sup>
Belfast Centre	Urban Background	N	95	95	30.1	29.0	29.0	25.0	27
Belfast Ormeau Road	Roadside	Y	96	96	27.0	27.0	28.0	25.0	26
Belfast Ballyhackamore	Roadside	Y	100	100	35.0	33.0	35.0	31.0	29
Belfast Stockmans Lane	Roadside	Y	97	97	<b>56.0</b>	<b>50.0</b>	<b>50.0</b>	<b>52.0</b>	<b>49</b>
Belfast Westlink Roden Street	Roadside	Y	100	100	35.0	34.0	39.0	34.0	40

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40µg/m<sup>3</sup>

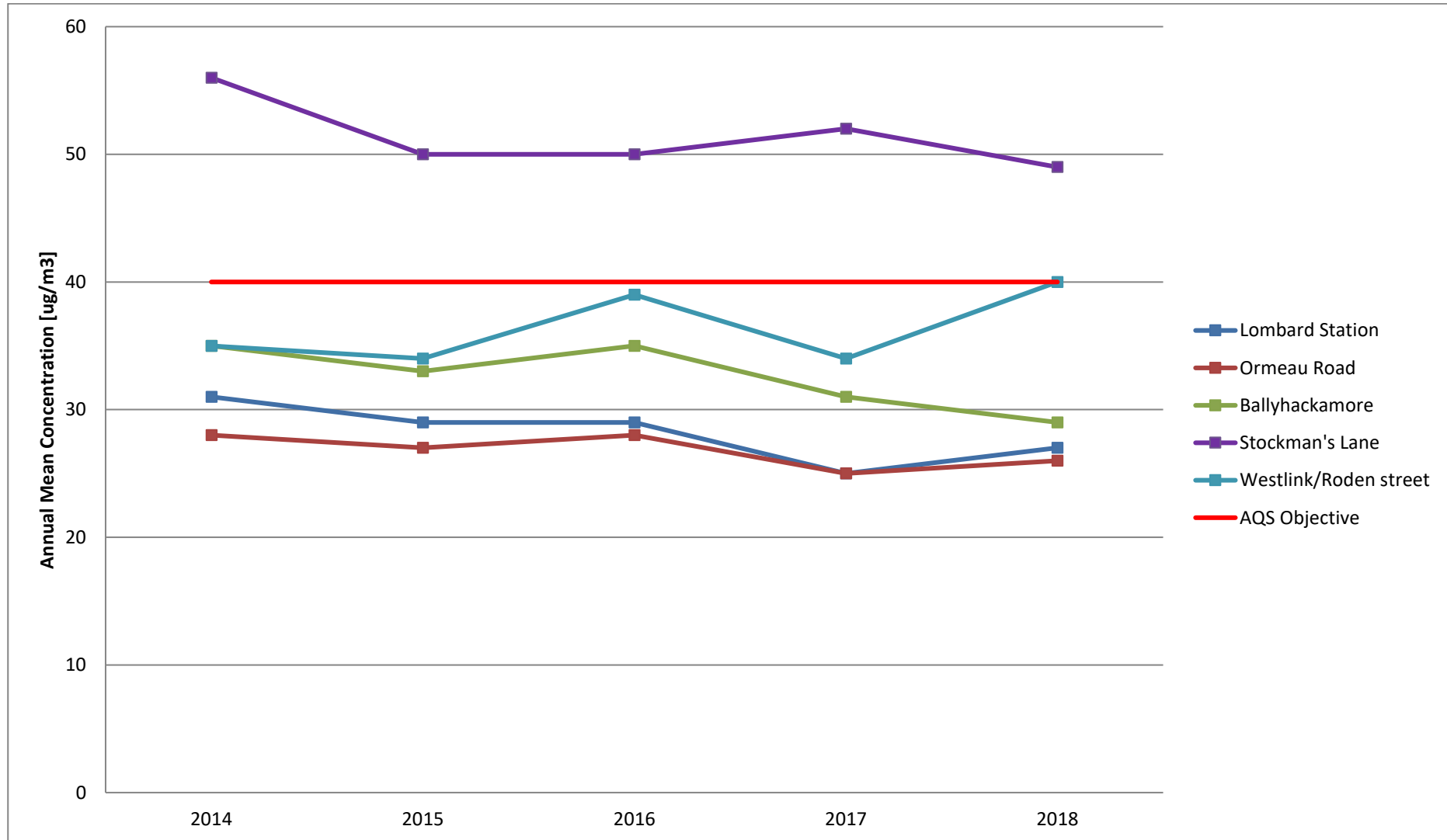
<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> Means should be “annualised” as in Boxes 7.9 and 7.10 of LAQM.TG16, if valid data capture is less than 75%

\* Annual mean concentrations for previous years are optional

Figure 2.3 – Trends in Annual Mean NO<sub>2</sub> Concentrations Measured at Automatic Monitoring Sites.





**Table 2.4 – Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with the 1-hour mean objective.**

Site ID	Site Type	Within AQMA ?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2018 % <sup>b</sup>	Number of Hourly Means > 200µg/m <sup>3</sup>				
					2014* <sup>c</sup>	2015* <sup>c</sup>	2016* <sup>c</sup>	2017* <sup>c</sup>	2018 <sup>c</sup>
Belfast Centre	Urban Background	N	95	95	0	0	1	1	0
Belfast Ormeau Road	Roadside	Y	96	96	0(98)	0	2	0	0
Belfast Ballyhackamore	Roadside	Y	100	100	2	0	1	0	0
Belfast Stockmans Lane	Roadside	Y	97	97	14	7	10	2	3
Belfast Westlink Roden Street	Roadside	Y	100	100	0	2	1	0	0

**In bold**, exceedence of the NO<sub>2</sub> hourly mean AQS objective (200 µg/m<sup>3</sup> – not to be exceeded more than 18 times per year)

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> If the data capture for full calendar year is less than 90%, include the 99.8<sup>th</sup> percentile of hourly means in brackets

\* Number of exceedences for previous years is optional

Diffusion Tube Monitoring Data.

In order to obtain a better understanding of how levels of nitrogen dioxide are varying across the city over time and to investigate those locations where previous rounds of the review and assessment process have highlighted areas of concern, Belfast City Council has placed 47 diffusion tubes at 41 relevant locations across the city. Data from these tubes for 2018 has been summarised in Table 2.5 alongside historical data where it is available in Table 2.6.

In terms of the outcome of the 2018 nitrogen dioxide diffusion tube monitoring, it is noted that the concentrations have slightly increased in comparison to the 2017 monitoring year's results at most locations. Annual mean exceedences during 2018 occurred at Great George's Street ( $44 \mu\text{g}/\text{m}^3$ ), and Stockmans Lane ( $48 \mu\text{g}/\text{m}^3$  – adjusted (triplicates) tubes mean,  $49 \mu\text{g}/\text{m}^3$  – automatic analyser mean). Both are located within existing the M1 Motorway / A12 Westlink Air Quality Management Area and have been the subject of mitigation measures for some time. Nevertheless, Defra NO<sub>2</sub> distance calculations have been provided for the above locations to calculate concentrations at relevant receptor locations. (Appendix B).

Exceedences also occurred at the Chichester Street ( $41 \mu\text{g}/\text{m}^3$ ) monitoring location, which is not currently declared as Air Quality Management Area. Further assessment was undertaken using the Defra NO<sub>2</sub> distance calculator to confirm if this exceedence applies at relevant receptor locations.

The calculated results, as provided in Appendix B, indicate that during 2018, nitrogen dioxide concentrations were below the annual mean objective in relation to relevant receptor locations. It is therefore not considered necessary to undertake a detailed assessment for these locations.

Table 2.5 – Results of NO<sub>2</sub> Diffusion Tubes 2018.

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2018 (Number of Months or %) <sup>a</sup>	2018 Annual Mean Concentration (µg/m <sup>3</sup> ) - Bias Adjustment factor = 0.86 <sup>b</sup>
1	Royal Victoria Hospital	Urban Background	N	N	100%	20
2	Black's Road	Roadside	Y	N	100%	36
3	61 Cromac Street	Roadside	Y	N	100%	30
4	Ravenhill Road	Roadside	Y	N	92%	27
5	Queen's Bridge	Roadside	N	N	83%	26
6	North Road	Urban Background	N	N	<b>67%</b>	12
7	Donegall Square South	Roadside	N	N	100%	31
9	Short Strand	Roadside	N	N	100%	40
10	301 Ormeau Road	Roadside	Y	N	100%	28
12	Knock Road	Roadside	Y	N	83%	35
13	Great George's Street	Kerbside	Y	N	100%	<b>44</b>
14	Lisburn Road	Roadside	N	N	100%	26
15	Shaftesbury Square	Kerbside	N	N	92%	32
16,19,20	Lombard Street	Urban Centre	N	Y	100%	25
17	Albert Clock	Roadside	N	N	92%	39
21,22,56	Stockmans Lane	Roadside	Y	Y	100%	<b>48</b>
23,24,32	Ballyhackamore	Roadside	Y	Y	92%	24

Belfast City Council – Northern Ireland

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2018 (Number of Months or %) <sup>a</sup>	2018 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = <b>0.86<sup>b</sup></b>
25	Whitewell Road	Roadside	N	N	83%	23
26	Donegall Road	Kerbside	N	N	100%	31
28	Falls Road and Andersonstown	Roadside	N	N	100%	27
30	Station Road	Roadside	N	N	92%	26
31	Malone Road	Roadside	N	N	<b>67%</b>	33
33	Great Victoria Street	Roadside	N	N	100%	35
34	College Square East	Roadside	N	N	100%	33
35	Chichester Street	Roadside	N	N	92%	<b>41</b>
36	Cromac & Ormeau Avenue	Kerbside	Y	N	83%	32
37	Glenmachan Street	Roadside	Y	N	83%	36
38	Crèche on M1/Westlink	Roadside	Y	N	100%	27
39	Ormeau Road (junction with Ravenhill Road)	Roadside	Y	N	83%	31
40	Upper Newtownards Road & Hollywood Road	Roadside	N	N	83%	26
41	Crumlin Road	Roadside	N	N	83%	28
42	228 Antrim Road	Roadside	N	N	100%	33

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2018 (Number of Months or %) <sup>a</sup>	2018 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.86 <sup>b</sup>
44	Shore Road (Ivan Street end)	Roadside	N	N	100%	28
59	York Street	Roadside	Y	N	100%	38
63	Queens Square	Kerbside	N	N	92%	35
74	Ardmore Park	Roadside	N	N	92%	32
76	Titanic Quarter	Roadside	N	N	100%	24
77	Poleglass	Roadside	N	N	75%	26
87	RVH Falls Road	Roadside	N	N	92%	35
88	Dunmurry Lane	Roadside	N	N	100%	25
89	Upper Knockbreda Rd	Roadside	N	N	100%	33

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Underlined, annual mean > 60 $\mu\text{g}/\text{m}^3$ , indicating a potential exceedence of the NO<sub>2</sub> hourly mean AQS objective

<sup>a</sup> Means should be “annualised” as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

<sup>b</sup> If an exceedence is measured at a monitoring site not representative of public exposure, NO<sub>2</sub> concentration at the nearest relevant exposure should be estimated based on the “[NO<sub>2</sub> fall-off with distance](http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html)” calculator (<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>), and results should be discussed in a specific section. The procedure is also explained in paragraphs 7.77 to 7.79 of LAQM.TG16.

Table 2.6 – Results of NO<sub>2</sub> Diffusion Tubes (2014 to 2018).

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m <sup>3</sup> ) - Adjusted for Bias <sup>a</sup>				
			2014 (Bias Adjustment Factor = 0.95)	2015 (Bias Adjustment Factor = 0.96)	2016 (Bias Adjustment Factor = 0.89)	2017 (Bias Adjustment Factor = 0.78)	2018 (Bias Adjustment Factor = 0.86)
1	Royal Victoria Hospital	N	23	22	22	18	20
2	Black's Road	Y	<b>42</b>	<b>43</b>	40	36	36
3	61 Cromac Street	Y	<b>42</b>	39	37	31	30
4	Ravenhill Road	Y	30	33	31	26	27
5	Queen's Bridge	N	34	31	30	25	26
6	North Road	N	15	16	17	14	12
7	Donegall Square South	N	38	34	33	29	31
9	Short Strand	N	<b>47</b>	<b>45</b>	<b>44</b>	39	40
10	301 Ormeau Road	Y	35	34	32	27	28
12	Knock Road	Y	<b>47</b>	<b>42</b>	<b>41</b>	36	35
13	Great George's Street	Y	<b>50</b>	<b>47</b>	<b>50</b>	36	<b>44</b>
14	Lisburn Road	N	30	27	28	26	26
15	Shaftesbury Square	N	38	34	34	31	32
16,19,20	Lombard Street	N	32	29	28	25	25
17	Albert Clock	N	<b>47</b>	<b>42</b>	38	33	39

Belfast City Council – Northern Ireland

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup>				
			2014 (Bias Adjustment Factor = 0.95)	2015 (Bias Adjustment Factor = 0.96)	2016 (Bias Adjustment Factor = 0.89)	2017 (Bias Adjustment Factor = 0.78)	2018 (Bias Adjustment Factor = 0.86)
21,22,56	Stockmans Lane	Y	<b>55</b>	<b>49</b>	<b>49</b>	<b>50</b>	<b>48</b>
23,24,32	Ballyhackamore	Y	35	34	36	31	24
25	Whitewell Road	N	33	25	23	20	23
26	Donegall Road	N	36	33	33	28	31
28	Falls Road and Andersonstown	N	29	27	29	25	27
30	Station Road	N	24	25	26	23	26
31	Malone Road	N	<b>45</b>	39	36	35	33
33	Great Victoria Street	N	<b>42</b>	40	39	34	35
34	College Square East	N	40	33	32	31	33
35	Chichester Street	N	<b>49</b>	<b>43</b>	<b>44</b>	36	<b>41</b>
36	Cromac & Ormeau Avenue	Y	36	34	33	30	32
37	Glenmachan Street	Y	<b>43</b>	40	39	28	36
38	Crèche on M1/Westlink	Y	35	30	34	24	27
39	Ormeau Road (junction with Ravenhill Road)	Y	30	31	32	29	31

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup>				
			2014 (Bias Adjustment Factor = 0.95)	2015 (Bias Adjustment Factor = 0.96)	2016 (Bias Adjustment Factor = 0.89)	2017 (Bias Adjustment Factor = 0.78)	2018 (Bias Adjustment Factor = 0.86)
40	Upper Newtownards Road & Hollywood Road	N	29	28	27	25	26
41	Crumlin Road	N	34	30	32	26	28
42	228 Antrim Road	N	<b>41</b>	37	36	29	33
44	Shore Road (Ivan Street end)	N	34	30	30	28	28
59	York Street	Y	<b>48</b>	39	<b>41</b>	32	38
63	Queens Square	N	40	38	36	32	35
74	Ardmore Park	N	-	35	36	31	32
76	Titanic Quarter	N	-	-	26	21	24
77	Poleglass	N	-	-	26	24	26
87	RVH Falls Road	N	-	-	31	33	35
88	Dunmurry Lane	N	-	-	-	23	25
89	Upper Knockbreda Rd	N	-	-	-	35	33

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40  $\mu\text{g}/\text{m}^3$

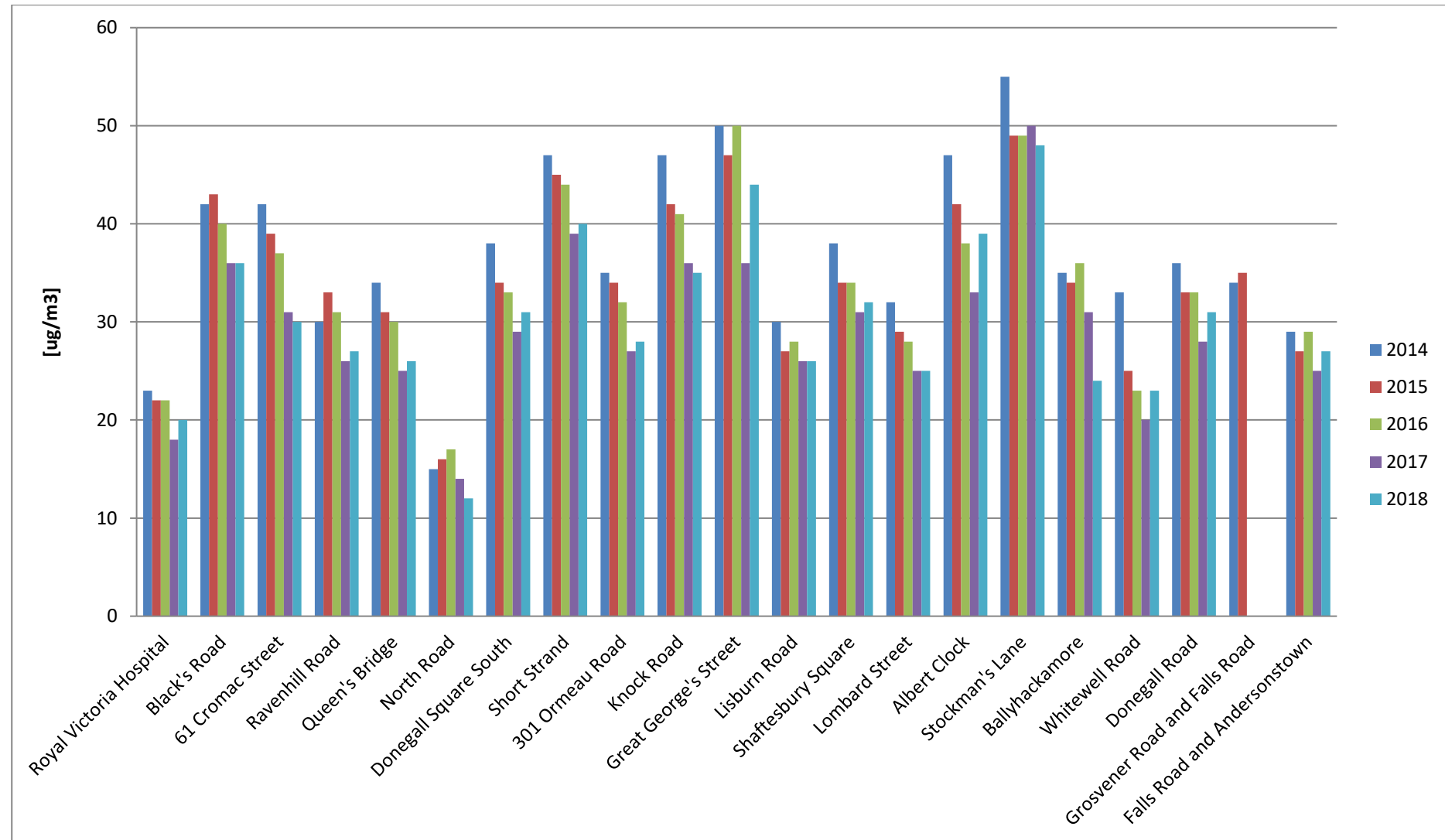
Underlined, annual mean > 60  $\mu\text{g}/\text{m}^3$ , indicating a potential exceedence of the NO<sub>2</sub> hourly mean AQS objective

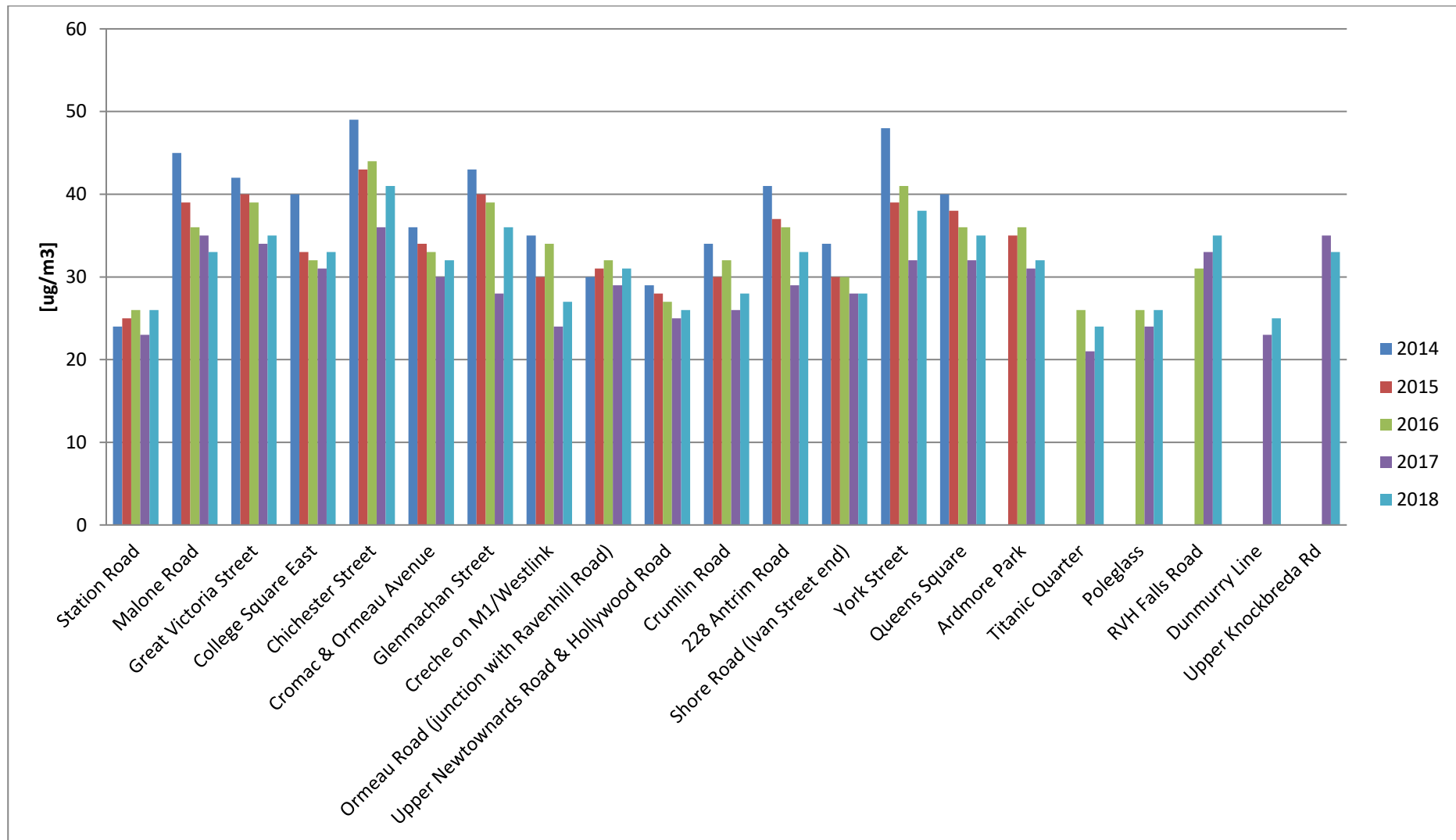
<sup>a</sup> Means should be “annualised” as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%



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

The following two graphs show trends in nitrogen dioxide annual mean diffusion tube data from 2014 where such data exists.





### **2.2.2 Particulate Matter (PM<sub>10</sub>).**

As a result of a historic reliance upon solid fuel for domestic heating, Belfast used to experience frequent exceedences of the 24-hour and annual mean objectives for particulate matter (PM<sub>10</sub>) across the city. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, emissions of particulate matter have decreased significantly since around 2000. As a result, the council was able to decommission its Belfast Clara Street particulate matter monitoring site in east Belfast in 2007.

However, as domestic and industrial emissions were addressed, so emissions of particulate matter from road transport along the M1 Motorway and A12 Westlink corridor gained in prominence. Upon completion of the council's first review and assessment of air quality in 2004, it was concluded that the M1 Motorway and A12 Westlink corridor should be declared as an Air Quality Management Area on the basis of modelled and monitored exceedences of the 24-hour and annual mean objectives for particulate matter.

As embodied in the subsequent 2006 Air Quality Action Plan for Belfast, a range of structural improvements, designed to relieve traffic congestion, were completed for the M1 Motorway and A12 Westlink. As a result, monitored levels of particulate matter began to decline within this Air Quality Management Area. Monitoring data for this site is summarised and reviewed in Tables 2.7, 2.8 and in Figure 2.5.

In terms of exceedences of the 40 µg<sub>m</sub><sup>-3</sup> particulate matter annual mean objective, there have been no exceedences of the annual mean objective within this AQMA since 2008. Monitoring data from the Belfast Westlink site at Roden Street, which was established in 2010 and is located within the M1 Motorway / A12 Westlink Air Quality Management Area, indicated no exceedences of particulate matter objectives up until 2014 whereupon PM<sub>10</sub> monitoring was discontinued. Particulate matter monitoring continues however at the Stockmans Lane site.

## Belfast City Council – Northern Ireland

Reflecting upon the particulate matter 24-hour mean objective data, as summarised in Table 2.8, the data has remained comfortably below the objective at all sites during recent years.

On the basis of historical monitoring data, which demonstrated sustained improvements in particulate matter, the council revoked the M1 Motorway / A12 Westlink Air Quality Management Area for exceedences of the particulate matter annual and 24-hour mean objectives in September 2015.

Furthermore, 2018 results, with an annual mean average of  $15 \mu\text{g}/\text{m}^3$  recorded at the Stockmans Lane site, indicates continuing significant decreases in  $\text{PM}_{10}$  concentrations within the M1 Motorway / A12 Westlink Air Quality Management Area.

Moreover, automatic monitoring stations at both Lombard Street and Stockmans Lane have not recorded any recent exceedences of the particulate matter 24-hour mean objective of  $50 \mu\text{g}/\text{m}^3$ .

**Table 2.7 – Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with the Annual Mean Objective.**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2018 % <sup>b</sup>	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m <sup>3</sup>				
						2014* <sup>c</sup>	2015* <sup>c</sup>	2016* <sup>c</sup>	2017* <sup>c</sup>	2018 <sup>c</sup>
Belfast Centre Lombard Street	Urban Background	N	85	85	Y	16	14	16	12	16
Belfast Stockmans Lane	Roadside	Y	95	95	Y	21	21	22	21	15

**In bold**, exceedence of the PM<sub>10</sub> annual mean AQS objective of 40µg/m<sup>3</sup>

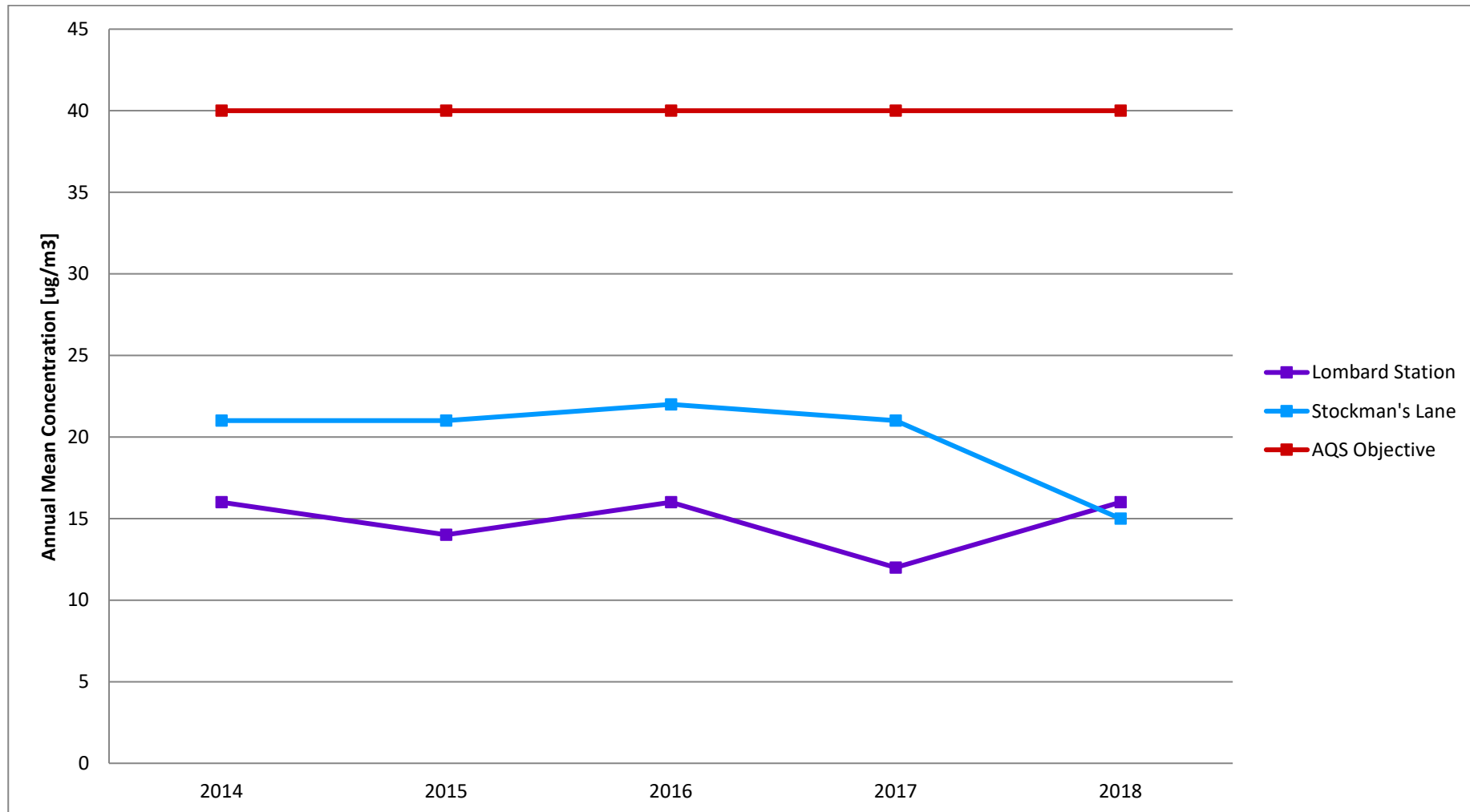
<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> Means should be “annualised” as in Boxes 7.9 and 7.10 of LAQM.TG16, if valid data capture is less than 75%

\* Annual mean concentrations for previous years are optional

Figure 2.5 – Trends in Annual Mean PM<sub>10</sub> Concentrations at Belfast monitoring sites 2014-2018.



**Table 2.8 – Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour Mean Objective.**

Site ID	Site Type	Within AQMA ?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2018 % <sup>b</sup>	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m <sup>3</sup> )				
						2014* <sup>c</sup>	2015* <sup>c</sup>	2016* <sup>c</sup>	2017* <sup>c</sup>	2018 <sup>c</sup>
Belfast Centre Lombard Street	Urban Background	N	85	85	Y	5	3	7	1(22)	0
Belfast Stockmans Lane	Roadside	Y	95	95	Y	4	4	3	2	0

**In bold**, exceedence of the PM<sub>10</sub> daily mean AQS objective (50µg/m<sup>3</sup> – not to be exceeded more than 35 times per year)

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> if data capture for full calendar year is less than 85%, include the 90.4<sup>th</sup> percentile of 24-hour means in brackets

\* Number of exceedences for previous years is optional.

### **2.2.3 Sulphur Dioxide (SO<sub>2</sub>).**

As a result of a historic reliance upon solid fuel for domestic heating, Belfast City used to experience frequent and widespread exceedences of the 15-minute, 1-hour and 24-hour mean objectives for sulphur dioxide. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, levels of sulphur dioxide have decreased dramatically since 2000. There have been no exceedences of any sulphur dioxide objective in the city since 2002. Sustained low levels of sulphur dioxide have meant that the council has been able to terminate ambient monitoring at all locations with the exception of the Belfast Centre AURN site at Lombard Street. No Air Quality Management Areas have been declared for sulphur dioxide across Belfast.

Recent sulphur dioxide monitoring data from the Belfast Centre site is summarised in Table 2.9. As indicated, no exceedence of any objective was observed during 2018.



**Table 2.9 – Results of Automatic Monitoring for SO<sub>2</sub>: Comparison with Objectives.**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2018 % <sup>b</sup>	Number of Exceedances (percentile in bracket µg/m <sup>3</sup> ) <sup>c</sup>		
					15-minute Objective (266 µg/m <sup>3</sup> )	1-hour Objective (350 µg/m <sup>3</sup> )	24-hour Objective (125 µg/m <sup>3</sup> )
Belfast Centre Lombard Street	Urban Background	N	97	97	0	0	0

**In bold**, exceedence of the relevant AQS objective (15-min mean = 35 allowed/year; 1-hour mean = 24 allowed/year; 24-hour mean = 3 allowed/year)

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> if data capture for full calendar year is less than 85%, include the relevant percentile in bracket (in µg/m<sup>3</sup>): 15-min mean = 99.9<sup>th</sup> ; 1-hour mean = 99.7<sup>th</sup> ; 24-hour mean = 99.2<sup>th</sup> percentile

**2.2.4 Benzene.**

Benzene concentrations have been monitored at the Belfast Centre and Belfast Roadside sites since 2002. The Belfast Centre site monitors benzene exposure for the City Centre whilst the Belfast Roadside site monitored benzene concentrations at a roadside location on the Upper Newtownards Road. Whilst monitoring concluded at the Belfast Roadside site in October 2007, no exceedences of the 2010 Air Quality Strategy objective (3.25 µg/m<sup>-3</sup> annual mean) or the 2010 EU Limit Value (5 µg/m<sup>-3</sup> annual mean) for benzene have been recorded in Belfast since 2002.

Previous rounds of R&A and monitored results going back to 2014, provided in Table 3.0 below, confirm that there has been no exceedence of the running annual mean of 3.25 µg m<sup>-3</sup> for benzene within Belfast. Therefore, a Detailed Assessment is not considered necessary.

**Table 3.0: Results of monitoring for benzene: Annual mean levels for the Belfast Centre Lombard Street site 2014 – 2018.**

Site ID	Site type	Within AQMA?	Valid Data Capture 2018%	Running annual mean concentrations (µg/m <sup>3</sup> )				
				2014	2015	2016	2017	2018
Belfast Centre	Urban Background	N	100	0.64	0.54	0.49	0.46	0.45

**2.2.5 Summary of Compliance with AQS Objectives.**

Belfast City Council has examined the results from monitoring within its district. Concentrations of ambient pollutants, as prescribed in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, outside of existing Air Quality Management Areas, are all below the objectives at relevant receptor locations. It is therefore the council's view that there is no need to proceed to a Detailed Assessment at this time.

However, the council will continue to monitor ambient conditions across the city in order to confirm that recent improvements in air quality are sustained and that those locations where poor air quality persists are addressed.

## **3 New Local Developments.**

### **3.1 Road Traffic Sources.**

The following road traffic sources which may have an impact on air quality have been considered since the last Progress Report:

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Progress Report.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2017 Progress Report, there is no need to proceed to a Detailed Assessment.

### **3.2 Other Transport Sources.**

The following additional transport sources, which may have an impact on air quality, have been considered since the 2017 Progress Report.

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2017 Progress Report, there is no need to proceed to a Detailed Assessment.

### 3.3 Industrial Sources.

The following industrial sources which may have an impact on air quality have been considered since the last Progress Report:

- **Industrial installations:** new or proposed installations for which an air quality assessment has been carried out.
- **Industrial installations:** existing installations where emissions have increased substantially or new relevant exposure has been introduced.
- **Industrial installations:** new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2017 Progress Report 2017, there is no need to proceed to a Detailed Assessment.

### 3.4 Commercial and Domestic Sources.

The following commercial and domestic sources which may have an impact on air quality have been considered since the last Updating and Screening Assessment:

- Biomass combustion plant –individual installations.
- Areas where the combined impact of several biomass combustion sources may be relevant.
- Areas where domestic solid fuel burning may be relevant.
- Combined Heat and Power (CHP) plant.

Belfast City Council confirms that the above installations are considered as a part of the council's planning process. Where necessary, an Air Quality Impact Assessment is requested to demonstrate that the proposal will not have an impact on localised air quality or relevant receptors. Further information on planning applications, which required an Air Quality Impact Assessment, is provided in Section 4 of this report.

The Assessments submitted to date have demonstrated that proposed developments would not have a significant adverse impact on air quality in the vicinity of the development sites. Accordingly, there is no need to proceed to a Detailed Assessment.

### **3.5 New Developments with Fugitive or Uncontrolled Sources.**

The following new developments with fugitive or uncontrolled sources, which may have an impact on air quality, have been considered since the last Progress Report:

- Landfill sites.
- Quarries.
- Unmade haulage roads on industrial sites.
- Waste transfer stations, etc.
- Other potential sources of fugitive particulate matter emissions.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2017 Progress Report, there is no need to proceed to a Detailed Assessment.

Belfast City Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area. Belfast City Council further confirms that all the following sources have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

## 4 Planning Applications.

During 2018, Belfast City Council’s Environmental Protection, Public Health and Housing Unit considered numerous planning applications for developments that had a potential to negatively impact upon air quality.

Detailed or screening air quality impact assessments were requested for all of the proposed developments that in the council’s view had the potential to have a negative impact on air quality or to introduce new receptors into an existing area of poor air quality.

A summary of Planning Applications and Air Quality Impact Assessments (AQIA) submitted or requested during 2018, in support of larger developments is presented in the following Table 4.1.

**Table 4.1 Major new developments that had a potential to have a negative impact on air quality in the 2018 period.**

Location	Development description	Outcomes of air quality impact assessment
Bostock House, Royal Victoria Hospital, 274 Grosvenor Road Belfast BT12 6BA	A new children's hospital and associated infrastructure incorporating the demolition of Bostock House.	<p>The assessment of the construction phase of the development has demonstrated that with the implementation of proposed mitigation measures, which are in line with the IAQM’s guidance, the impact of the construction phase is predicted to be negligible.</p> <p>A final Dust Management Plan is to be submitted to Belfast Planning Authority for review and written approval.</p>
West of existing Children's Hospitals Royal Group Of Hospitals site Belfast BT12 6BA	Demolition of buildings and provision of temporary plant, service road and associated site works.	<p>All air pollution sources (road sources and combustion plant) applicable to the development have been considered within the assessment. The assessment has demonstrated that contribution from the proposed combustion plant (four gas boilers, each rated at 1.457 MW heat output) is predicted to be insignificant in terms of annual and hourly mean nitrogen dioxide concentrations.</p> <p>The cumulative modelling results have demonstrated that the development will not have an adverse impact on air quality in the vicinity of the site and there will be no</p>

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
		significant air quality impact on relevant receptors.
Lands at 88 - 104 Andersonstown Road and between 36 - 42 Mooreland Park and 202 - 206 Stockmans Lane	Re-development of Casement Park to provide a new Stadium (Capacity of 34578). Development comprises: demolition of the existing facilities; construction of new pitch, boundary wall and stands, incorporating bar/restaurant & ancillary kitchen areas, conference, training, community and cultural heritage and education facilities, ancillary offices, player accommodation and welfare facilities, press/media & broadcast facilities, replacement floodlighting, stadium/event management suite, ground support facilities including new arrangements for vehicles and pedestrians, electronic display installations, storage, surface and undercroft car parking, hard and soft landscaping, new landscaped pedestrian access from Mooreland Park to Stockmans Lane. Use of the stadium for up to three outdoor music concerts in any calendar year	A revised AQIA was received and reviewed by this Service. A final response is due to be issued.
Lands at former Sirocco Works Short Strand and adjacent to Bridge End and the River Lagan Belfast	Mixed use development comprising offices, residential apartments (including affordable), hotel and serviced apartments, retail and professional services, community and cultural, leisure uses, cafes, bars, restaurants, with associated car parking, circulation and servicing arrangements; public realm works, landscaping, replacement of existing pedestrian bridge fixed to railway bridge and	<p>The submitted air quality impact assessment has demonstrated that no relevant receptors, located in the vicinity of the proposed development, will be exposed to air quality concentrations exceeding UK Air Quality Strategy objectives or European Limit Values as a consequence of the proposed development.</p> <p>This Service notes, however, that detailed technical information for the proposed gas heating system, to include combustion flue locations and emission discharge velocities, has not been provided in full at this stage.</p>



## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
	associated access works to Short Strand and Bridge End with other infrastructural works, and demolition of existing structures including boundary walls	In view of the lack of known detail at this stage, this Service requested that Prior to commencement of each phase of the development, the applicant shall submit AQIA confirming the final design of the centralised energy and hot water plant. Moreover, a Construction Environmental Management Plan is to be submitted, prior to commencement of each phase of development, which must include mitigation measures to control dust emissions.
240-252 Cambrai Street, Belfast	Installation of two biomass boilers	The assessment has demonstrated that the proposed installation will not have adverse impact on air quality in the vicinity of the site.
The King's Hall and RUAS site, south of Upper Lisburn Road/Balmoral Avenue, Belfast BT9 6GW	Demolition of 29 Balmoral Avenue, demolition of existing non-listed building on site (including conference facility, showgrounds and stables). Refurbishment, creation of new floor space and change of use from King's Hall venue to primary health care centre (including ancillary retailing and café). Erection of 2-storey side extension, repositioned access to Upper Lisburn Road, alterations to existing Balmoral Avenue access, internal access roads, public realm and landscaping, surface level car parks and associated site works including boundary treatments. Amended plans and further information received	The assessment has demonstrated that contribution from the proposed combustion plant is predicted to be insignificant in terms of annual and hourly mean nitrogen dioxide concentrations. The assessment has revealed that nitrogen dioxide concentrations are predicted to exceed the annual mean air quality objective at four receptor locations during 2019, with or without the scheme in place. However, the percentage increases in annual mean nitrogen dioxide concentrations, as the result of the development, are predicted to be low (between 0% and 3%).  The report states that there will be a low to medium risk of dust impact during demolition, earthworks, construction and trackout activities and proposes a range of mitigation measures  A final Dust Management Plan is to be submitted to Belfast Planning Authority for review and written approval.
Former Belfast Telegraph complex at 124-144 Royal Avenue and 1-29 Little Donegall Street Belfast BT1 1DN.	Demolition of existing non listed buildings and redevelopment of site to accommodate office led mixed use development comprising Class B1 (a) office, ancillary Class B2 industrial floor space, active ground floor uses retail (A1), restaurants, cafes and bars (sui generis); basement parking and associated access and circulation .	The assessment has demonstrated that the operational phase of the proposed development will not have an adverse impact on air quality in the local area.  However, detailed information on the boiler design and its location are not provided at this early stage of the process. Accordingly, this Service requested that this information be provided once the final design of the development is agreed in order to demonstrate that boiler emissions will not have an adverse impact on the nearby relevant receptors.

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
	Proposals include the retention and restoration of the listed Seaver building comprising façade restoration, new roof and reintroduction of dormers, replacement windows and reinstatement of original entrance to southern façade	A final Dust Management Plan is to be submitted to Belfast Planning Authority for review and written approval.
81-87 Academy Street, BT1 2LS	Demolition of existing building and erection of 16 storey residential building comprising 90 units (30 x one bed and 60 x two bed), ancillary ground floor uses including management suite, café, servicing, plant room, substation and associated public realm works.	<p>The assessment has demonstrated that future occupants will not be exposed to air quality concentrations exceeding AQ objectives and that the proposed development will not have a significant impact on air quality in the local area.</p> <p>However, information on the CHP stack design and location are not provided at this early stage of the design process; therefore this Service would request this information to be provided once the final design of the development is agreed in order to adequately assess the dispersion of the CHP emissions</p> <p>Moreover, the consultant has identified the potential for dust emissions associated with demolition and construction phase of the development.</p> <p>This Service requested a Dust Management Plan to be submitted prior the commencement of either construction or demolition works on the site.</p>
Lands at and adjacent to plot 4 Cromac Place The Gas Works Belfast BT7 2JD	Erection of 6 No. storey Grade A office development, incorporating a ground floor coffee bar, associated car parking, part retention and reconfiguration of existing car park, and all ancillary site works and landscaping.	The Assessment has demonstrated that the development will not have an adverse impact on air quality in the vicinity of the site and there will be no significant air quality impact on future residents along Ormeau Road. However, in order to avoid negative impacts from dust emissions during the construction phase of the development, this Service requested that proposed by the consultant dust mitigation measures were adopted.
Lands at 3-9 Dalton Street (Bordered by Middlepath Street and Bridge End) Belfast	Demolition of existing building and construction of 178 No. apartments, a gym, 3 No. retail units and associated car parking and landscaping	The assessment has demonstrated that the operational impact of the proposed development on existing receptors in the local area is predicted to be negligible and future occupants will not be exposed to air quality concentrations exceeding AQ objectives and European Limit Values.

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
		A Dust Management Plan containing recommended mitigation measures to be approved by the Planning Service and implemented during on the site construction works.
40-50 Townsend Street Belfast	New residential scheme consisting of 41 apartments in 3 blocks varying in height from 3 to 5 stories	The assessment has demonstrated that future users will not be exposed to pollutants concentrations in excess of the relevant ambient air quality objectives. A Dust Management Plan containing recommended mitigation measures to be approved by the Planning Service and implemented during on the site construction works.
Lands at Nos. 348-350 Ormeau Road Belfast BT7 2FZ	Demolition of 2 storey rear return, external steps and single storey outbuilding of former Parochial House, demolition of existing vestry entrance porch, external steps, single storey boiler house and part of internal wall to tower and relocation of internal spiral staircase of former Holy Rosary Church. Erection of 3 storey and single storey rear and 2 storey side extensions and associated works. Change of use to 18 bed hotel and licensed restaurant	The assessment has demonstrated that the development will have negligible impact on local air quality in the vicinity of the site and that local residents will not be exposed to air quality concentrations exceeding AQ objectives and European Limit Values. As a result, this Service has no concerns regarding the air quality impacts of the development proposal.
Lands at Lacefield Campbell College Lands to the rear of Cabin Hill Court Upper Newtownards Road Belfast	Proposed development of 33 dwellings, garages and all other associated site works. Dwellings comprise of 16 No. apartments, 4 No. town houses, 8 No. semi-detached dwellings and 5 No. Detached dwellings	The assessment has demonstrated that the increase in pollution concentrations as a result of the development is insignificant and future users will not be exposed to pollutant concentrations in excess of the relevant ambient air quality objectives. However, to reduce the potential for construction dust nuisance to a negligible impact, the applicant shall implement recommended in the assessment mitigation measures during all construction works on the site.
56 - 76 Townsend Street and 110 - 122 Peters Hill Belfast BT13 3ET	Erection of 2 blocks - 1 no. block consisting of 22 no. apartments. 1 no. block with office and community use.	The assessment has demonstrated that the increase in pollution concentrations as a result of the development is insignificant and future users will not be exposed to pollutants' concentrations in excess of the relevant ambient air quality objectives. However, prior to commencement of development, a construction dust, noise and vibration management plan shall be developed and submitted for review and approval by Belfast Planning Service.

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
233-263 Shore Road Belfast BT15 3PW	Four restaurant units with associated parking, access, servicing, site and landscaping works	<p>The assessment has demonstrated that future users will not be exposed to air quality concentrations exceeding AQ objectives and European Limit Values.</p> <p>Moreover, there will be only negligible increases in nitrogen dioxide and particulate matter concentrations in the local area as result of the development.</p> <p>This Service requested that mitigation measures as within the report are applied during the demolition and construction phase of the development.</p>
332 Ormeau Road Belfast BT7 2GE	Demolition of former derelict Police Station and the erection of a mixed-use development comprising 2 No. buildings with a total of 57 apartments. Block A comprises 33 No. apartment units with 3 No. ground floor café/restaurant/retail units. Block B comprises 24 no. apartment units. Development includes communal landscaped courtyards, landscaping, basement car parking and all associated site and access works.	<p>The assessment has demonstrated that the increase in pollution concentrations as a result of the operational phase of the development is insignificant and future users will not be exposed to pollutant concentrations in excess of the relevant ambient air quality objectives.</p> <p>However, detail information on the gas boilers design and emissions were not confirmed at that early stage of the process; therefore, this Service requested that this information be provided once the final design of the development is agreed in order to demonstrate that boiler emissions will not have an adverse impact on the nearby relevant receptors.</p>
11-15 Donegall Place and 1-7 Fountain Lane Belfast	Change of use (part 1st floor, 2nd, 3rd and 4th floors) from vacant hairdresser/office space and the extension of floors 4 and 5 to provide 36 studio apartments and 1 guest suite with associated roof terraces.	<p>This Service has no concerns regarding the air quality impacts of the development proposal.</p> <p>However as specific details of proposed gas boilers were not confirmed at that early stage of the process this Service requested that this information be provided once the final design of the development is agreed to ensure that potential adverse impacts are avoided and to eliminate a requirement of a more detailed assessment for the proposed development.</p>
King Street, Belfast BT1 6AD	11 storey apartment building	<p>It is concluded that the operational phase of the proposed development is expected to have an overall negligible impact on the surrounding area and pollutant concentrations at the facades of residential accommodation are predicted to meet the annual mean nitrogen dioxide objective.</p> <p>The consultant predicted that with appropriate mitigation measures proposed in the Construction Air Quality and Noise Impact Assessment there will be no significant effects arising from construction phase of the proposed development.</p>

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
		Therefore, this Service requested that a Dust Management Plan containing recommended mitigation measures was developed and implemented during all construction works on the site.
Lands bounded by Little Victoria Street Bruce Street & Holmes Street Belfast	Demolition of existing building at lands bound by Little Victoria Street, Bruce Street & Holmes Street and erection of new 15 No. storey purpose built student accommodation building	<p>The AQIA advised that there should be no significant air quality impact of the additional traffic sources.</p> <p>Moreover, the proposed combustion system is predicted not to be significant in terms of nitrogen dioxide emissions.</p> <p>However, details of the proposed heating systems were not defined in full at that stage. Accordingly, this Service has recommended a condition requiring this information to be submitted prior to occupation.</p> <p>Moreover, there will be a medium to high risk of dust impact during demolition, earthworks, construction and track-out activities. Therefore, the consultant has proposed a range of mitigation measures to be adopted during the various phases of the development.</p>
Lands immediately North of Stanhope Street West of Clifton Street and East of Regent Street 7a Stanhope Street Belfast BT13 1BL	1 two bedroom dwelling, 3 three bedroom dwellings and 6 two bedroom apartments with associated landscaping, amenity space and associated site works	<p>The assessment has demonstrated that future occupants will not be exposed to air quality concentrations exceeding UK Air Quality objectives or European Limit Values and the proposed development will not have a significant impact on air quality in the local area.</p> <p>Moreover, the Consultant has identified the potential for dust emissions associated with demolition and construction phase of the development. The consultant has indicated that with the implementation of suitable mitigation measures, the potential for dust impact will be reduced from medium to negligible.</p>
Vacant Lands at existing level carpark bounded by Winetavern Street Gresham Street and North Street including 108 North Street and 1 Gresham Street, Belfast	Mixed-use regeneration and development of vacant surface level car park and refurbishment of existing listed butchers building, with erection of new fixed use buildings (heights varying between 3-9 stories). proposal to comprise basement level car parking, ground floor retail/restaurant/coffee shop/workspace uses, with Grade A and SME offices above	<p>Modelled results demonstrated that the impact of additional transport emissions associated with the development will not be significant in terms of nitrogen dioxide and particulate matter concentrations. In addition, the modelling data indicate that none of the local sensitive receptors will experience breaches of the nitrogen dioxide and particulate matter air quality objectives. However, the submitted assessment has not considered the impact of combustion sources on the nearest relevant receptors. Therefore, this Service requested that details of the proposed heating systems must be provided and an additional air quality report</p>

## Belfast City Council – Northern Ireland

Location	Development description	Outcomes of air quality impact assessment
		submitted to the Planning Authority for review and written approval. As a site was categorised as High Risk in accordance with the Guidance on the assessment of dust from demolition and construction IAQM, this Service requested that the mitigation measures as outlined within the assessment are adopted into a Dust Management Plan prepared for the development.
Lands adjacent to 14 College Square North and south of 62-76 Hamill Street Belfast	Residential development over 7 floors (49 social housing units in a mix of 1 and 2 beds) with associated site access, car parking and landscaping works.	The assessment has demonstrated that future users will not be exposed to pollutants concentrations in excess of the relevant ambient air quality objectives. As a result, this Service has no concerns regarding the air quality impacts of the operational phase of the development proposal. A Dust Management Plan shall be submitted for review and be approved in writing by Belfast Planning Authority.
370-372 Ormeau Road Belfast	Construction of 9 apartments over 3 storeys along with car parking and associated site works	The assessment has demonstrated that the increase in pollution concentrations as a result of the development is insignificant and future users will not be exposed to pollutant concentrations in excess of the relevant ambient air quality objectives. As a result, this Service has no concerns regarding the air quality impacts of the development proposal.
Lands between 55-71 Ormeau Road and 163-169 Donegall Pass Belfast	Erection of a seven storey residential development comprising 38 apartments with car parking, amenity space and associated site works.	The Assessment has demonstrated that the development will not have an adverse impact on air quality in the vicinity of the site and there will be no significant air quality impact on future residents. As a result, this Service has no concerns regarding the air quality impacts of the development proposal.
Laganbank Road Belfast BT1 3LY	Extension of and alterations to existing office building including the provision of 2 No. additional storeys, roof plant area, extension to existing fifth and sixth floors and all other associated external alterations and site works	The assessment has demonstrated that the proposed development will not have a significant impact on air quality in the vicinity of the site.  Nevertheless, the consultant proposed a range of mitigation measures for operational and construction phase of the development to further minimise potential adverse air quality impacts on a local area

## 5 Air Quality Planning Policies.

Most developments across the city are subject to the Planning process, which provides an opportunity to identify and prevent potential air quality problems from arising in the first place.

In June 2009 and in view of the need for a consistent approach to air quality management as part of the planning process, Belfast City Council launched its '*Air quality and land use planning: A Belfast specific guidance note for developers and air quality consultants*' document. The document outlines what the council's Environmental Protection Unit, as an internal consultee to the Belfast Planning Service, would look for in forming its opinion on a proposed development and its potential impact on ambient air quality.

Since production of this Belfast specific guidance document, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have produced their 2017 guidance document entitled, '*Land-Use Planning & Development Control: Planning For Air Quality Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes*'. The council's Environmental Protection Unit now refers to the qualifying criteria set out in this document in order to determine when an Air Quality Impact Assessment is required.

Belfast City Council is currently developing its Local Development Plan (LDP) that outlines how land across the city will be used and developed in the future. The Belfast Local Development Plan - Draft Plan Strategy 2035 consultation document includes numerous references and commitments to improving air quality across the city. In addition, Appendix E: List of Supplementary Planning Guidance indicates that a new Supplementary Planning Guidance document (ENV1) will be published specifically to address 'Environmental Quality'. Ambient air quality will be a key component and consideration of this supplementary planning guidance document and it is noted that where relevant to a particular development proposal, Supplementary Planning Guidance will be taken into account as a material consideration in making planning decisions.

## 6 Implementation of Action Plans.

In 2006, the council, along with relevant partner organisations launched its first Air Quality Action Plan (AQAP) for the city designed to address areas of air quality concern, safeguard good air quality and to achieve national air quality strategy objectives and EU limit values by 2010. Around 90 per cent of the action plan was complete by the 2010 deadline but, although the air quality limit values for particulate matter have now been achieved across the city, limit values for nitrogen dioxide continue to be exceeded and give cause for concern in a few remaining locations.

In order to fulfil our statutory obligations under the provisions of the Environment (Northern Ireland) Order 2002, the council and relevant partner organisations committed to the development of a revised AQAP for the city to tackle the outstanding nitrogen dioxide (NO<sub>2</sub>) pollution issues.

In December 2015, we launched a new AQAP 2015-2020 that draws upon all forms of air quality and transport planning activities, including sustainable transport options as well as engineering solutions. The aim of this AQAP is to improve road vehicle operations and to promote and enable a shift onto more sustainable modes of transport to achieve compliance with the NO<sub>2</sub> annual mean EU limit value by 2020. Table 6.1 below provides progress information on the 2015 Belfast Air Quality Action Plan since its launch.



**Table 6.1 Belfast Air Quality Action Plan Progress.**

No.	Measure	Focus	Lead Authority	Planning & Implementation Phase	Progress since 2015	Estimated Completion Date
1	Belfast Multi-Modal Transport Model	This model will provide the capability to estimate the likely change in air quality arising from different transport investment options.	Dfl	2014-2016	The Belfast model has been constructed and audited.	Completed March 2017
2	Belfast Rapid Transit (BRT)	Increase in the usage of the public transport would contribute to reduced congestion and improved air quality.	Dfl	Ongoing construction commenced 2014	Sections of the BRT route completed, and bus lanes introduced, in East and West Belfast. Further sections currently in construction. Contract for provision of BRT vehicles awarded and construction proceeding. On target for operational date in September 2018	Estimated completion 2018
3	Belfast Transport Hub	Experience in Great Britain and Europe shows that investing in public transport infrastructure, particularly this type of project, can improve public transport uptake.  Increase in the usage of the public transport generally contributes to reduced congestion and improved air quality,	Dfl / Translink	Pre-planning application process commenced 2015. Planning applications due to be submitted Q2, 2017.	Feasibility design complete and OBC1 approved for single option development.	Estimated opening of new station end 2020

**Belfast City Council – Northern Ireland**

<b>No.</b>	<b>Measure</b>	<b>Focus</b>	<b>Lead Authority</b>	<b>Planning &amp; Implementation Phase</b>	<b>Progress since 2015</b>	<b>Estimated Completion Date</b>
4	Bicycle Strategy for NI	<p>The Bicycle Strategy will contribute to improvements in the physical environment.</p> <p>Increased levels of cycling could reduce congestion, improved air quality, reduce noise pollution and contribute to a cleaner environment.</p> <p>The Bicycle Strategy will be followed with a Bicycle Network Plan for Belfast to guide the development &amp; operation of bicycle infrastructure in the city for the next 10 years.</p>	DfI	Bicycle Strategy launched in 2015 to be followed by a 10yr Network Plan for Belfast	<p>The Department for Infrastructure has published the Draft Belfast Bicycle Network 2017 Consultation Document.</p> <p>The Draft Belfast Bicycle Network 2017 is to guide the development and operation of the bicycle infrastructure for the next 10 years and is a progression from the Bicycle Strategy published in 2015. The Bicycle Strategy identified 3 pillars, one of which was to build a comprehensive network for the bicycle. The draft document is a public consultation exercise on a bicycle network for Belfast.</p>	Ongoing
5	ecarNI	There are significant benefits to both the environment and to the driver in the use of electric vehicles.	DfI	2015	<p>A network of 336 public charge points across Northern Ireland is now in place and commercially operated by the Electricity Supply Board. A further 54 charge points have been installed in the public sector estate to facilitate workplace initiatives. The Department continues to work with partners in the Office for Low Emission Vehicles and the private sector to build capacity for the Ultra-Low Emission Vehicle market.</p>	Ongoing
6	Park and Ride (P&R) (Bus & Rail)	DfI considering additional Park & Ride schemes. This would have positive effect on reducing air quality in Belfast by providing alternative transport for commuters coming into the city rather than private car.	DfI	DfI Park and Ride Delivery Programme	DfI Strategic Park & Ride Delivery programme 2013-2016 delivered over 2,100 additional spaces across Northern Ireland. A new Programme has been established for the period 2016-2020 and will deliver further additional spaces.	Ongoing

## Belfast City Council – Northern Ireland

No.	Measure	Focus	Lead Authority	Planning & Implementation Phase	Progress since 2015	Estimated Completion Date																								
7	York Street Interchange	The York Street interchange redevelopment will in effect improve the throughput of traffic and reduce background concentrations of NO <sub>2</sub> .	DfI	Scheme on hold pending funding. Possible start late 2018	On hold	Estimated completion 2022																								
8	Fleet improvement	Fleet improvement will reduce emissions from buses and consequently improve air pollution especially along the busy roads.	Translink	Translink Fleet procurement programme in place for the period 2013-2020	<p>Current Euro Class breakdown for the Metro Fleet is as follows: -</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Euro Class</th> <th>Number of Vehicles</th> <th>% of Vehicles</th> </tr> </thead> <tbody> <tr> <td>Pre Euro</td> <td>0</td> <td>0.00%</td> </tr> <tr> <td>Euro 1</td> <td>0</td> <td>0.00%</td> </tr> <tr> <td>Euro 2</td> <td>20</td> <td>7.35%</td> </tr> <tr> <td>Euro 3</td> <td>101</td> <td>37.13%</td> </tr> <tr> <td>Euro 4</td> <td>39</td> <td>14.34%</td> </tr> <tr> <td>Euro 5</td> <td>58</td> <td>21.32%</td> </tr> <tr> <td>Euro 6</td> <td>54</td> <td>19.85%</td> </tr> </tbody> </table> <p>Please note that 23 new Euro 6 Metro Double Decks are expected for delivery in the coming month. These will replace all of the Euro 2 vehicles left in the Metro Fleet.</p>	Euro Class	Number of Vehicles	% of Vehicles	Pre Euro	0	0.00%	Euro 1	0	0.00%	Euro 2	20	7.35%	Euro 3	101	37.13%	Euro 4	39	14.34%	Euro 5	58	21.32%	Euro 6	54	19.85%	2020
Euro Class	Number of Vehicles	% of Vehicles																												
Pre Euro	0	0.00%																												
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Euro 2	20	7.35%																												
Euro 3	101	37.13%																												
Euro 4	39	14.34%																												
Euro 5	58	21.32%																												
Euro 6	54	19.85%																												

## Belfast City Council – Northern Ireland

9	Promote Public Transport	The impact of this measured will be low initially, but should increase over time as further marketing campaigns encourage greater usage of public transport.	Translink	Ongoing publicity campaigns	<b>Marketing / Comms campaigns:</b> <ul style="list-style-type: none"> <li>• Extensive Marketing / Communications carried out for Smartmovers</li> <li>• Dedicated Bus &amp; Train Week</li> <li>• Metro Smartlink, Metro Daylink, Metro Saturdays, Metro corridor Offers</li> <li>• NI Railways 1/3 off /Goldline 1/3 off – Me Time campaign on rail</li> <li>• Summer / holiday offers, Airport Services</li> <li>• P&amp;R</li> <li>• MasterCard Competition</li> <li>• Goldline campaign – Regional Roadshows</li> <li>• Metro Offers – corridor specific</li> <li>• Ulsterbus 1/3 off after 9.30am</li> <li>• Flexible travel after 6.30pm travel home bus train no matter what ticket you have</li> <li>• Rail 50% off vouchers issued to Bangor and Larne Lines</li> <li>• Ylink – almost 30k card sales inc +28% growth</li> <li>• Metronomics – corporate business Challenge</li> <li>• Metro Evening offer after 6.30pm - £2 return</li> <li>• Metro Legends</li> <li>• Mlink – Metro</li> <li>• Bus and Train Week</li> <li>• Enterprise</li> </ul>	Ongoing
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					<ul style="list-style-type: none"> <li>• Easter offers</li> <li>• Eco Schools Travel challenge.</li> </ul> <p><b>NOTE: BRAND NEW SMARTMOVERS FULLY INTEGRATED MAR / COMMS CAMPAIGN COMMENCED MARCH 2017</b></p> <p>Also, a number of Sponsorships carried out in Belfast Area to promote PT / CSR. Highlights include:</p> <ul style="list-style-type: none"> <li>• Ulster in Bloom</li> <li>• Belfast City Marathon</li> <li>• Eco Schools Sponsorship</li> <li>• Tall Ships</li> <li>• NIABF Sponsorship - Anti Bullying Week</li> <li>• Festival of Fools</li> <li>• East Belfast Partnership</li> <li>• Feile Sponsorship</li> <li>• Culture Night</li> <li>• Belfast Children's Festival - Young at Art</li> </ul> <p>During 2015/16 passenger journeys increased by 400, 000 and in financial year 2016/17 Metro continue to experience impressive increases of over 3% , with approximately 1 million more passenger journeys compared to 2015/16. Belfast remains one of the few cities in the UK which is experiencing sustained growth in passenger journeys, delivered</p>	
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## Belfast City Council – Northern Ireland

No.	Measure	Focus	Lead Authority	Planning & Implementation Phase	Progress since 2015	Estimated Completion Date
					through investment in modern fleet, improved bus priority measures and enforcement of bus lanes, value for money promotions and innovative marketing and active travel promotional campaigns, plus continuous improvement in service provision, through increased capacity, frequency and delivery of more reliable, timely services.	
10	Assess Feasibility for a Belfast FCC	FCC combined with the use of low emission vehicles could have a significant impact on emissions level.	RHA & FTA	Investigate and explore options 2015-2020	BCC have completed an online survey available from 10 February to 31 March 2017 to collect and then evaluate feedback on the need or want for a Belfast Freight Consolidation Centre (FCC).  Future decision making on this measure will be based on outcomes from the survey.	Investigation & research to be completed 2020
11	ECO Stars	Uptake of this scheme would result in greener and modern delivery vehicles in the city centre (reductions in emissions).	RHA & FTA	Investigate and explore options 2015-2020	ECO Stars Scotland Manager delivered presentation to Belfast AQ Steering Group.  Following consideration of the cost benefits to implement this scheme in Belfast, LAQM Funding was not secured from DAERA to progress this measure further.	Completed 2016

## Belfast City Council – Northern Ireland

No.	Measure	Focus	Lead Authority	Planning & Implementation Phase	Progress since 2015	Estimated Completion Date
12	Servicing and Loading Bays (S&L)	More loading bays in the city would reduce engine idling caused by vehicles having to wait for suitable parking space. It would also reduce the occurrence of double parking therefore reducing traffic congestion.	Transport NI	Transport NI S&L Bays review is scheduled for 2015-2017	TransportNI will be reviewing the operating times of the loading bays in central Belfast, between April and June 2017.  A decision on implementation will depend on the outcome of this review.	2017
13	Coca-Cola Zero Belfast Bikes	Using the bikes for shorter city centre journeys will cut congestion and improve air quality.	BCC	Operational April 2015	Belfast Bikes has expanded with an additional 10 stations added to the network serving areas outside the core city centre area. The scheme has now generated over 380,000 trips. 46 docking locations are in Belfast and in 2019; a location added on the Ormeau Road (AQMA).	Completed 2015 & ongoing expansion
14	BCC Fleet Improvement	This will reduce overall emissions from council fleet.	BCC	2015	A further £2.4m was then spent on fleet replacements in 2015/16 (over 80% of this in Cleansing); we are currently spending £2.1m during the 2016/17 year and council approval has already been obtained to spend a further £2.1m in 2017/18 and another £1.95m in 2018/19.	Ongoing

**Belfast City Council – Northern Ireland**

<b>No.</b>	<b>Measure</b>	<b>Focus</b>	<b>Lead Authority</b>	<b>Planning &amp; Implementation Phase</b>	<b>Progress since 2015</b>	<b>Estimated Completion Date</b>
15	Active Travel Plan	Increasing use of public transport and active travel such as walking and cycling should reduce single occupancy car use, improve air quality and result in a beneficial effect on health.	BCC	Travel Plan implementation 2014 - 2020	<p>Phase 1 (2014-2016) of the Active Travel Plan is now complete and work has begun on developing a phase 2 plan (2017-20).</p> <p>In phase 1, partners completed / progressed a total of 26 of 31 actions including:</p> <ul style="list-style-type: none"> <li>• the development of a draft Bicycle Network for Belfast by DfI;</li> <li>• the funding of a workplace active travel programme by PHA;</li> <li>• support to community walking and cycling programmes via Active Belfast; and</li> <li>• delivery of an annual Active Travel Challenge by Sustrans.</li> </ul> <p>The remaining 5 actions to be progressed will be considered within the Phase 2 plan.</p>	2020



## 7 Conclusions and Proposed Actions.

### 7.1 Conclusions from New Monitoring Data.

Belfast City Council has presented a range of monitoring data within this Progress Report that addresses a number of the pollutants prescribed within the UK Air Quality Strategy. Although these pollutants are routinely measured across the city, the council's focus remains principally upon addressing existing Air Quality Management Areas and upon those areas of the city centre where traffic congestion might lead to further exceedences of the nitrogen dioxide annual mean and hourly objectives. There were no monitored exceedences for any of the Air Quality Strategy objectives for sulphur dioxide, benzene and particulate matter during 2018.

Nevertheless, 2018 monitoring data for nitrogen dioxide confirms continuing exceedences of the annual mean for nitrogen dioxide in the vicinity of Stockmans Lane, which is located within the M1 Motorway / A12 Westlink Air Quality Management Area. Similar exceedences of the annual mean objective were recorded at Great George's Street near to the end of the A12 Westlink where it joins with the M2 and M3 motorways. However, an automatic monitoring site at Westlink / Roden Street indicates compliance with both annual and hourly mean objectives for nitrogen dioxide along this section of the A12 Westlink, suggesting that structural improvements have reduced the number of nitrogen dioxide annual mean exceedence locations along the M1 Motorway / A12 Westlink to a series of '*hot spots*'.

Historical monitoring data for the Upper Newtownards Road Air Quality Management area revealed sustained exceedences of the nitrogen dioxide annual mean objective. The last number of years have demonstrated decreases in nitrogen dioxide levels to the extent that the annual mean objective has been achieved at Ballyhackamore since 2011. The magnitude of the decrease in nitrogen dioxide levels along the Upper Newtownards Road has been beyond the year-on-year reductions that might have been reasonably predicted using Defra's forward projection factors. Accordingly, the reductions in ambient nitrogen dioxide levels within this Air Quality Management Area are welcomed.

However, the Knock Road non-automatic roadside diffusion tube site, located at the junction of the Upper Newtownards Road, Hawthornden Way and the Knock Road has recorded exceedences of the annual mean objective in previous years up until 2017. The 2017 calendar year was the first year when the annual mean concentration at the Knock Road junction was below the air quality objective ( $36 \mu\text{g m}^{-3}$ ), which is also the case in 2018 ( $35 \mu\text{g m}^{-3}$ ). The council will therefore continue to monitor nitrogen dioxide concentrations along the Upper Newtownards Road and at the junction with the Knock Road in order to determine whether this improvement in ambient conditions is sustained and what implications it may have for this Air Quality Management Area.

The Belfast Ormeau Road site experienced extensive problems with the air conditioning during 2012 and 2013, preventing the monitoring equipment working to full capacity. The site enclosure was upgraded in 2014 which has resolved this problem. Following the site upgrade, the annual mean concentration has remained reasonably constant at  $27 \mu\text{g m}^{-3}$  in 2014,  $27 \mu\text{g m}^{-3}$  in 2015,  $28 \mu\text{g m}^{-3}$  in 2016,  $25 \mu\text{g m}^{-3}$  in 2017 and  $26 \mu\text{g m}^{-3}$  in 2018. Based on this data, which demonstrates sustained improvements in annual mean nitrogen dioxide concentrations, with levels much below the Air Quality Objective, the council is planning to revoke the Ormeau Road Air Quality Management Area for exceedences of the nitrogen dioxide annual mean objective. Accordingly, the council will liaise with the Department for Agriculture, Environment and Rural Affairs, Department for Infrastructure and other relevant partners before coming to a conclusion regarding the potential for revocation.

In conclusion, Belfast City Council will continue to monitor ambient nitrogen dioxide levels at all current monitoring locations in order to ensure that recent downward trends are maintained. Furthermore, based on the monitoring data, the council is planning to revoke the Ormeau Road Air Quality Management Area for exceedences of the nitrogen dioxide annual mean objective.

Finally, Belfast City Council confirms that no new Air Quality Management Areas need to be declared for the city at this time.

## 7.2 Conclusions relating to New Local Developments.

Of the planning applications received and reviewed in 2018, it was concluded that they would have no significant negative impact on existing local air quality. In addition, no significant changes in local circumstances were identified within Belfast, which would require detailed consideration. It is therefore not considered necessary to proceed to a 'Detailed Assessment' based on new local developments or potential sources.

## 7.3 Proposed Actions.

In conclusion, the 2018 Progress Report has not identified the need to proceed to a Detailed Assessment for any pollutant under consideration.

Furthermore, Belfast City Council has already highlighted that it operates an expansive air quality monitoring network across the city predominantly for nitrogen dioxide. On this basis, the council is content that existing monitoring locations provide a detailed representation of pollution levels the city and, as a consequence, does not need to be expanded at this time.

With regard to our four Air Quality Management Areas, a review of the monitoring data for these Air Quality Management Areas indicates that there have been some recent improvements in annual mean nitrogen dioxide levels across the city. As a result, Belfast City Council will consider revocation of the Ormeau Road AQMA, where monitored data demonstrates sustained improvements in annual mean nitrogen dioxide concentrations, with levels now much below the Air Quality Objective. Accordingly, the council will liaise with the Department for Agriculture, Environment and Rural Affairs, Department for Infrastructure and other relevant authority partners regarding the potential revocation.

As part of the revocation process, a detailed report in support of the revocation will be prepared by the council, as prescribed in the Defra *Local Air Quality Management Technical Guidance LAQM.TG(16)*.

In terms of forward actions, the council along with relevant partners have developed a comprehensive Air Quality Action Plan that draws upon all forms of air quality and transport planning activities, including sustainable transport options as well as

## **Belfast City Council – Northern Ireland**

engineering solutions. The Air Quality Action Plan 2015-2020 was published in December 2015. It is considered that successful implementation of the measures will improve road vehicle operations and promote and enable a shift onto more sustainable modes of transport to achieve compliance with the nitrogen dioxide UK Objectives and EU Limit Value by 2020. Progress on implementing individual measures within AQAP are reported upon annually by Belfast City Council as prescribed in the Defra *Local Air Quality Management Technical Guidance LAQM.TG(16)*.

## 8 References.

Belfast City Council, 2015, Air Quality Action Plan 2015 – 2020, December 2015.

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Belfast City Council, Belfast Progress Report, June 2017.

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Defra, Local Air Quality Management: Technical Guidance 2016

<http://laqm.defra.gov.uk/supporting-guidance.html>

Defra 'Workplace Analysis Scheme for Proficiency (WASP) NO<sub>2</sub> diffusion tubes proficiency tests'.

<http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html>

Directive 2008/50/EC in respect of ambient air quality and cleaner air for Europe  
Environment (Northern Ireland) Order 2002.

[www.legislation.gov.uk/nisi/2002/3153/contents/made](http://www.legislation.gov.uk/nisi/2002/3153/contents/made)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0050:en:NOT>

Environment (Northern Ireland) Order 2002.

<http://www.legislation.gov.uk/nisi/2002/3153/contents/made>

Northern Ireland Air – Air Quality in Northern Ireland website

<http://www.airqualityni.co.uk/>

## **Appendices.**

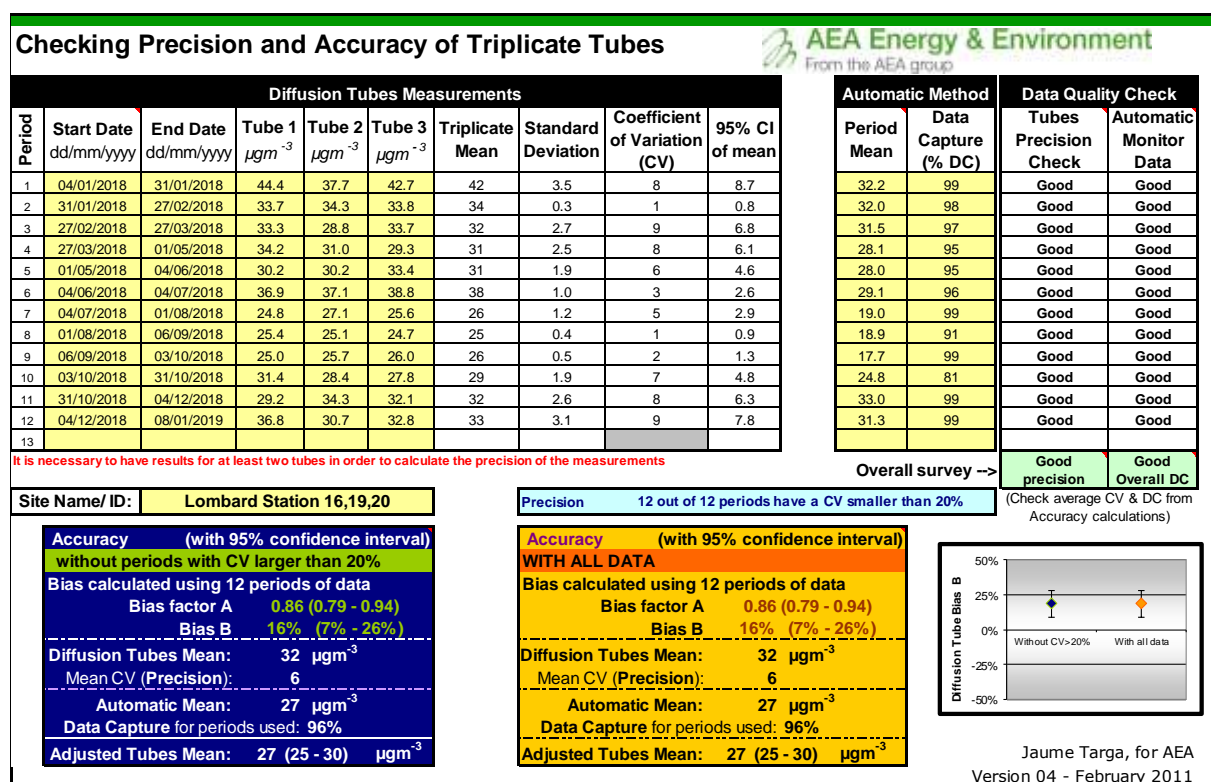
Appendix A: Quality Assurance / Quality Assurance and Quality Control  
(QA/QC) Data

Appendix B: Defra NO<sub>2</sub> Distance Calculator Results.

## Appendix A: QA/QC Data.

### Diffusion Tube Bias Adjustment Factors.

As in previous years, we have employed a triplicate collocation study at the Belfast Centre Lombard Street AURN monitoring site in order to obtain a local diffusion tube bias adjustment factor for ‘correcting’ our diffusion tubes monitoring data. The bias adjustment factor was calculated and our data ‘corrected’ using the Defra Bias Adjustment Factor Calculation spreadsheet (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor). Outputs from the spreadsheet are presented as follows:



Jaume Targa, for AEA  
Version 04 - February 2011

## Adjustment of SINGLE Tubes

Diffusion Tube Measurements														Raw Mean	Valid periods
Site Name/ID	Periods														
	1	2	3	4	5	6	7	8	9	10	11	12	13		
1. RVH	24.7	25.9	26.8	22.4	20.5	23.9	16.7	18.1	20.1	26.6	31.0	29.2		23.8	12
2. Blacks Rd	44.2	41.3	37.5	35.4	33.9	45.0	37.0	40.0	51.9	47.0	44.7	47.3		42.1	12
3. 61 Cromac Str	48.6	13.3	37.6	37.4	37.0	41.7	29.6	28.7	31.8	38.9	39.2	38.7		35.2	12
4. Ravenhill Rd	37.1	31.4	32.1	30.7		42.6	26.4	25.1	26.7	29.6	38.1	27.8		31.6	11
5. Queens Bridge	35.7	34.3	38.4	27.7	27.6		16.2	22.6		32.1	32.5	32.9		30.0	10
6. North Road	12.3	19.1		14.6	12.2	16.3			11.0		17.7	17.8		15.1	8
7. Donegal Sq. South	40.7	36.1	35.8	35.8	33.9	40.5	31.8	26.8	29.0	38.8	40.8	38.7		35.7	12
9. Short Strand	62.6	51.0	40.9	44.0	44.1	55.3	40.4	36.1	42.8	54.0	42.5	46.9		46.7	12
10. 301 Ormeau Rd	45.6	35.5	32.0	27.5	29.6	37.2	28.4	22.8	26.2	33.9	35.8	35.1		32.5	12
12. Knock Rd	40.2	54.3			36.6	43.7	34.1	35.3	34.5	42.9	45.1	40.3		40.7	10
13. Gr Georges Str	57.8	45.2	25.9	60.2	63.2	72.7	47.1	36.6	40.7	49.1	61.8	47.5		50.7	12
14. Lisburn Rd	39.3	29.0	34.5	31.0	27.3	34.2	20.8	25.5	27.9	30.7	34.5	31.9		30.6	12
15. Shaftesbury Sq	46.4	36.0		44.8	41.8	43.4	30.1	27.5	29.2	36.4	40.5	31.3		37.0	11
17. Albert Clock	60.0	43.0	45.7	45.3		44.4	38.9	36.7	39.6	44.6	49.0	55.9		45.7	11
25. Whitewell Rd	30.8	22.3	28.7	30.8		31.3	22.2	17.6	16.3	26.3	37.1			26.3	10
26. Donegal Rd	39.0	37.7	39.2	35.4	35.5	44.3	30.1	27.3	28.8	38.7	35.5	34.2		35.5	12
28. Falls and Andytown	36.0	32.8	35.4	33.0	33.0	36.1	25.3	23.8	24.3	31.0	32.4	32.9		31.3	12
30. Station Rd	37.1	31.6	49.1	28.3		31.9	21.9	20.5	24.1	28.4	25.5	26.7		29.5	11
31. Malone Road			41.4	39.2	34.8	42.0	29.1	27.1	32.3			38.4		35.5	8
33 Great Victoria Street	52.3	43.1	36.4	38.4	38.0	44.7	34.8	34.5	39.5	43.2	39.0	42.0		40.5	12
34 College Square East	44.0	39.6	41.6	39.2	38.7	43.8	32.0	28.2	27.5	37.6	50.6	38.1		38.4	12
35 Chichester Street	48.9	47.8	49.2	50.4	46.5	66.6	39.8		38.0	46.0	47.8	45.0		47.8	11
36 Cromac/Ormeau Avenue	43.0	39.1	41.4	38.5	33.4	38.1	30.5	29.3	33.7		41.3			36.8	10
37 Westlink/Glenmachan Str	47.0	40.1	36.3	34.9			34.4	38.3	47.9	48.4	41.8	45.9		41.5	10
38 Creche on M1	37.4	31.4	39.1	24.7	34.0	40.9	26.6	20.0	19.9	29.8	41.6	33.9		31.6	12

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

Adjusted measurement (95% confidence interval) with all the data
12 periods used in this calculations
Bias Factor A 0.86 (0.79 - 0.94)
Bias B 16% (7%- 26%)
Tube Precision: 6 Automatic DC: 96%
Adjusted with 95% CI 20 (19 - 22)
Adjusted with 95% CI 36 (33 - 40)
Adjusted with 95% CI 30 (28 - 33)
Adjusted with 95% CI 27 (25 - 30)
Adjusted with 95% CI 26 (24 - 28)
Adjusted with 95% CI 13 (12 - 14)
Adjusted with 95% CI 31 (28 - 34)
Adjusted with 95% CI 40 (37 - 44)
Adjusted with 95% CI 28 (26 - 31)
Adjusted with 95% CI 35 (32 - 38)
Adjusted with 95% CI 44 (40 - 48)
Adjusted with 95% CI 26 (24 - 29)
Adjusted with 95% CI 32 (29 - 35)
Adjusted with 95% CI 39 (36 - 43)
Adjusted with 95% CI 23 (21 - 25)
Adjusted with 95% CI 31 (28 - 33)
Adjusted with 95% CI 27 (25 - 29)
Adjusted with 95% CI 25 (23 - 28)
Adjusted with 95% CI 31 (28 - 33)
Adjusted with 95% CI 35 (32 - 38)
Adjusted with 95% CI 33 (30 - 36)
Adjusted with 95% CI 41 (38 - 45)
Adjusted with 95% CI 32 (29 - 35)
Adjusted with 95% CI 36 (33 - 39)
Adjusted with 95% CI 27 (25 - 30)

## Adjustment of SINGLE Tubes

Diffusion Tube Measurements														Raw Mean	Valid periods
Site Name/ID	Periods														
	1	2	3	4	5	6	7	8	9	10	11	12	13		
39 Ormeau Rd/Ravenhill Rd	43.7	35.6	34.1	31.3		28.4	27.9		40.7	42.0	36.6	43.9		36.4	10
40 Hollywood Rd Arches	41.8	33.7	34.2	26.5	26.9		22.9	22.5	26.5		35.1	35.3		30.5	10
41 Crumlin Rd	35.2	37.5	35.1		31.2		26.3	24.5	25.6	34.9	40.2	30.9		32.1	10
42 228 Antrim Rd	43.2	39.7	40.7	44.7	42.1	39.8	29.8	29.1	29.1	40.7	50.6	34.7		38.7	12
44 Shore Rd (Ivan St. End)	34.6	34.7	36.1	37.9	31.1	34.4	27.0	20.8	24.0	34.6	41.0	37.1		32.8	12
59 York Street	50.5	43.0	32.1	56.1	47.8	51.2	37.3	31.0	32.1	41.5	58.9	43.7		43.8	12
63 Queen's Sq	52.9	42.4	49.3		43.2	49.1	33.6	28.8	29.7	39.5	45.2	35.9		40.9	11
74 Ardmore Park	48.3	47.7	38.6	36.7		32.9	27.6	27.3	34.9	38.2	38.1	39.9		37.3	11
76 Titanic Quarter	31.3	32.4	30.4	26.5	27.2	33.9	21.9	20.8	23.4	27.5	28.7	28.2		27.7	12
77 Poleglass	35.5		33.9	29.5		32.8		20.5	23.5	27.1	35.7	30.6		29.9	9
87 RVH Falls Road	41.3	40.2	41.0	41.4	39.7	41.8	34.8		33.7	40.4	48.5	43.5		40.6	11
88 Dunmurry Line	34.6	31.2	35.3	30.2	28.2	28.2	20.5	20.9	23.5	29.6	36.8	31.7		29.2	12
89 Upper Knockbreda Rd	49.3	42.7	41.3	35.4	33.6	43.6	32.4	33.3	39.8	40.4	39.2	32.7		38.6	12

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

Adjusted measurement (95% confidence interval) with all the data
12 periods used in this calculations
Bias Factor A 0.86 (0.79 - 0.94)
Bias B 16% (7%- 26%)
Tube Precision: 6 Automatic DC: 96%
Adjusted with 95% CI 31 (29 - 34)
Adjusted with 95% CI 26 (24 - 29)
Adjusted with 95% CI 28 (25 - 30)
Adjusted with 95% CI 33 (31 - 36)
Adjusted with 95% CI 28 (26 - 31)
Adjusted with 95% CI 38 (35 - 41)
Adjusted with 95% CI 35 (32 - 38)
Adjusted with 95% CI 32 (29 - 35)
Adjusted with 95% CI 24 (22 - 26)
Adjusted with 95% CI 26 (24 - 28)
Adjusted with 95% CI 35 (32 - 38)
Adjusted with 95% CI 25 (23 - 27)
Adjusted with 95% CI 33 (31 - 36)



**Diffusion Tube Bias Adjustment Factors.**

Using the spreadsheet, we have determined that diffusion tube agreement with the automatic nitrogen dioxide analyser at the Belfast Centre AURN site for our Gradko supplied and analysed diffusion tubes was deemed ‘good’ for all available sampling periods in 2018. In addition, the precision checks were also deemed ‘good’ for all sampling periods. The overall bias factor was calculated as 0.86.

**Discussion of Choice of Factor to Use.**

For those local authorities that do not wish, or are unable to undertake a triplicate diffusion tube collocation study, government publishes a database of bias adjustment factors derived from other local authority co-location studies throughout the United Kingdom. These factors are used subsequently to calculate a combined bias adjustment factor for a range of nitrogen dioxide diffusion tube laboratories. The latest factors were published in March 2019 and cover sampling periods up until 2018. In 2018, the government derived bias adjustment factor for Gradko Laboratories for a 20% solution of triethanolamine was 0.92. This factor compares well with the council’s 2018 locally derived bias adjustment factor of 0.86. Historically, we have always used our own bias adjustment factors and for consistency in results, we will continue to apply the same methodology.

**Short-term to Long-term Data Adjustment.**

Guidance for the treatment of diffusion tube monitoring data, as provided in Table 2.5 of this report, requires that where annual mean results are based upon monitoring data of less than 9 months sampling, these means should be “annualised” in accordance with the procedure outlined in Box 7.10 of the government’s local air quality management technical guidance LAQM.TG16.

In order to complete the annualising process, councils are required to identify nearby long-term background continuous monitoring sites for nitrogen dioxide or alternatively use a number of background diffusion tube sites with 12 months of data. We only have one background continuous monitoring site for nitrogen dioxide (Lombard Street) which was used to complete the annualising process.

## Belfast City Council – Northern Ireland

Individual adjustment factors have been calculated for two diffusion tube monitoring sites, commensurate with the diffusion tube exposure periods. The adjustment ratios for our sites with less than 9 months of data is summarised as follows:

**Table: Annualising NO2 Diffusion Tube Monitoring Data - Tube 6, North Road (DC 67%).**

Date	B1 (Lombard Station)	D1(tube)	B1 when D1 is available
Jan	32.2	12.3	32.2
Feb	32.0	19.1	32.0
Mar	31.5		
Apr	28.1	14.6	28.1
May	28.0	12.2	28.0
Jun	29.1	16.3	29.1
Jul	19.0		
Aug	18.9		
Sep	17.7	11.0	17.7
Oct	24.8		
Nov	33.0	17.7	33.0
Dec	31.3	17.8	31.3
Average	27.1	15.1	28.9

**Am/Pm = 0.94**

**D1 = 15.1 \* 0.94 = 14.19**

**D1 with Bias (0.86) = 12.21**

**Table: Annualising NO2 Diffusion Tube Monitoring Data - Tube 31, Malone Road (DC 67%).**

Date	B1 (Lombard Station)	D1(tube)	B1 when D1 is available
Jan	32.2		
Feb	32.0		
Mar	31.5	41.4	31.5
Apr	28.1	39.2	28.1
May	28.0	34.8	28.0
Jun	29.1	42.0	29.1
Jul	19.0	29.1	19.0
Aug	18.9	27.1	18.9
Sep	17.7	32.3	17.7
Oct	24.8		
Nov	33.0		
Dec	31.3	38.4	31.3
Average	27.1	35.5	25.4

**Am/Pm = 1.07**

**D1 = 35.5\* 1.07 = 37.98**

**D1 with Bias (0.86) = 32.67**

**QA/QC of Automatic Monitoring Data.**

As highlighted in the body of this report, Belfast City Council operates a number of automatic monitoring sites across the city. In order to ensure that our data is accurate and precise, we calibrate our sites on a biweekly or four-weekly basis, in accordance with the requirements of the Defra Site Operators Manual for the Automatic Urban and Rural Network, published in 2009 (most updated version: *LSO Manual, Ricardo, May 2019*).

For our automatic nitrogen dioxide analysers, we complete a two-point calibration using zero air and a nitric oxide span gas of certified concentration. We obtain our calibration gases under contract from Air Liquide who also provide similar gases to government owned AURN monitoring stations. By considering instrument operating parameters and the results of successive calibrations, we can make a determination regarding the ongoing performance of our analysers. Where an instrument is found not to be operating within normal operating parameters, we refer the matter promptly to 'We Care 4 Air', who provided service and maintenance support for our equipment in 2018.

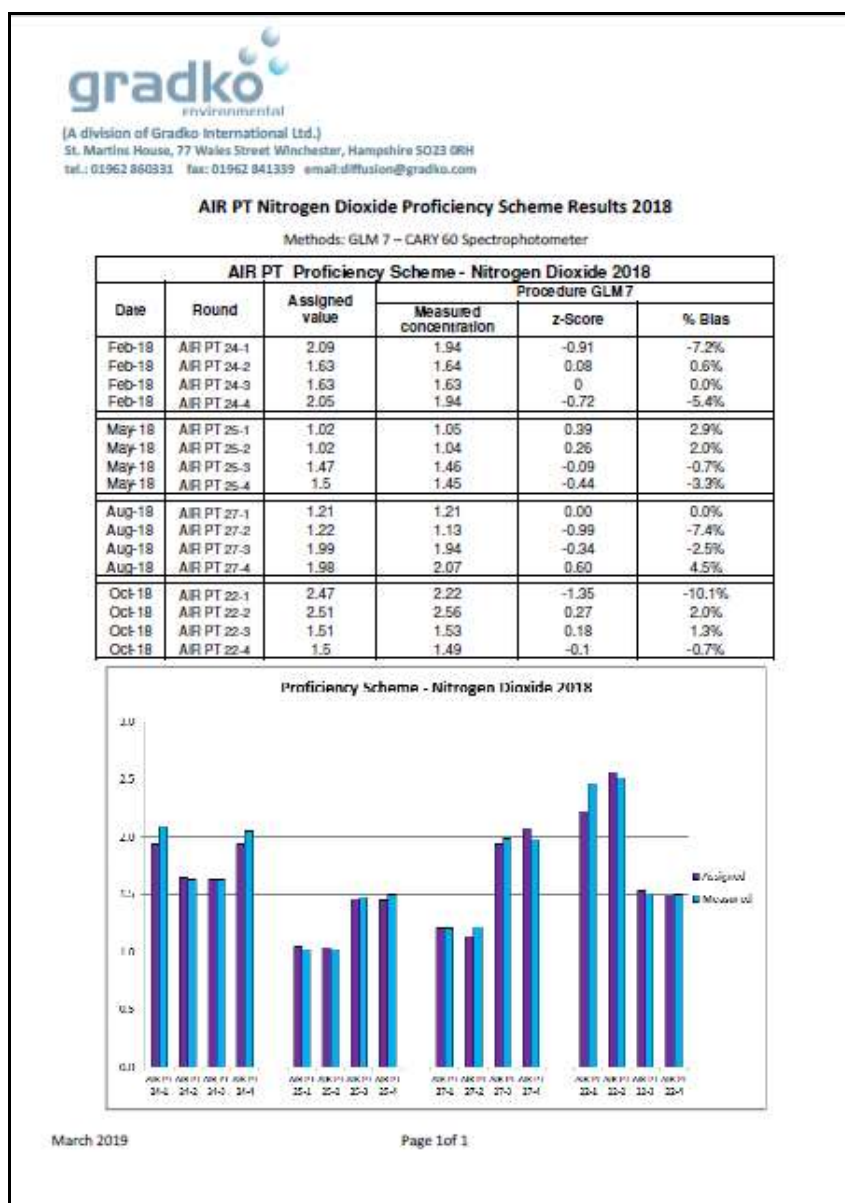
Finally, Belfast City Council appointed suitably qualified equipment engineers (Ricardo-AEA) to provide quality assurance and quality control support for the monitoring equipment to ensure compliance with the requirements of the National Air Quality Strategy as contained within the Defra Technical Guidance Document LAQM.TG(16). Ricardo-AEA staff visit our sites on a six-monthly basis and compare the performance of our analysers against a range of laboratory grade standards. AEA subsequently provides a series of calibration and scaling factors that are used to correct our automatic monitoring data. These scaling procedures enable the council to robustly compare our air quality data with Air Quality Strategy Objectives and European Union Limit Values.

**QA/QC of Diffusion Tube Monitoring.**

**Workplace Analysis Scheme for Proficiency (WASP) nitrogen dioxide proficiency testing.**

Government provides an additional layer of surety for local authorities operating nitrogen dioxide diffusion tubes through the independent analytical proficiency-testing scheme. Through the Workplace Analysis Scheme for Proficiency, laboratories are provided with a number of test samples that are designed to test their proficiency in undertaking chemical analysis of diffusion tubes. The WASP scheme is operated independently by the Health and Safety Laboratory.

For the 2018 sampling period, Gradko’s performance was assessed as follows:



## Appendix B: Defra NO<sub>2</sub> Distance Calculator.



BUREAU  
VERITAS

Enter data into the pink cells

Site Name/ID	Distance (m)		NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> )			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
Great Georges Street	0.5	5.4	22.0	44.0	34.7	
Chichester Street	2.0	5.0	24.0	41.0	37.4	Predicted concentration at Receptor within 10% the AQS objective.
Stockmans Lane	2.0	9.7	20.0	49.0	38.3	Predicted concentration at Receptor within 10% the AQS objective.