2016 Air Quality Progress Report

The City of Cardiff Council

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

August 2016

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Executive Summary

This report is Cardiff Council's 2016 Progress Report. It is the second of three annual reports to be made under "Phase 6" of the Local Air Quality Management regime.

Since the 2015 Updating and Screening Assessment the Council has continued its monitoring of nitrogen dioxide in specific areas situated within the Cardiff Borough. The monitoring has been able to provide results that assist with quantifying the potential impacts of planning applications and significant industrial developments on local air quality.

The 2015 nitrogen dioxide monitoring data presented in this report shows a number of sites representative of relevant exposure with exceedences of the 40µgm^3 annual mean objective. These sites are predominantly contained within the declared AQMAs. However, there are two monitoring locations (Site IDs- 74 & 172) which are not located within AQMAs, but it should be noted that annual exceedences are not out of character for these sites and are in locations not representative of relevant exposure. Site 74 (Station Terrace) is a kerbside location, established to monitor long-term trends of immediate road network. At the time of writing this report Site 74 has been relocated to a new location Site 183 which represents improved relevant exposure. Site 172 (Ocean Way) is a kerbside location situated up to 650m from any relevant exposure, used to examine potential impacts of traffic resulting from industrial development in the area.

Following the completion of this 2016 Progress Report a detailed assessment is scheduled to be compiled to investigate the elevated concentration of NO2 levels for Kingsway/ Duke Street/ Castle Street link area. This assessment will essentially confirm whether the current City Centre AQMA needs to be extended to include these streets.

Monitoring for other pollutants did not result in other exceedences of National Air Quality Standards.

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1 Introduction

1.1 Description of Local Authority Area

The capital city of Wales, Cardiff has a population of 346,100 people, and is a base for many of the country's political, cultural, sporting and commercial institutions. Principal destinations include the Millennium Stadium in the city centre, the St David's I and II shopping centres, and the historic Cardiff Castle. To the south of the city, Cardiff Bay (in the Butetown and Grangetown Wards) houses the Senedd, Wales Millennium Centre, BBC studios. Cardiff City Football Club and rugby union side Cardiff Blues are also both based in the capital.

Cardiff is a relatively flat city bounded by hills on the outskirts to the north and west. The Western, Northern and Eastern areas of the City are mainly residential, with the main commercial areas being in the City Centre and to the south. The industrial areas are centered on the docks in coastal areas to the south.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

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

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in Wales** are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138), Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre µg/m^3 (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	5.00 µg/m^3	Annual mean	31.12.2011
1,3-butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate matter (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

This Report is the second of Phase 6 of the Local Air Quality Management regime. The outcomes of the previous phases are discussed below.

Phase 1

The Local Air Quality Management regime commenced with the Air Quality Regulations 1997, which came into force in December of that year. These Regulations were revoked and superceded by the current Air Quality (Wales) Regulations 2000 (as subsequently amended in 2002).

The first phase of the review and assessment process concluded that for six of the seven pollutants included in the regulations there was little or no risk of the objectives being breached and that Air Quality Management Areas (AQMAs) for these pollutants were not necessary. Measures taken at the national level would be sufficient to ensure that there would be no local "hot-spots" of these pollutants and therefore local controls in addition to the national measures would not be required.

However, for the seventh of these pollutants, nitrogen dioxide (NO_2), it was concluded that national control measures such as vehicle emission and fuel standards, controls on industrial emissions, etc., would not, of themselves, be sufficient to ensure that the air quality objectives for this pollutant would not be met in all areas of Cardiff.

Whilst the vast majority of the area would meet the objectives, there were predicted to be local "hot-spots" close to heavily-trafficked road junctions where there were buildings close to the road and significant amounts of queuing traffic where the objectives would not be met.

As a result, four AQMAs were declared, each having been declared on the basis of measurements and modelling showing predicted breaches of the annual average objective for NO_2. These AQMAs were known as:

- The Cardiff West AQMA
- The Newport Road AQMA
- The Philog AQMA
- The St Mary Street AQMA

The first three of these came into force on 1st December 2000 and the latter on 1st September 2002. AQAPs the first three were published in November 2002 and for St Mary Street in February 2010.

Phase 2

The Council's 2003 USA concluded that for five of the seven pollutants regulated under the LAQM regime there was no evidence to suggest that local "hot-spots" for these pollutants had been missed in the first phase of the review and assessment process and that there was no need to consider these pollutants further at this time.
The 2003 USA also concluded that no local hot-spots of nitrogen dioxide had been overlooked during the first phase of review and assessment and that further detailed assessment of this pollutant was not necessary.

However, whilst the USA concluded that there was no evidence to suggest a likely breach of the 2004 objective for particulate matter (PM_{10}), there was considerable doubt that the provisional 2010 objectives for PM_{10} would be achieved.

As a result of the conclusions of the 2003 USA the Council issued Progress Reports in 2004 and 2005.

Phase 3

Following the 2006 USA, the Council published and consulted upon an Air Quality Management Area (AQMA) Review during the autumn of 2006. This concluded that two of the four AQMAs could be revoked and that the then Cardiff West AQMA should be reduced in size and renamed as the Ely Bridge AQMA. Orders making the changes came into force on 1st February 2007.

The 2007 Progress Report highlighted a potential problem with regard to nitrogen dioxide concentrations on Newport Road in the immediate vicinity of Stephenson Court, where concentrations had been marginally, but consistently, above the Air Quality objective for a

few years. It was concluded that the possibility of declaring a new AQMA would be assessed in the 2008 Progress Report.

The monitoring data for the Stevenson Court area presented in the 2008 Progress Report led to the conclusion that a further "watching brief" would be kept with a view to reaching a firm conclusion once ratified monitoring data for the 2008 calendar year became available.

The monitoring data for 2007 presented in the 2008 Progress Report provided reassurance that the Council's decisions in respect of the 2006 AQMA Review were soundly based.

Phase 4

The 2009 USA concluded that a Detailed Assessment for the Stephenson Court area of Newport Road was required as the annual mean concentration of nitrogen dioxide at three sites representative of relevant exposure in the area were above the air quality Objective.

A Detailed Assessment for this area was consulted upon during the summer of 2010 and the AQMA came into force on 1st December 2010.

The Council's 2010 Progress Report was submitted in December 2010 and the 2011 Progress Report in June 2011.

The 2011 Progress Report highlighted abnormally high NO_2 2010 annual mean concentrations across the Council's monitoring network which could not be attributed to a particular source and evidence was presented to show that this was a regional issue probably associated with a prolonged period of unusually cold weather during November and December 2010. After dialogue with Welsh Assembly Government with regard to the conclusions reached about this data it was concluded that the Council would proceed to Detailed Assessments for the Llandaff and Westgate Street areas of the city and review the situation with regard to other exceedences when 2011 data is available and reported in 2012. A Further Assessment for the Stephenson Court AQMA was submitted to WAG for review in December 2011, i.e. one year after the AQMA was declared, in compliance with Section 84(2)(a) of the Environment Act 1995.

Phase 5

The 2012 USA was the first report in Phase 5 of the review and assessment process.

Monitoring data for 2011 largely confirmed that the annual mean concentrations of nitrogen dioxide previously reported for 2010 were unusually elevated, both locally and regionally, and local concentrations had returned to more typical values in 2011.

Detailed Assessments in respect of nitrogen dioxide in Westgate Street and for the Llandaff area were consulted upon during the summer of 2012 and as a result a new AQMA for Llandaff was declared on 1st April 2013 and Westgate Street was incorporated into the St Mary Street AQMA; this latter AQMA is now named Cardiff City Centre AQMA.

The Council's 2013 Progress Report recommended proceeding to a Detailed Assessment for the Fairoak Road Roundabout in the Plasnewydd Ward of the city as monitoring data over previous years indicated the need. This was submitted for review during 2014. The Assessment concluded that, as monitoring data for 2013 had returned to Objective compliance, there was no need to declare an AQMA at that time. It was proposed to continue monitoring in the area and review the results year-on-year.

The Further Assessment for the City Centre AQMA was submitted in April 2014 and the conclusion that the declaration of the AQMA was justified was accepted.

A Further Assessment for the Llandaff AQMA was also submitted for review in 2014. This concluded that the declaration of the AQMA was justified based upon monitoring data available at the time. However, as monitoring data for 2013 showed compliance with the Objective, it was concluded that there was no need to develop an Action Plan at that time. Monitoring would continue and the situation would be reviewed year-on-year.

In summary, there are currently four AQMAs in Cardiff; all have been declared in respect of NO_2 resulting from road-traffic emissions:

- Cardiff City Centre AQMA
- Ely Bridge AQMA
- Stephenson Court AQMA
- Llandaff AQMA

Phase 6

The 2015 USA was the first report in Phase 6 of the review and assessment process.

Monitoring data for 2014 largely confirmed that the annual mean concentrations of nitrogen dioxide previously reported for 2010 were unusually elevated, both locally and regionally, and local concentrations had returned to more typical values in 2011.

Figure 1.1 Boundary of Cardiff City Centre AQMA

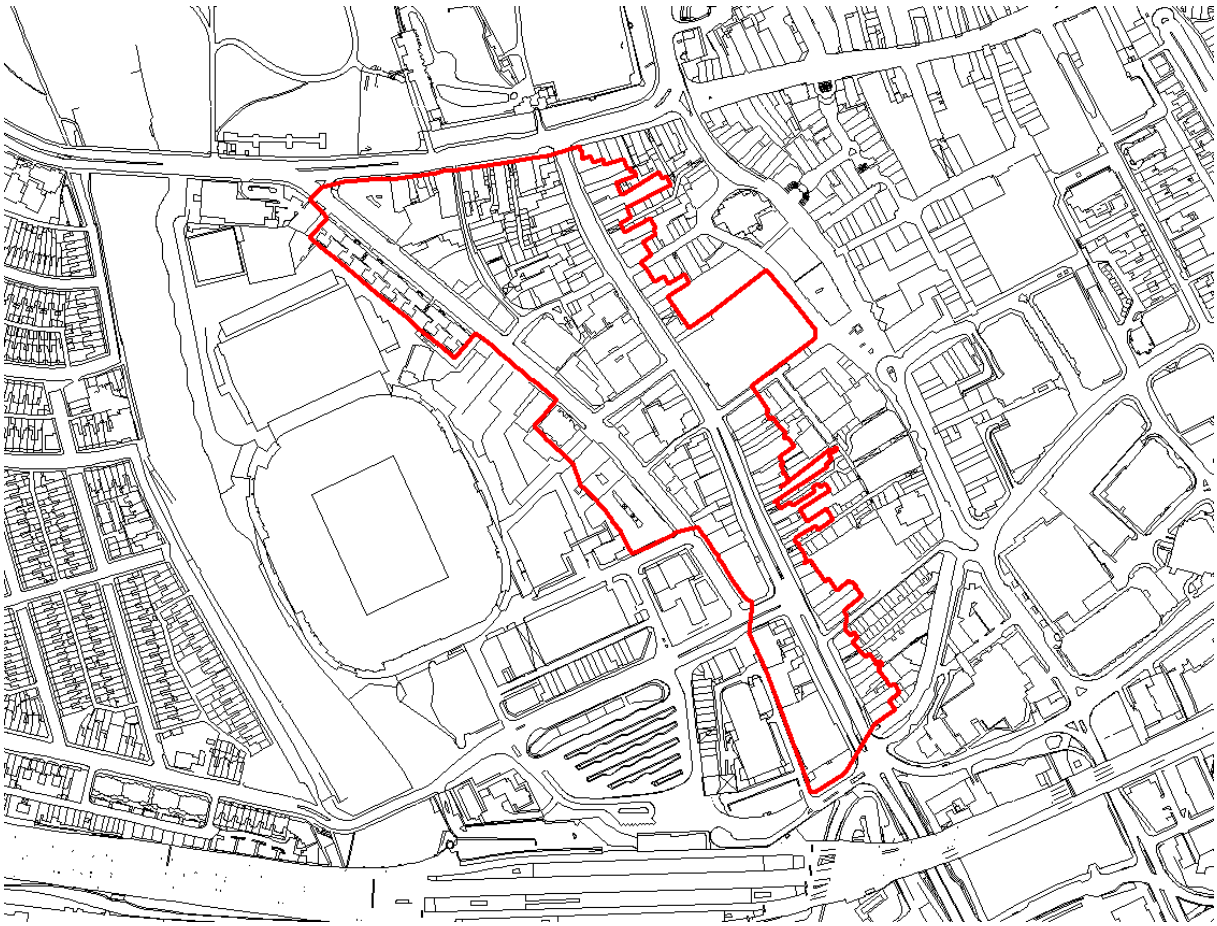


Figure 1.2 Boundary of Ely Bridge AQMA

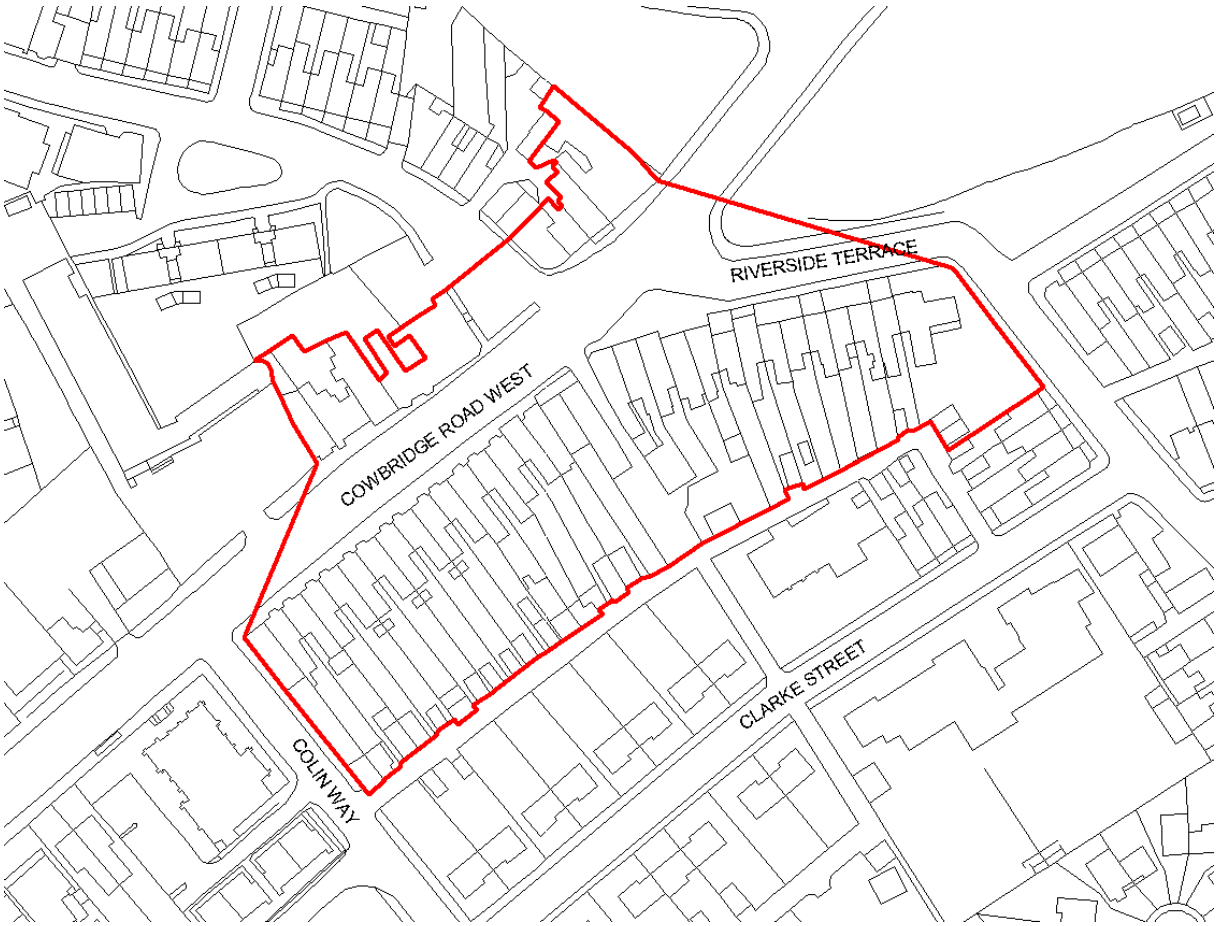


Figure 1.3 Boundary of Stephenson Court AQMA

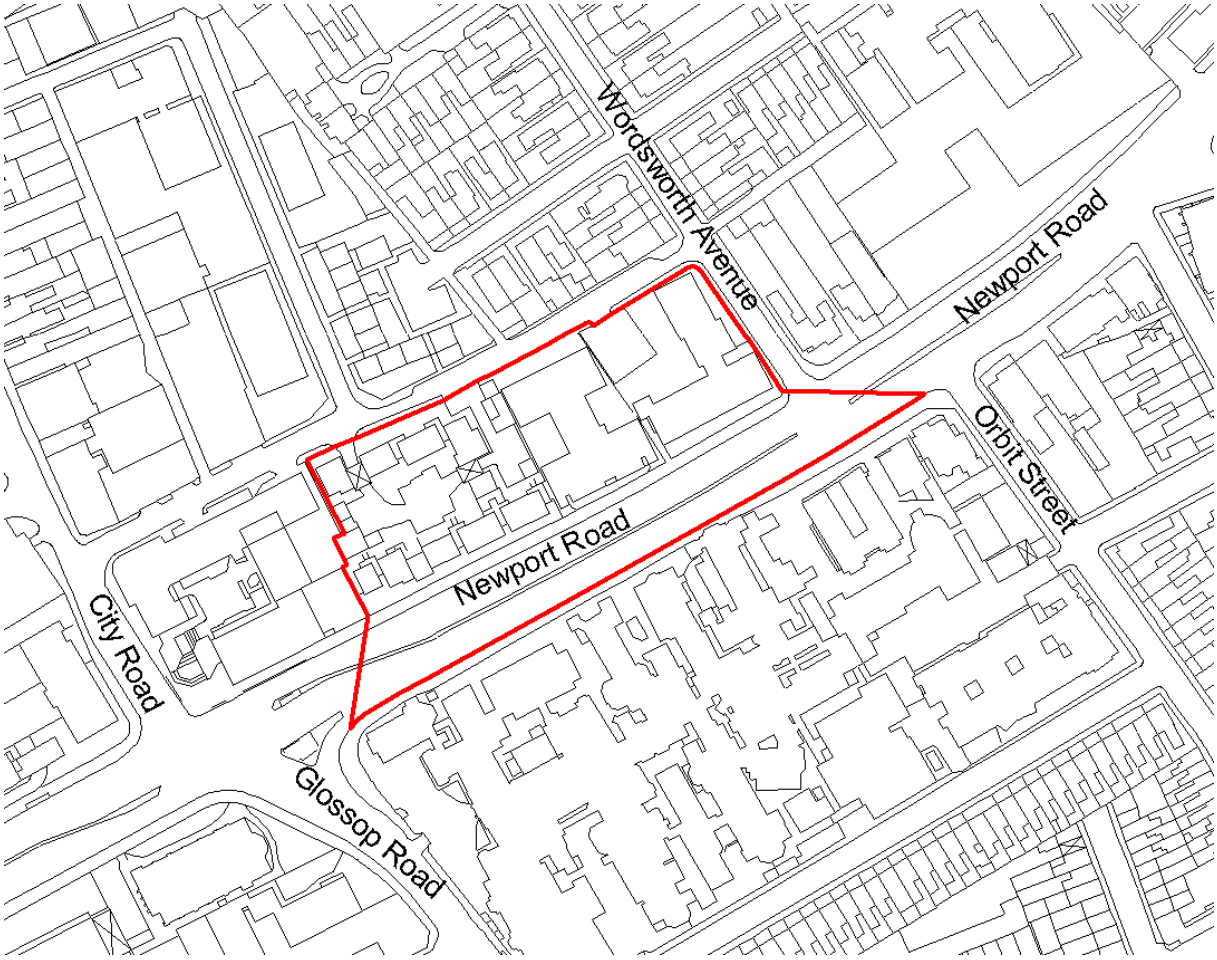


Figure 1.4 Boundary of Llandaff AQMA

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

During 2015 monitoring took place at one automatic monitoring site in Cardiff, i.e. DEFRA's Cardiff Centre AURN site in Frederick Street (adjacent to the pedestrianised Queen Street shopping centre).

The Cardiff Centre AURN has been operating since May 1992. The station is part of DEFRA's AURN network and there are similar stations located in towns and cities across the UK.

This site is subject to six-monthly QA/QC audits by AEA, DEFRA's appointed contractor, and calibration gases are all traceable to National Standards. Calibrations have been carried out fortnightly by the appointed contractor. The repair and replacement of equipment has been contracted to suppliers of national repute throughout the station's working life. In February 2007 the PM_{10} analyser was replaced with a PM_{10} FDMS analyser and the site was augmented with a $PM_{2.5}$ FDMS analyser in August 2008.

Data from the Cardiff Centre AURN site has been validated and ratified by Ricardo-AEA and was downloaded from the Welsh Air Quality Forum database during May 2016. The site can be accessed here:

http://www.welshairquality.co.uk/

Figure 2.1 Location of Cardiff Centre AURN Monitoring Site

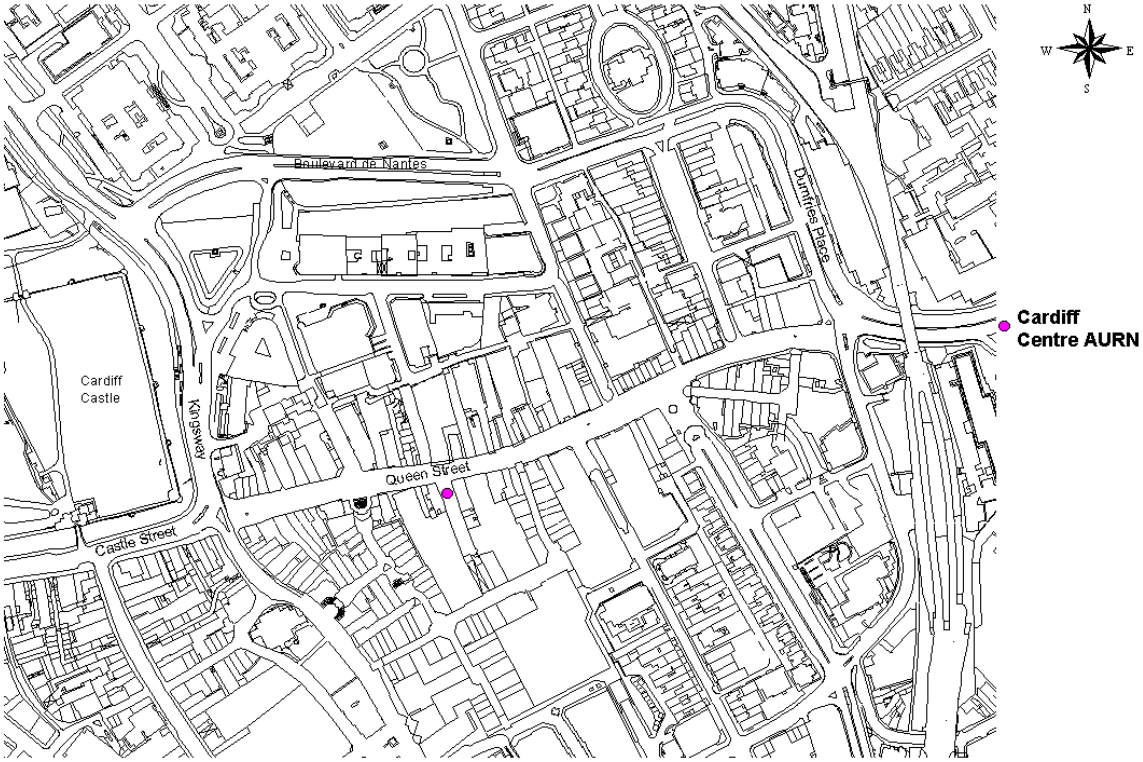


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Cardiff Centre AURN	Urban Centre	318416	176525	NO_2	N	Chemiluminescence	Y (5m)	200m	N
Cardiff Centre AURN	Urban Centre	318416	176525	PM_{10}, $PM_{2.5}$	N	TEOM- FDMS	Y (5m)	200m	N
Cardiff Centre AURN	Urban Centre	318416	176525	SO_2	N	UV Fluorescence	Y (5m)	200m	N
Cardiff Centre AURN	Urban Centre	318416	176525	CO	N	Infra-Red GFC	Y (5m)	200m	N
Cardiff Centre AURN	Urban Centre	318416	176525	O_3	N	UV Absorption	Y (5m)	200m	N

2.1.2 Non-Automatic Monitoring Sites

Cardiff Council carries out monitoring of ambient air quality for Nitrogen Dioxide (NO_2). During the period since the Updated Screening Assessment in 2015, monitoring of NO_2 using passive diffusion tubes has been carried out at 73 locations throughout the district. The locations of the diffusion tubes are described in Table 2.2 and shown in Figures 2.2- 2.25.

The Council's monitoring network has evolved over time and, as sites have been closed and replaced by new ones, the tube locations have become increasingly focussed on residential premises close to busy roads and junctions.

No diffusion tube monitoring sites were decommissioned during 2015; all sites operational in 2014 were operational in 2015.

Since 2002, three diffusion tubes have been located on the inlet duct of the Cardiff Centre AURN monitoring site for bias-adjustment purposes.

A map showing the location and distribution of the diffusion tubes is shown below and Table 2.2 details the monitoring sites and their locations.

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?
16	Ninian Park Road	Roadside	317040	176060	1.5	NO_2	N	N	Y (0.05m)	5m	Y
33	Mitre Place	Kerbside	315248	178165	3.0	NO_2	Y	N	N (20m)	1m	Y
44	City Road	Kerbside	319086	177097	3.0	NO_2	N	N	Y (2m)	1m	Y
45	Mackintosh Place	Kerbside	318722	177788	3.5	NO_2	N	N	N (3m)	1m	Y
47	Ely Bridge	Kerbside	314457	176738	2.5	NO_2	Y	N	N (2m)	0.25m	Y
49	Penarth Road	Roadside	317760	175310	1.5	NO_2	N	N	Y (0.05m)	7m	Y
56	Birchgrove Village	Roadside	316816	180005	2.5	NO_2	N	N	N (10m)	1.5m	Y
58	Westgate Street	Kerbside	317937	176400	2.5	NO_2	Y	N	N (5m)	0.5m	Y
73	Green Street	Kerbside	317607	176434	2.5	NO_2	N	N	N (2m)	0.5m	Y
74	Station Terrace	Kerbside	318772	176544	2.5	NO_2	N	N	N (50m)	1m	Y
81	Stevenson Court	Roadside	319387	176980	2.0	NO_2	Y	N	Y (0.05m)	5m	Y
82	104 Birchgrove Road	Roadside	316518	179683	2.0	NO_2	N	N	Y (0.05m)	5m	Y
85	497 Cowbridge Road West	Roadside	312129	175084	1.5	NO_2	N	N	Y (0.05m)	5m	Y
86	19 Fairoak Road	Roadside	318452	178805	1.5	NO_2	N	N	Y 0.10m)	10m	Y

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?
96	Manor Way Junction	Roadside	316601	179653	1.5	NO_2	N	N	Y (0.05m)	5m	Y
97	Newport Road (premises)	Roadside	319955	177546	1.5	NO_2	N	N	Y (0.05m)	10m	Y
98	Western Avenue (premises)	Roadside	314805	177345	1.5	NO_2	N	N	Y (0.05m)	10m	Y
99	Cardiff Road Llandaff	Roadside	315275	178117	1.5	NO_2	Y	N	Y (0.05m)	3m	Y
100	188 Cardiff Road	Roadside	316226	177305	1.5	NO_2	N	N	Y (0.10m)	20m	Y
101	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO_2	N	Y, Triplicate with Tubes 102 & 103	Y (0.10m)	200m	Y
102	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO_2	N	Y, Triplicate with Tubes 101 & 103	Y (0.10m)	200m	Y
103	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO_2	N	Y, Triplicate with Tubes 101 & 102	Y (0.10m)	200m	Y
106	30 Caerphilly Road	Roadside	316851	179520	1.5	NO_2	N	N	Y (0.05m)	5m	Y
107	Lynx Hotel	Roadside	320356	177618	1.5	NO_2	N	N	Y (0.05m)	4m	Y
111	98 Leckwith Road	Roadside	316444	175866	1.5	NO_2	N	N	Y (0.05m)	6m	Y
112	17 Sloper Road	Roadside	316613	175910	1.5	NO_2	N	N	Y (0.05m)	5m	Y
115	21 Llandaff Road	Roadside	316604	176641	1.5	NO_2	N	N	Y (0.05m)	3m	Y

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?
117	25 Cowbridge Road West	Roadside	314458	176735	2.0	NO_2	Y	N	Y (0.05m)	2m	Y
119	Havelock Street	Kerbside	318184	176086	2.0	NO_2	N	N	N	1m	Y
124	287 Cowbridge Road East	Roadside	316586	17535	1.5	NO_2	N	N	Y (0.05m)	10m	Y
126	Westgate Street Flats	Roadside	317946	176387	1.5	NO_2	Y	N	Y (0.10m)	5m	Y
128	117 Tudor Street	Roadside	317540	175979	1.5	NO_2	N	N	Y (0.05m)	5m	Y
129	Stephenson Court 2	Roadside	319349	176963	1.2	NO_2	Y	N	Y (3m)	4m	Y
130	Burgess Court	Roadside	319326	176949	2.0	NO_2	Y	N	Y (0.05m)	5m	Y
131	Dragon Court	Roadside	319292	176932	1.75	NO_2	Y	N	Y (0.05m)	5m	Y
133	St Mark's Avenue	Roadside	317019	179078	2.0	NO_2	N	N	N (21m)	2m	N
134	Sandringham Hotel	Roadside	318261	176229	2.0	NO_2	Y	N	N (3m)	5m	Y
139	Lower Cathedral Road	Kerbside	317540	176410	2.0	NO_2	N	N	Y (3m)	1m	Y
140	Clare Street	Kerbside	317600	176047	2.0	NO_2	N	N	Y (6m)	0.5m	Y
141	Fairoak Road 2	Roadside	318438	178742	2.0	NO_2	N	N	N (5m)	1.5m	Y
142	Pure Rugby	Kerbside	318326	176086	2.0	NO_2	Y	N	N (>25m)	0.25m	Y
143	Windsor House	Roadside	318009	176337	1.5	NO_2	Y	N	Y (0.10m)	6.5m	Y
144	Marlborough House	Roadside	318046	176307	1.5	NO_2	Y	N	Y (0.10m)	6.5m	Y
145	Tudor Street Flats	Roadside	317904	175921	1.5	NO_2	N	N	Y (0.05m)	4.5m	Y
146	Neville Street	Roadside	317508	176275	2.0	NO_2	N	N	Y (0.05m)	3.5m	Y

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?
147	211 Penarth Road	Roadside	317636	175161	1.5	NO_2	N	N	Y (0.10m)	7.0m	Y
148	161 Clare Road	Roadside	317695	175389	1.5	NO_2	N	N	Y (0.05)	5.0m	Y
149	10 Corporation Road	Roadside	317764	175174	1.5	NO_2	N	N	Y (0.05)	4.6m	Y
152	James Street	Roadside	319003	174596	1.5	NO_2	N	N	Y (0.10m)	6.0m	Y
153	Magic Roundabout	Roadside	319491	176183	1.5	NO_2	N	N	Y (0.10m)	12.5m	Y
156	2a/4 Colum Road	Roadside	317997	177412	1.5	NO_2	N	N	Y (0.10m)	5.0m	Y
157	47 Birchgrove Road	Roadside	316605	179703	1.5	NO_2	N	N	Y (0.10m)	8.0m	Y
158	64/66 Cathays Terrace	Roadside	318093	177716	1.5	NO_2	N	N	Y (0.05m)	3.0m	Y
159	IMO façade replacement	Roadside	320709	177918	1.5	NO_2	N	N	Y (0.10m)	4.0m	Y
160	High Street Zizzi	Urban Centre	318131	176407	2.0	NO_2	Y	N	Y (0.10m)	65m	Y
161	52 Bridge Road	Roadside	315230	178205	1.5	NO_2	Y	N	Y (0.05m)	7.9m	Y
162	58 Cardiff Road	Roadside	315533	177809	1.5	NO_2	N	N	Y (0.05m)	8.8m	Y
163	118 Cardiff Road	Roadside	315738	177723	1.5	NO_2	N	N	Y (0.05m)	14.8m	Y
164	725 Newport Road	Roadside	321405	179345	1.5	NO_2	N	N	Y (0.05m)	6.5m	Y
165	6 Heol Tyrrell	Roadside	315918	176221	1.5	NO_2	N	N	Y (0.05m)	5.5m	Y
166	163 Lansdowne Road	Roadside	315950	176424	1.5	NO_2	N	N	Y (0.05m)	5.4m	Y

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?
167	359 Lansdowne Road	Roadside	315326	176714	1.5	NO_2	N	N	Y (0.05m)	6.1m	Y
168	570 Cowbridge Road East	Roadside	314856	176929	1.5	NO_2	N	N	Y (0.05m)	4.8m	Y
169	43 Clos Hector	Urban Background	321586	177414	1.5	NO_2	N	N	Y (0.05m)	43m	Y
170	11 Pengam Green	Roadside	320973	177721	1.5	NO_2	N	N	Y (0.05m)	9.3m	Y
171	23 Tweedsmuir Road	Roadside	320750	177053	1.5	NO_2	N	N	Y (0.05m)	10.2m	Y
172	Ocean Way 1	Roadside	320544	175613	2.0	NO_2	N	N	N (>650m)	1.5m	Y
173	Ocean Way 2	Roadside	320395	175623	2.0	NO_2	N	N	N (>650m)	1.5m	Y
174	76 North Road	Kerbside	317508	177868	1.5	NO_2	N	N	Y (0.1m)	1m	Y
175	Northgate House	Kerbside	318217	176545	2.0	NO_2	N	N	N (9.4m)	0.2m	Y
176	Castle Arcade	Roadside	318079	176457	2.0	NO_2	N	N	N (3.8m)	2.6m	Y
177	Angel Hotel	Roadside	317944	176438	2.0	NO_2	N	N	Y (0.1m)	3m	Y
178	Park Street/Westgate Street	Kerbside	318235	176140	2.0	NO_2	N	N	N (2.5m)	0.3m	Y

Figure 2.2 Map Showing Location and Distribution of Diffusion Tubes in 2015

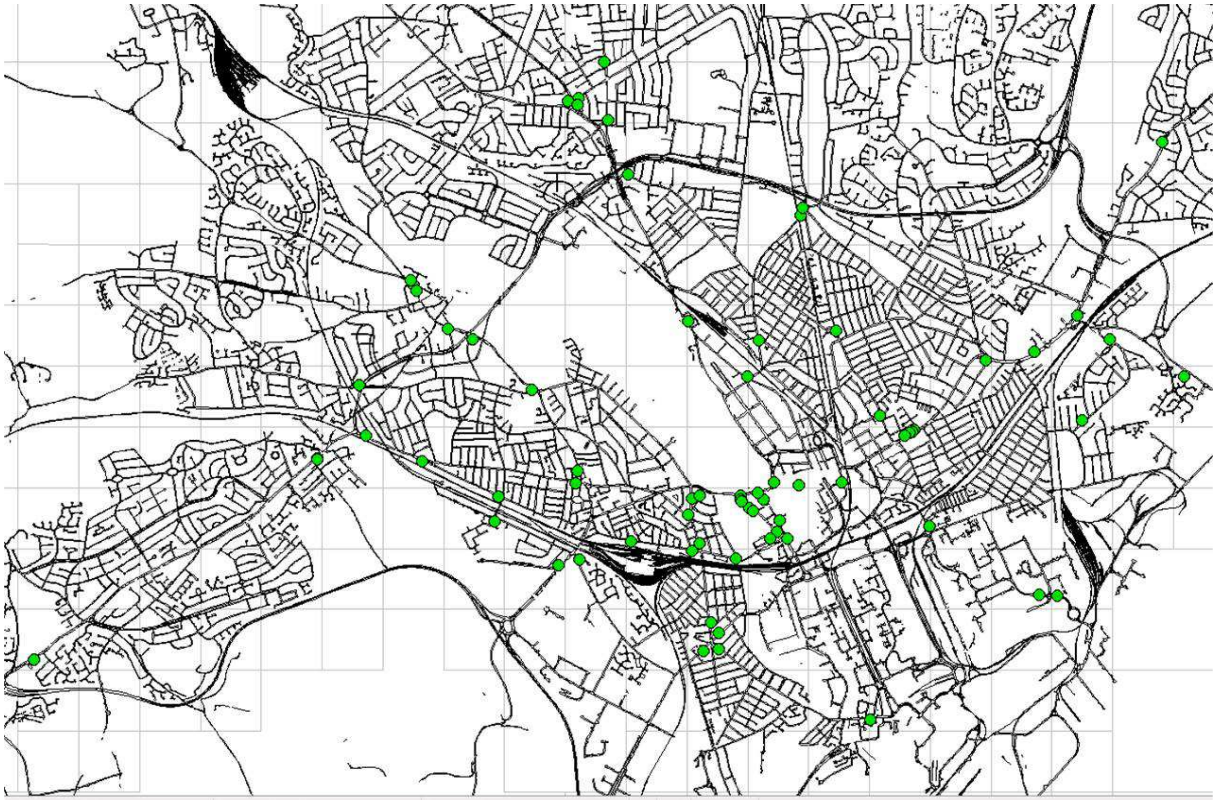


Figure 2.3 Map Showing Location of Diffusion Tubes in and around the Cardiff City Centre AQMA

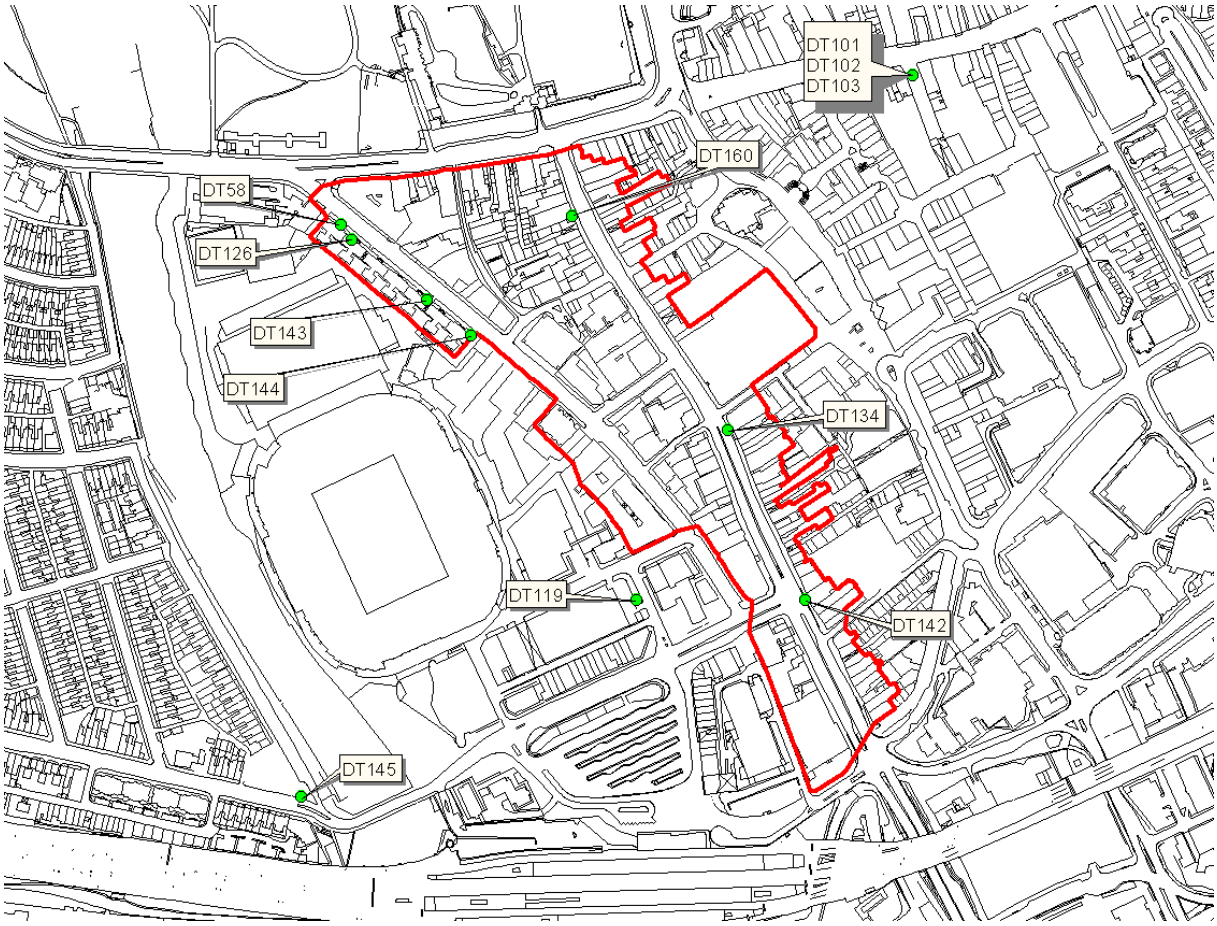


Figure 2.4 Map Showing Location of Diffusion Tubes in and around the Ely Bridge AQMA

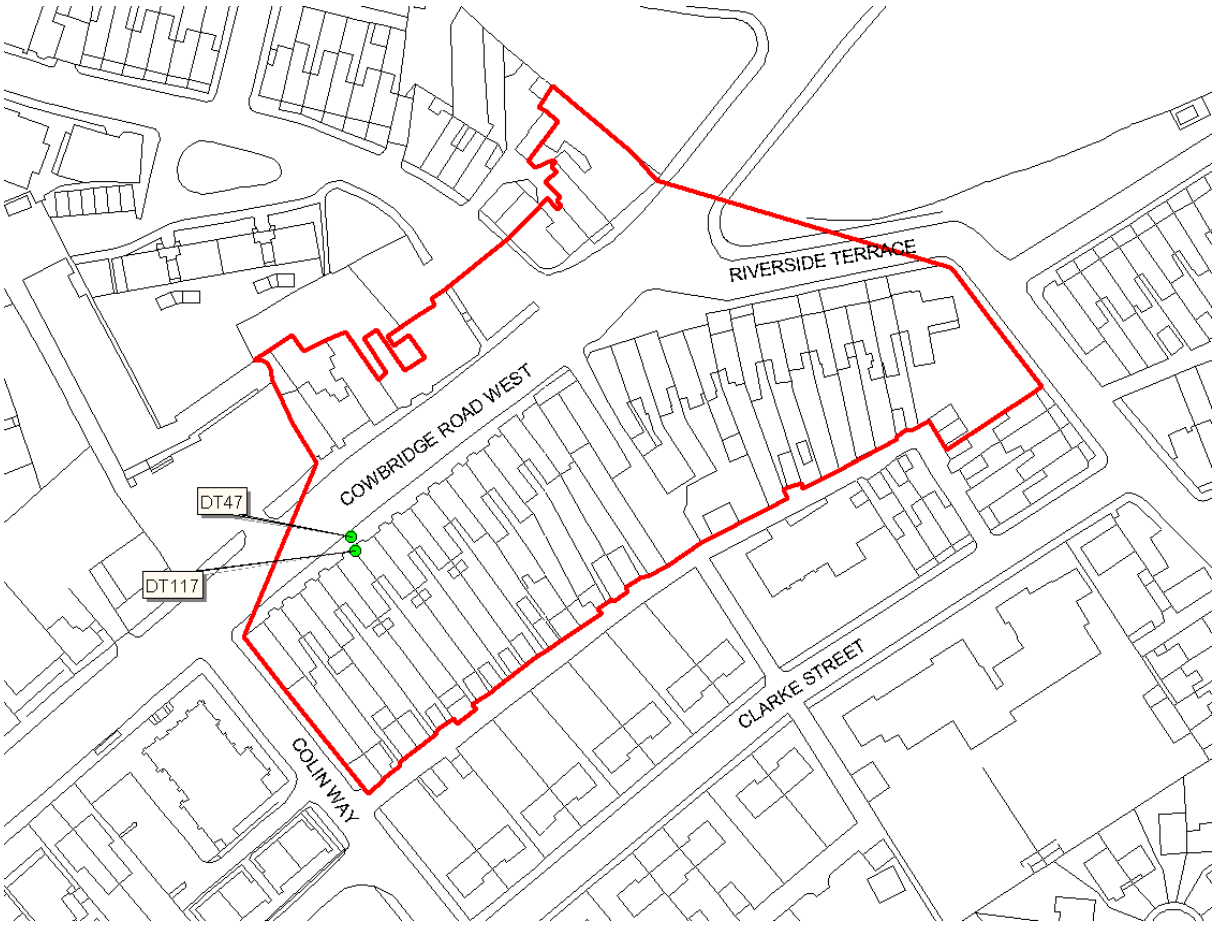


Figure 2.5 Map Showing Location of Diffusion Tubes in and around the Stephenson Court AQMA

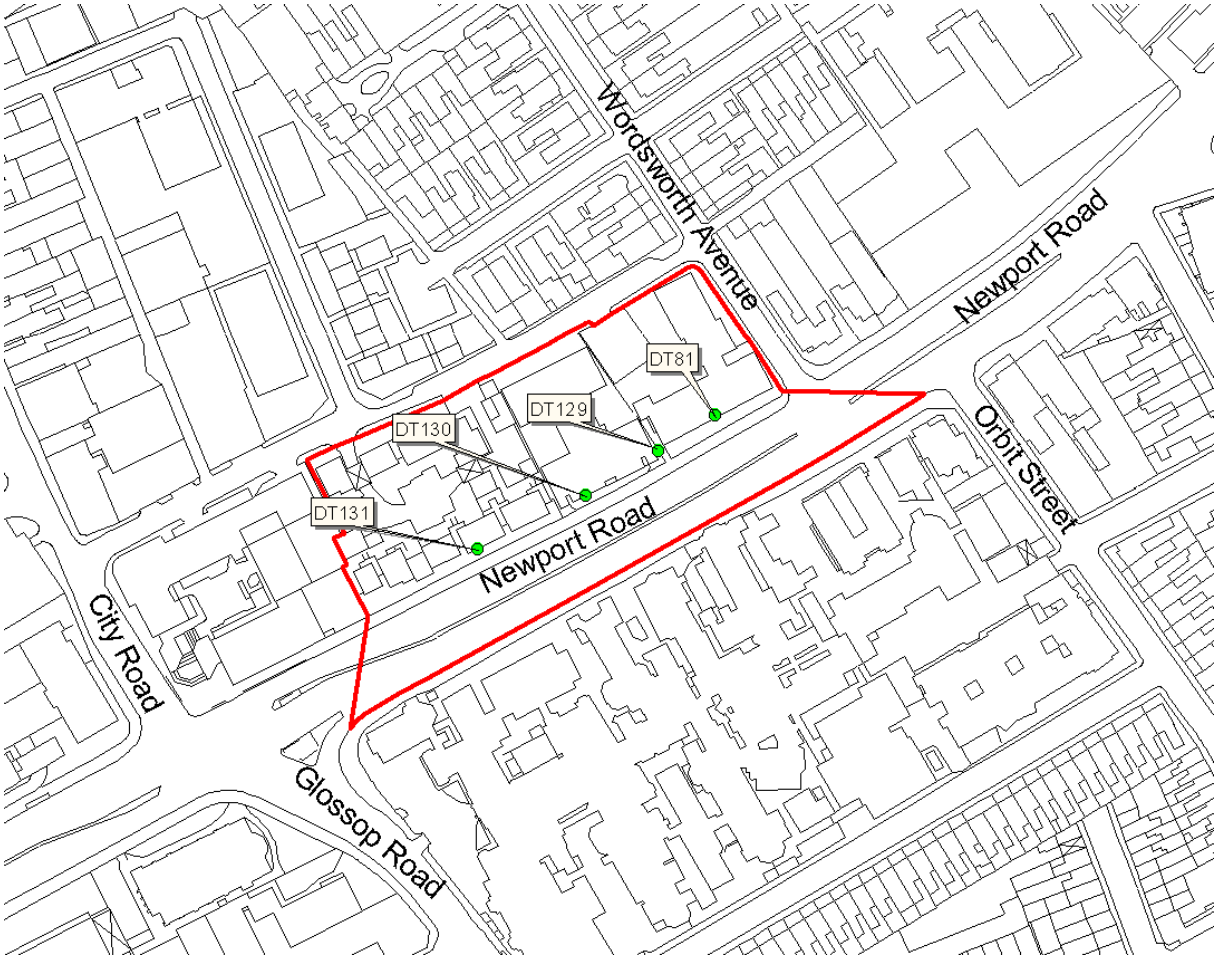


Figure 2.6 Map Showing Location of Diffusion Tubes in and around the Llandaff AQMA

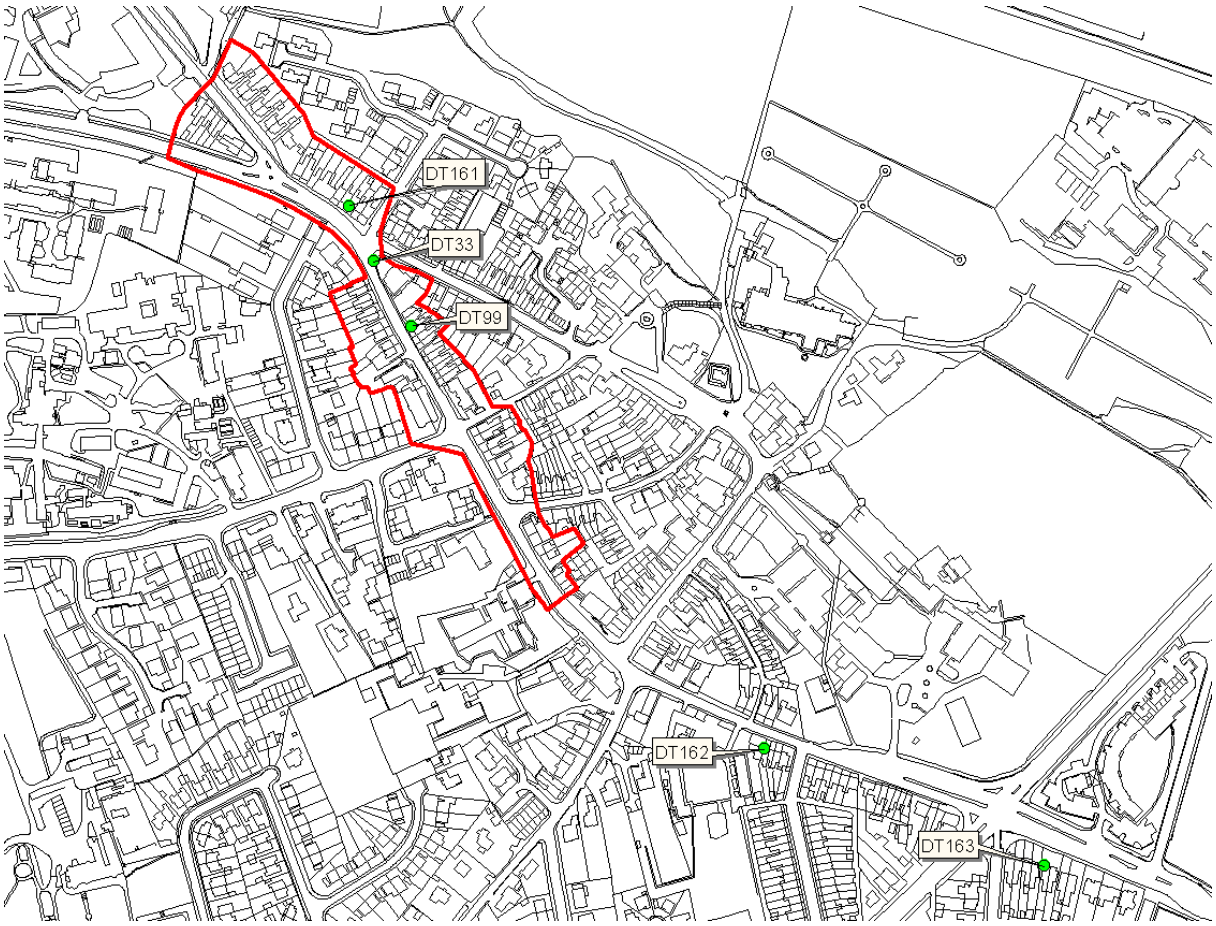


Figure 2.7 Map Showing Location of Diffusion Tube at Cardiff Road

Figure 2.8 Map Showing Location of Diffusion Tubes in Cathays area

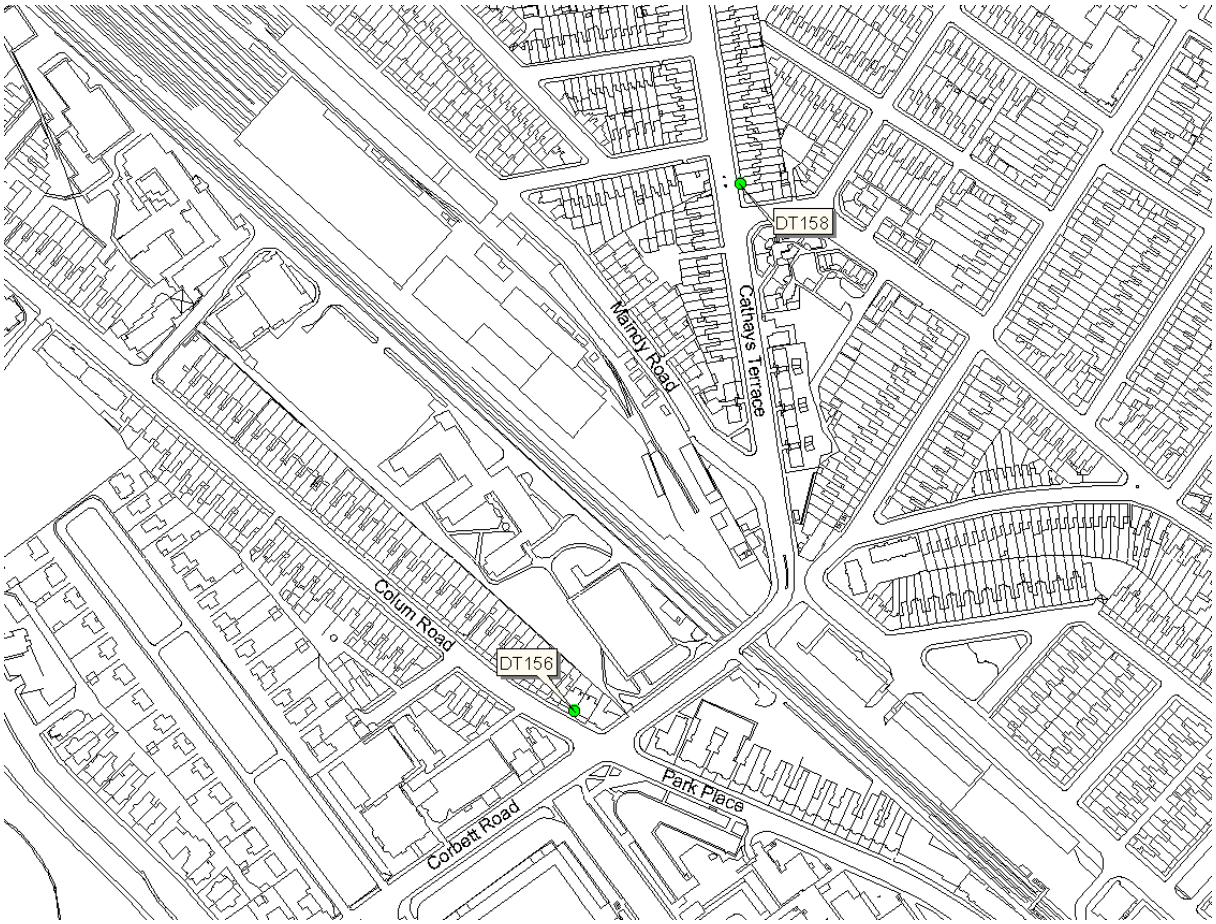


Figure 2.9 Map Showing Location of Diffusion Tube in City Road

Figure 2.10 Map Showing Location of Diffusion Tubes in Riverside area

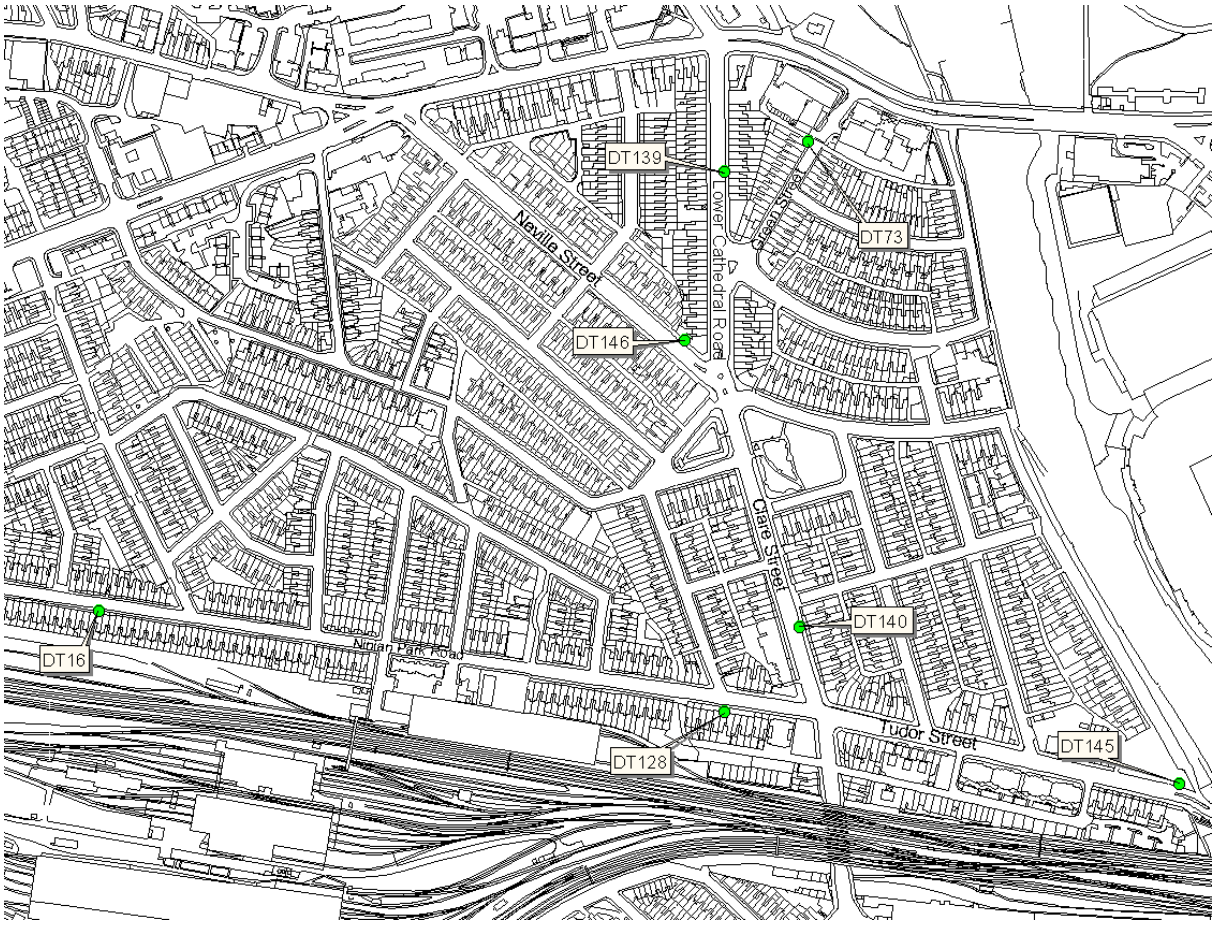


Figure 2.11 Map Showing Location of Diffusion Tube at Cowbridge Road West

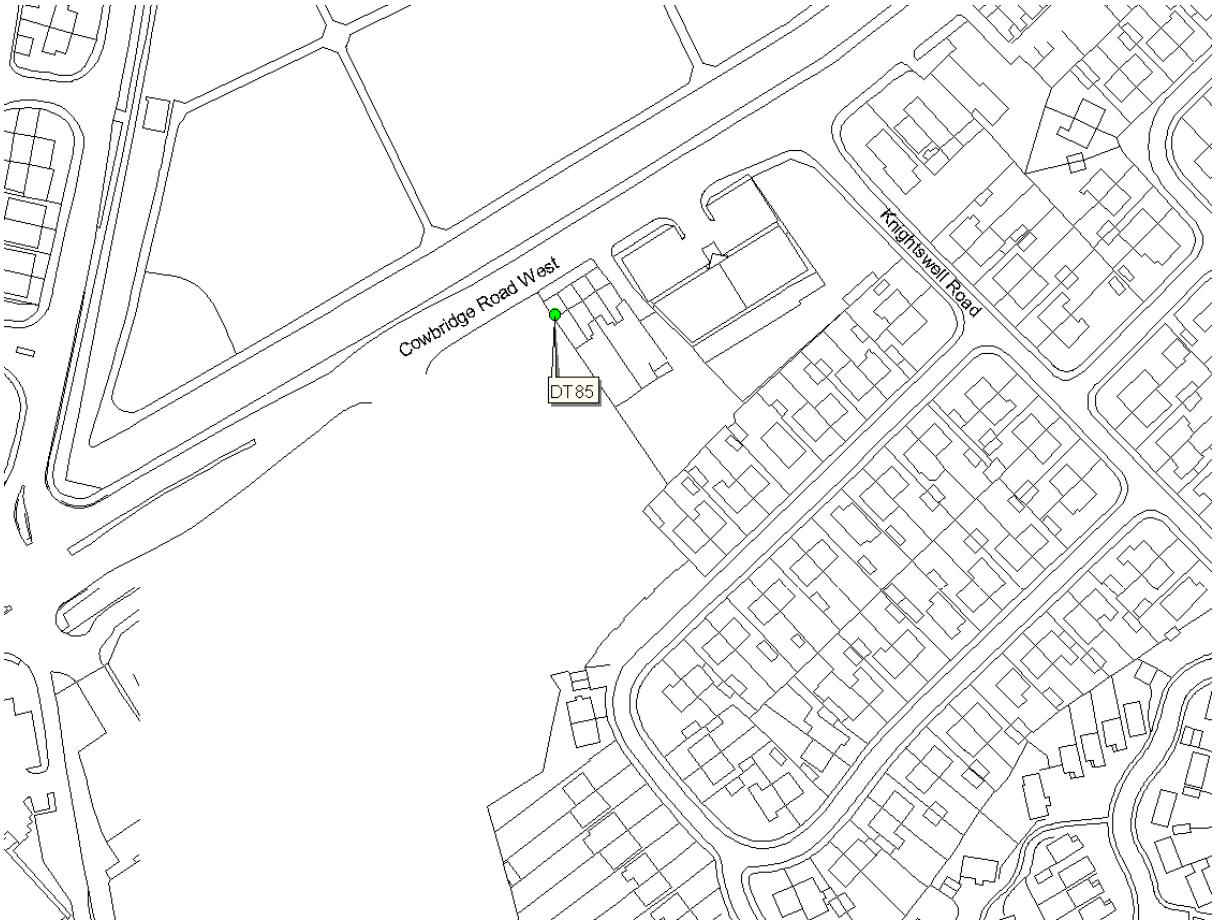


Figure 2.12 Map Showing Location of Diffusion Tube in Mackintosh Place

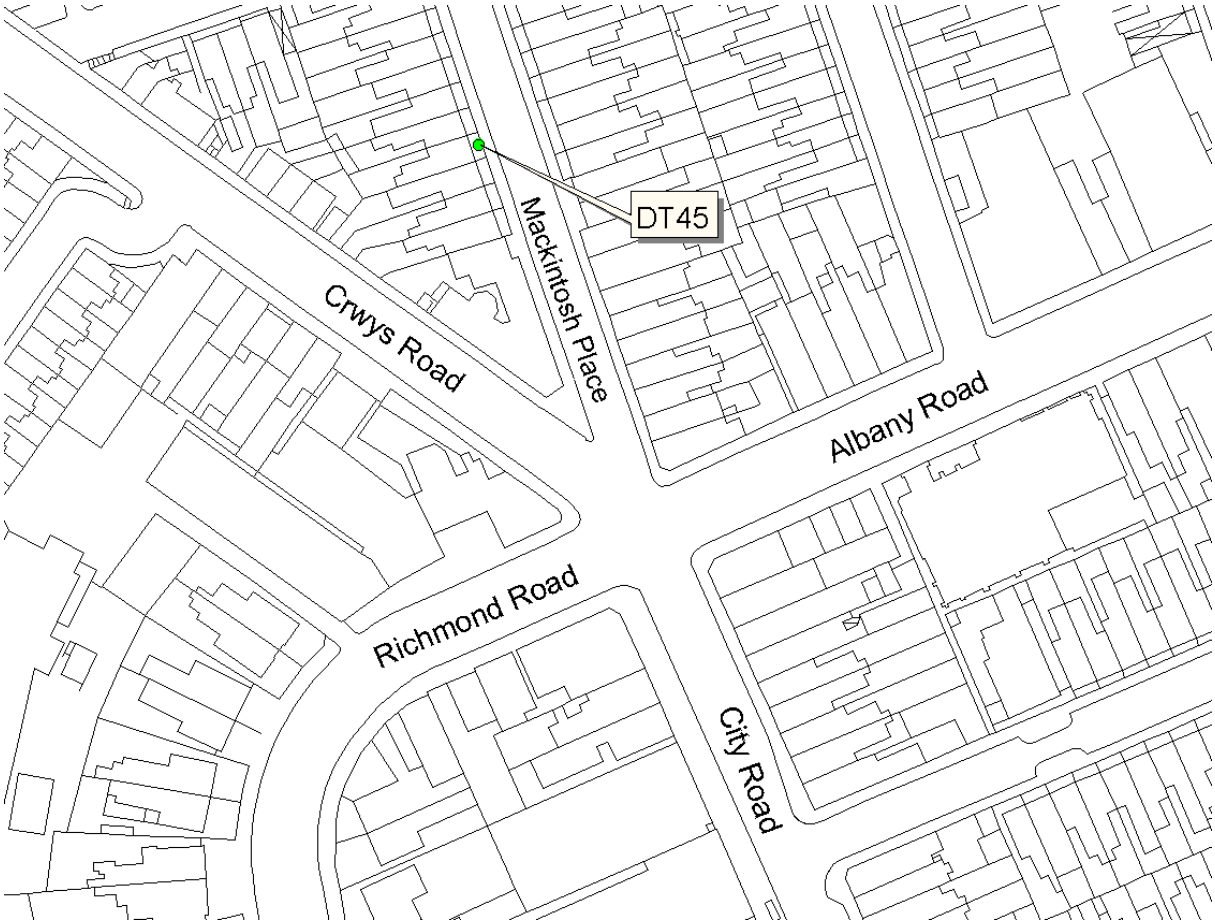


Figure 2.13 Map Showing Location of Diffusion Tubes in Fairoak Road

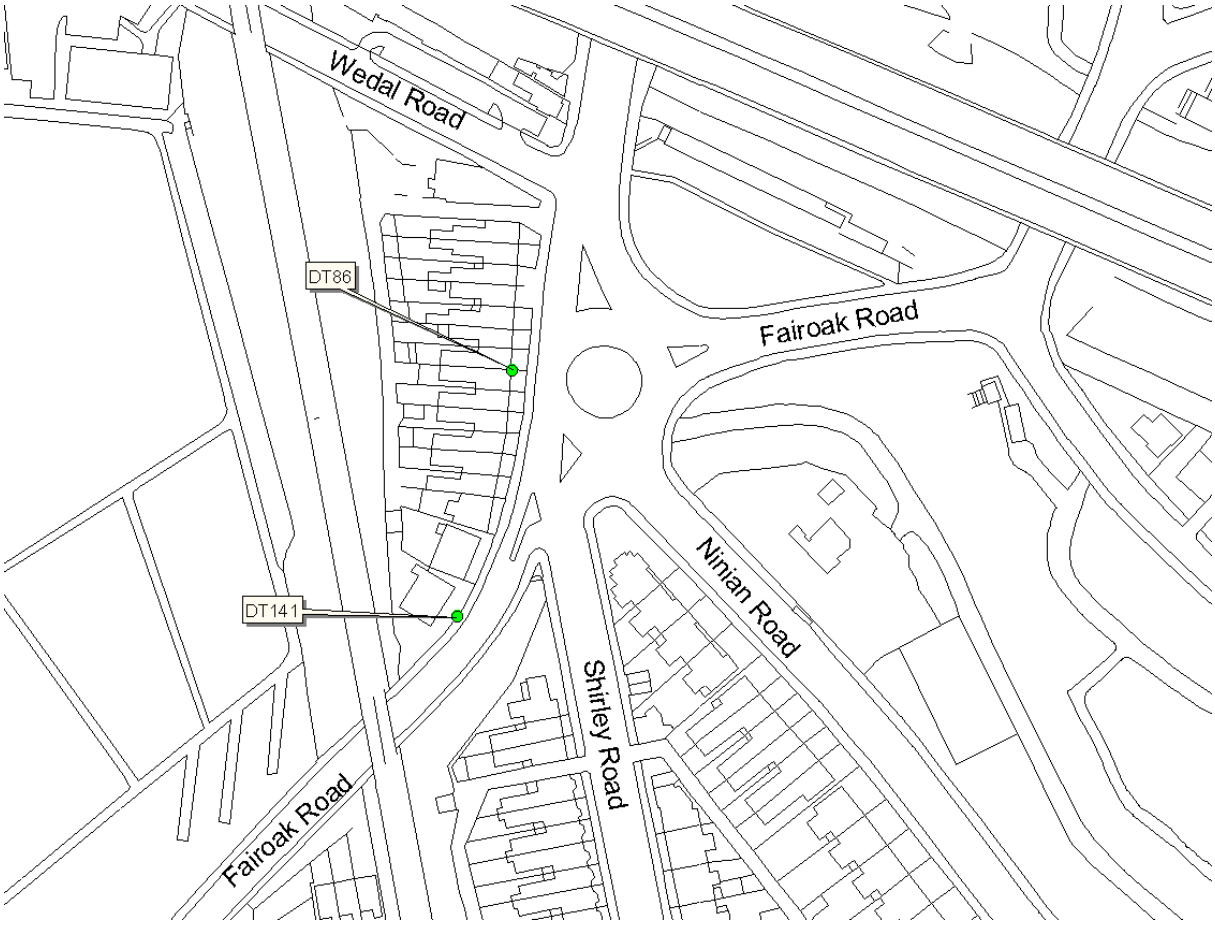


Figure 2.14 Map Showing Location of Diffusion Tubes in Heath area

Figure 2.15 Map Showing Location of Diffusion Tube in James Street

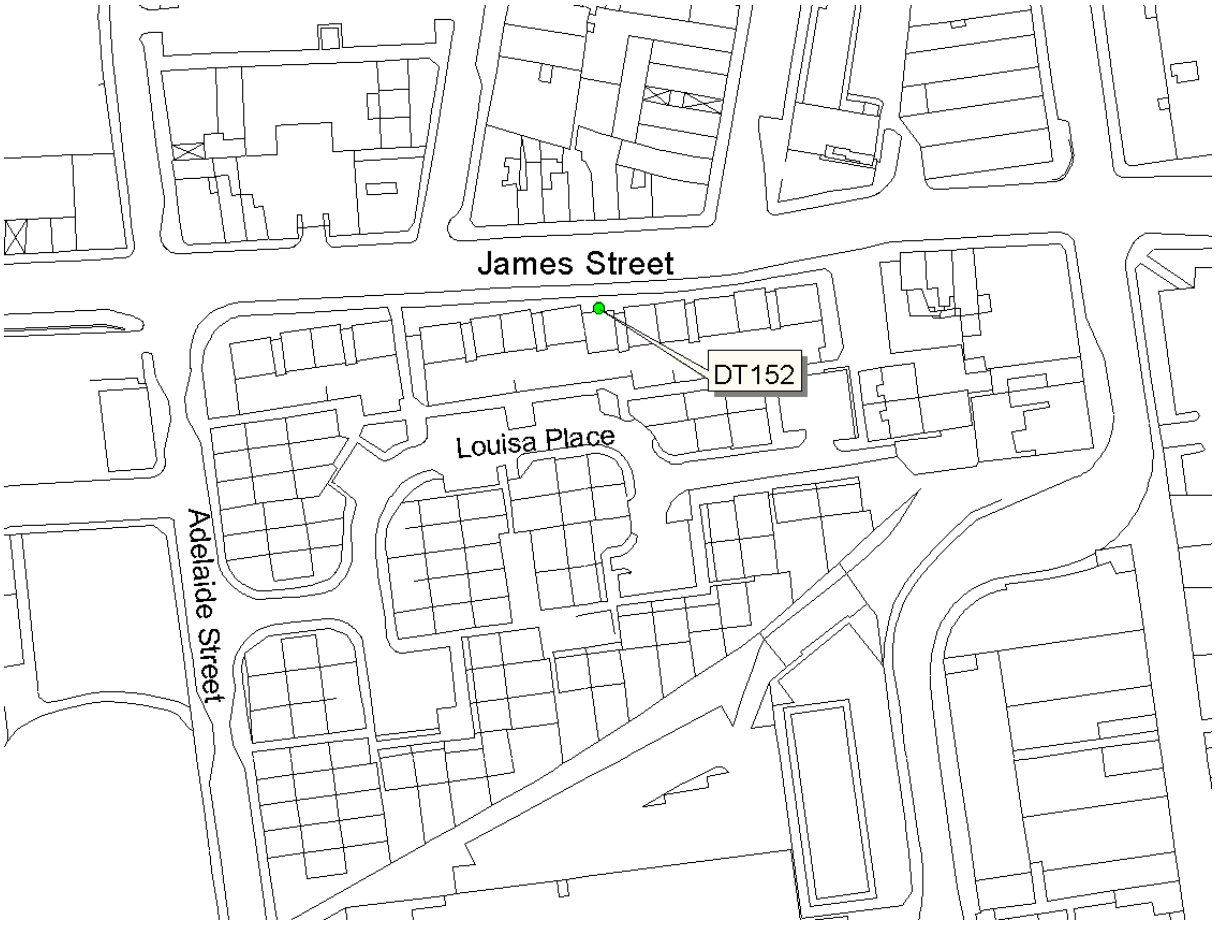


Figure 2.16 Map Showing Location of Diffusion Tubes in Leckwith area

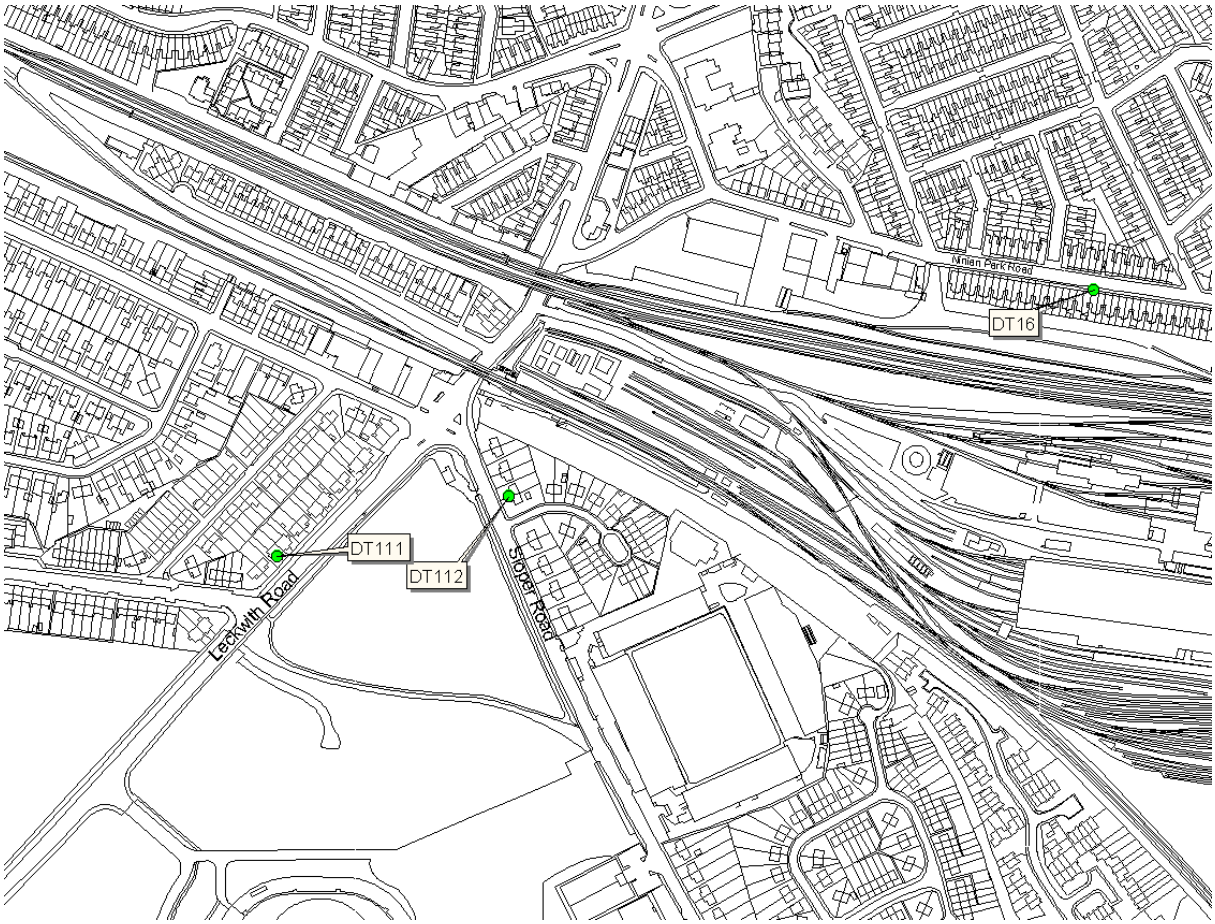


Figure 2.17 Map Showing Location of Diffusion Tube in East Tyndall Street

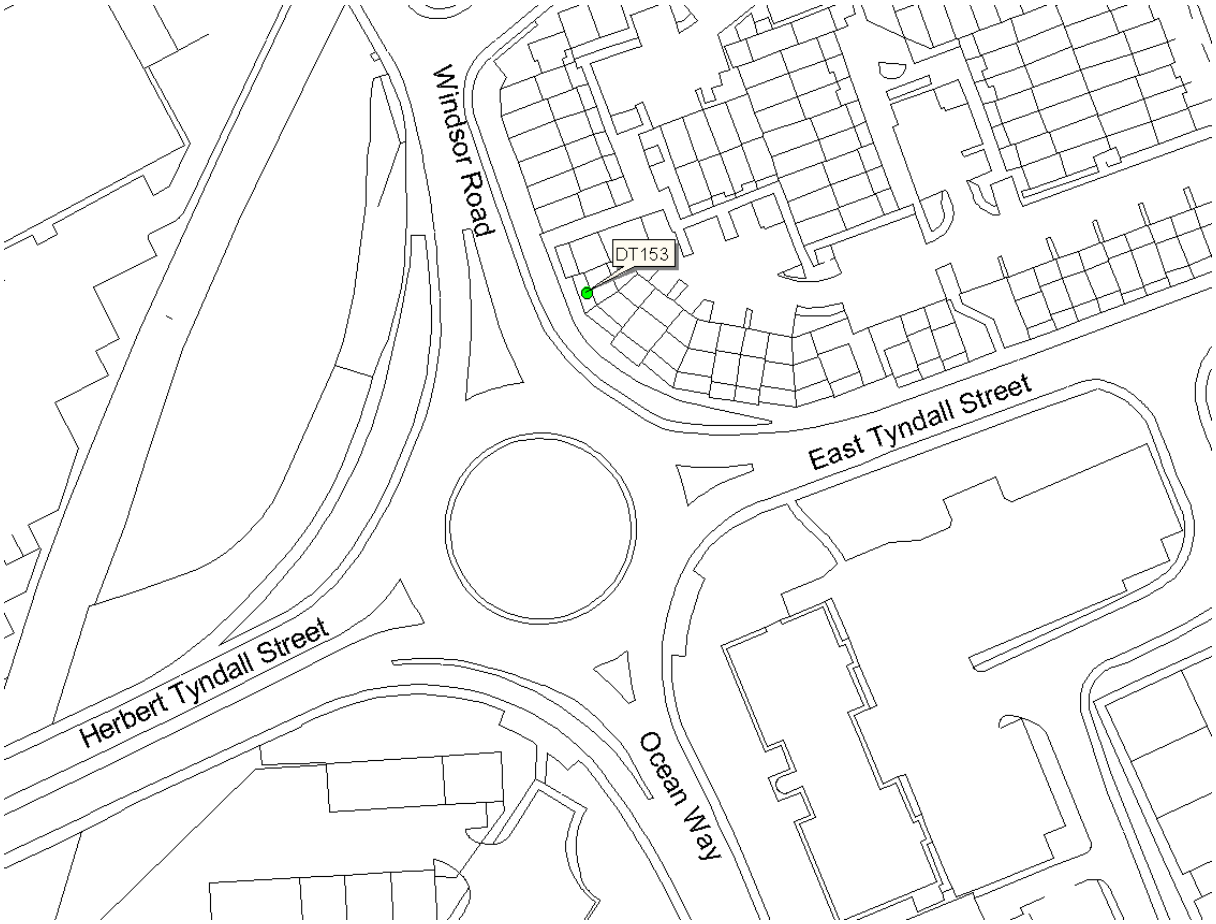


Figure 2.18 Map Showing Location of Diffusion Tubes in Newport Road

Figure 2.19 Map Showing Location of Diffusion Tubes in Penarth Road area

Figure 2.20 Map Showing Location of Diffusion Tube in Western Avenue

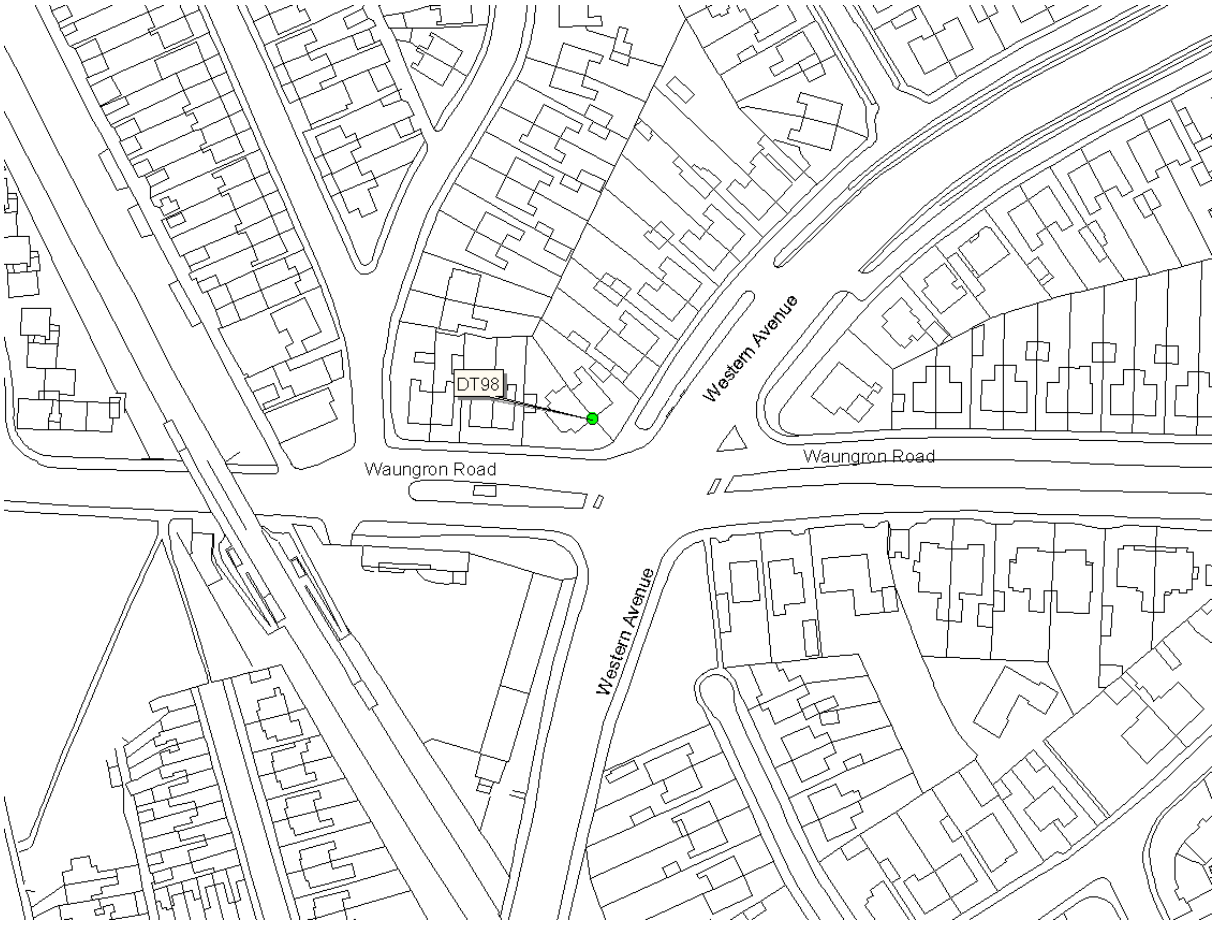


Figure 2.21 Map Showing Location of Diffusion Tubes in Cowbridge Road East and Llandaff Road

Figure 2.22 Map Showing Location of Diffusion Tubes in Ocean Way

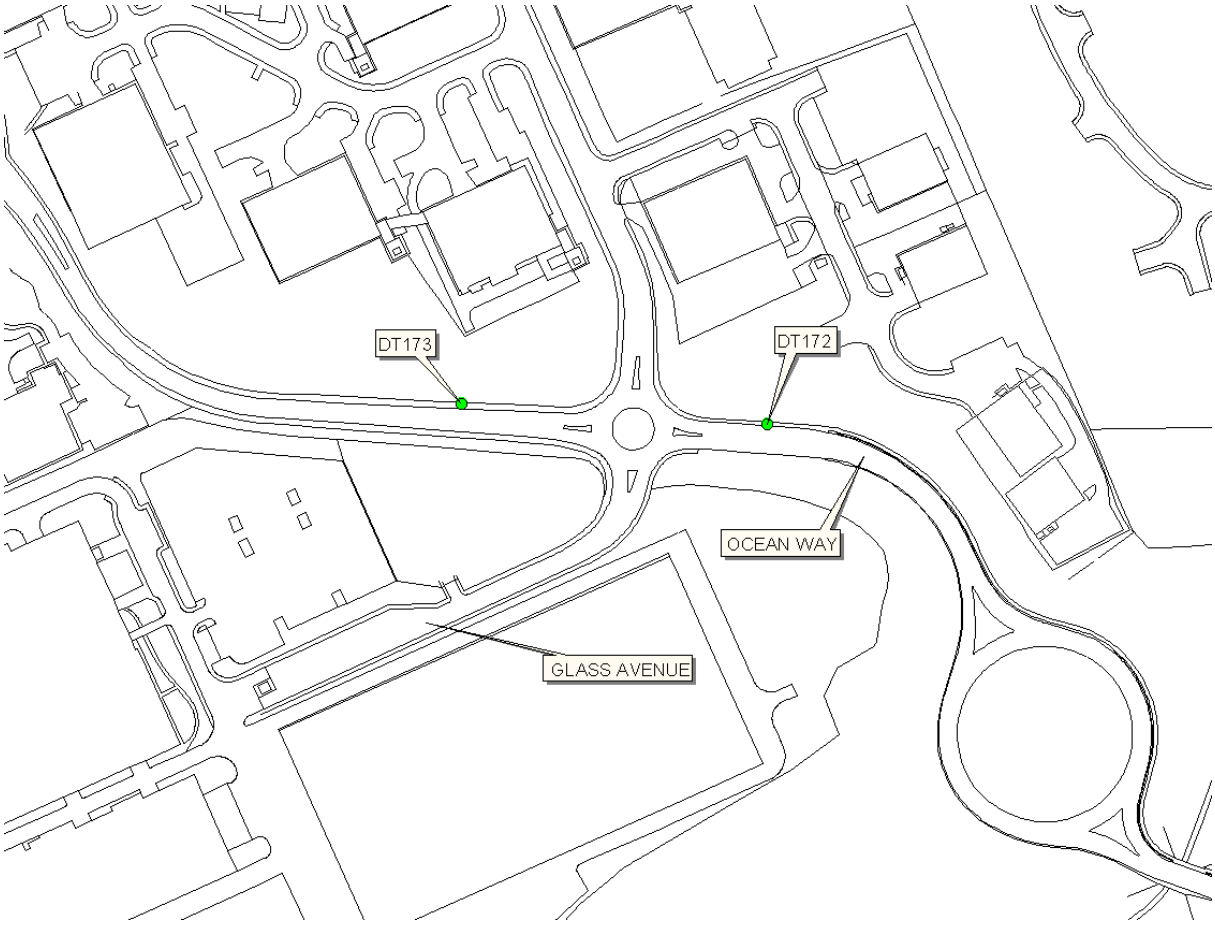
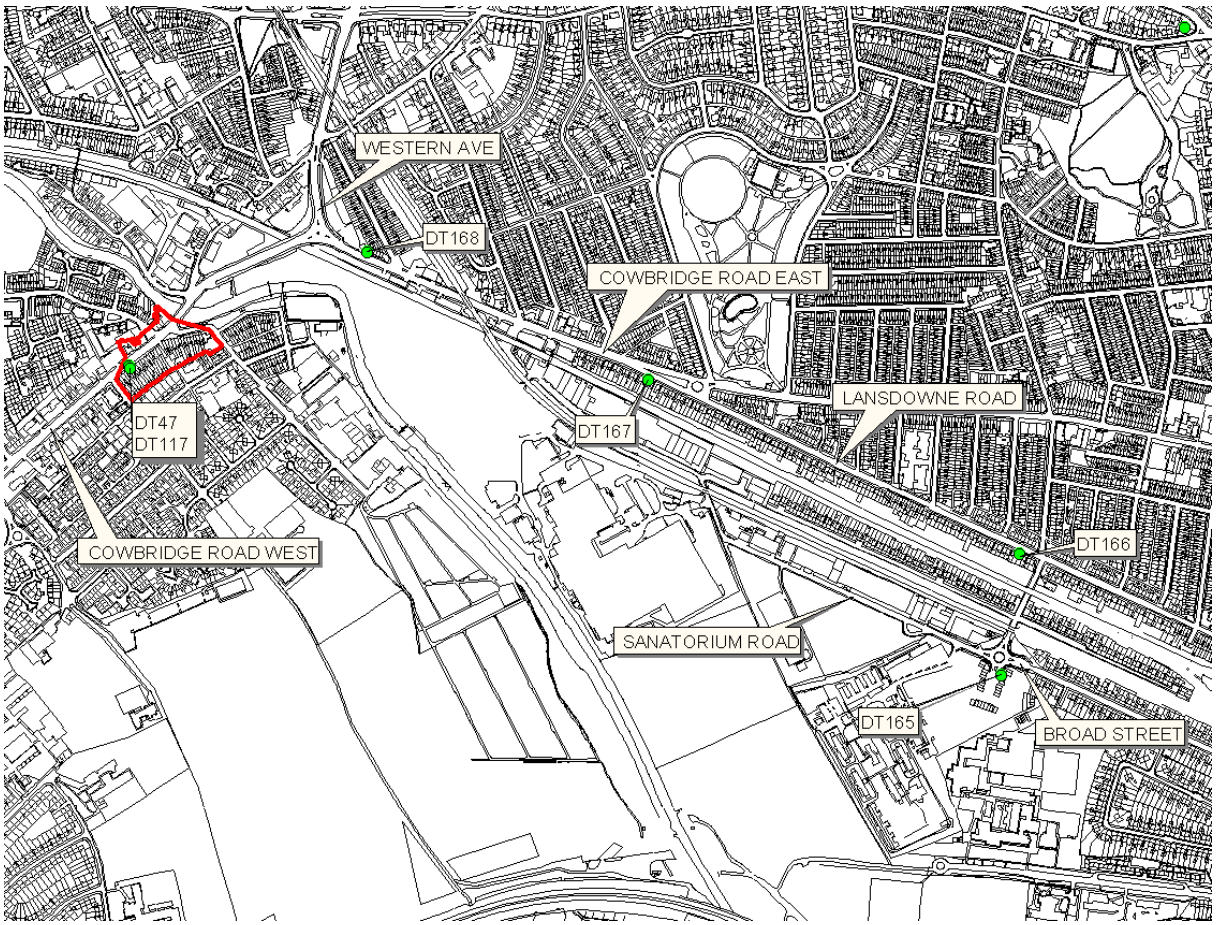


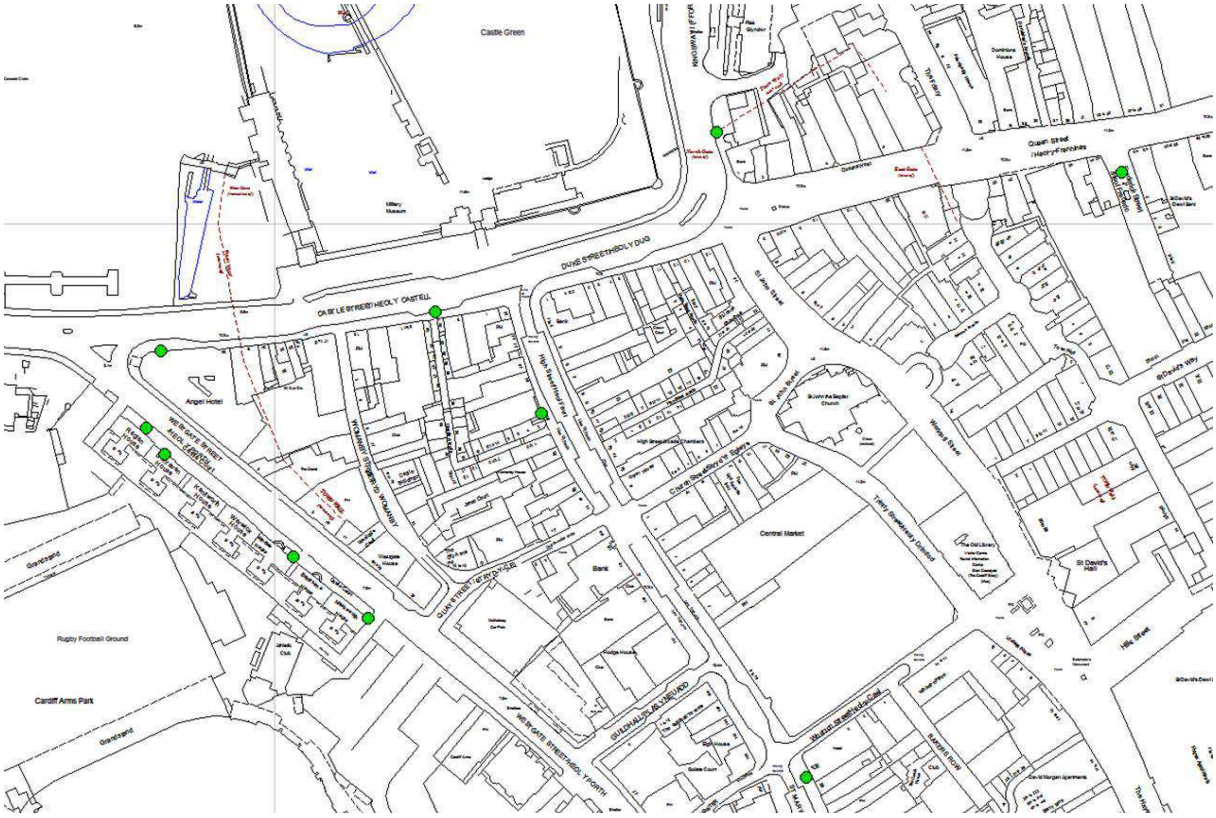
Figure 2.23 Map Showing Location of Diffusion Tubes in Tremorfa area

Figure 2.24 Map Showing Location of Diffusion Tubes in area of former Papermill, Canton



Area outlined in red is boundary of Ely Bridge AQMA

Figure 2.25 Map Showing Location of Diffusion Tubes in Kingsway, Duke Street and Castle Street



2.2 Comparison of Monitoring Results with Air Quality Objectives

During 2015 monitoring was carried out for Nitrogen Dioxide and Particulate Matter (PM_{10}). There was no monitoring undertaken for benzene or 1-3-butadiene.

2.2.1 Nitrogen Dioxide (NO_2)

Nitrogen Dioxide was measured during 2015 at one site equipped with an automatic analyser and by a network of 73 passive diffusion tubes. The results are given and discussed below.

2.2.2 Automatic Monitoring Data

The annual mean nitrogen dioxide concentrations at Cardiff Council's City Centre AURN site is summarised in Table 2.3, for the years 2011 to 2015. The annual mean nitrogen dioxide concentration was below the objective in 2015. In addition there were no exceedences of the 1- hour mean objective (Table 2.4).

Table 2.3 – Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2015 % [b]	Annual Mean Concentration µg/m³				
					2011	2012	2013	2014	2015
Cardiff Centre AURN	Urban Centre	N	100	79.5	27	27	26	25	27

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

Figure 2.3 – Trends in Annual Mean NO_2 Concentrations Measured at Automatic Monitoring Sites

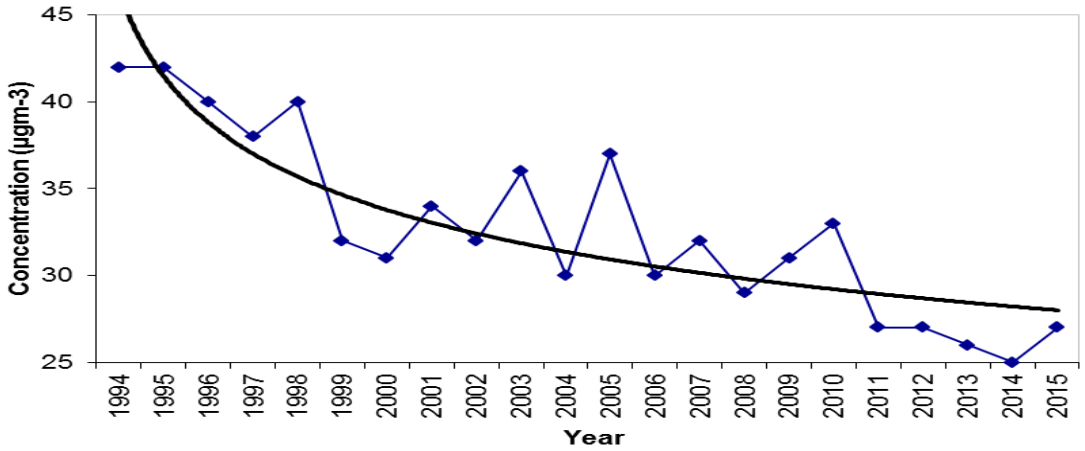


Table 2.4 – Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2015 % [b]	Number of Hourly Means > 200µg/m^3				
					2011* [c]	2012* [c]	2013* [c]	2014* [c]	2015 [c]
Cardiff Centre AURN	Urban Centre	N	100	79.5	0	0	5	0	0 (14.98)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

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

* Number of exceedences for previous years is optional

2.2.3 Diffusion Tube Monitoring Data

The nitrogen dioxide diffusion tube data is summarised in Table 2.5. The full dataset (monthly mean values) is included in Appendix A1. All data has been bias adjusted. The applied bias adjustment factor was 0.79, as described in Appendix A2. The national bias correction factor for this laboratory was utilized due to insufficient annual data capture from the Cardiff City Centre, Frederick Street Automatic Monitor (<90%) and the co-location study was less than 75% of the year. It must be noted, due to maintenance, no co-location diffusion tubes were placed in parallel to the analyser for January and February 2015.The bias correction factor of 0.79 was obtained from the following website: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Table 2.5 shows that 10 of the 73 monitoring sites recorded a concentration of NO_2 above the 40µg/m^3 annual mean Objective in 2015. Of these 10 sites, 4 are inside one of the four AQMAs.

Of the 10 sites (numbers 74, 172, 175, 176, 177 & 178) are not currently in an AQMA where the measured concentration of NO_2 was above the 40µg/m^3 annual mean Objective in 2015. However, none are at locations which represent relevant exposure as each site is a kerbside site with the exception of Site 177, which is on the façade of a hotel.

Site 74 has been discussed in previous reports; it is not representative of relevant exposure and remains in place to record long-term trends on the immediate local road network.

Site 172 is placed on Ocean Way to monitor potential impacts of traffic resulting from industrial developments in the area. The site is not representative of relevant exposure, the nearest being >650m away.

Sites 175, 176, 177 and 178 (Northgate House, Castle Arcade, Angel Hotel and Park Street/Westgate Street respectively) were commissioned in February and March 2014 in response to the granting of planning consent for residential accommodation at Northgate House. The premises were formerly used for retail (ground floor) and offices (1st floor and above) with a basement pub/nightclub. Residential use of Northgate House, Kingsway, commenced during the late summer/autumn of 2014 and Site 175 is at a kerbside location outside the premises. It was not possible to locate a diffusion tube on the façade of the premises during the construction phase of the development. I can confirm that at the time of writing this report Site 175 has relocated to the façade of the building following the completion of construction works. Results will be analysed and produced in 2017's PR.

Sites 176 and 177 were commissioned to monitor concentrations along the Kingsway/Castle Street/Duke Street road link past Cardiff Castle to Westgate Street and the Cardiff City Centre AQMA.

Site 178, whilst not technically within the City Centre AQMA, is located at a kerbside about 2.5m from the façade of residential accommodation that is within the AQMA. The site was commissioned to monitor the effects of road-traffic changes on Westgate Street during the construction and initial operational phase of the proposed new Central Square development.

It is possible to estimate the decrease in nitrogen dioxide concentration with increasing distance from the kerb using the following tool made available by DEFRA:

http://laqm.defra.gov.uk/documents/NO2withDistancefromRoadsCalculatorIssue4.xls

The tool can be used to estimate concentrations at relevant locations, i.e. façades of nearby buildings, from concentrations measured at kerbside sites and this has been done for Sites 175, 176 and 178.

Site 175 (Northgate House) is located on street-furniture 0.2m from the Kingsway kerb and Northgate House is 9.6m from kerb. Site 176 (Castle Arcade) is rather more complex, being 0.2m from the kerb of a loading bay but 2.6m from the main carriageway. The nearest building façade is 3.8m from the kerb of the loading bay (6.4m from the carriageway). Generally, vehicles tend to park in the loading bay for significant periods without their engines running. For the purposes of assessment, therefore, it is assumed that the nearest road-traffic source to the monitoring site and façade is the main Castle Street carriageway. Site 178 (Park Street/Westgate Street) is located on street furniture 0.3m from the kerb. The façade of residential accommodation, which is within the Cardiff City Centre AQMA although the monitoring site is not, is a further 1.5m from the kerb (1.8m in total).

Using the above tool together with 2015 monitoring data gives calculated façade concentrations as follows:

Site 175:	34.7µgm^{-3}
Site 176:	47.8µgm^{-3}
Site 178:	45.4µgm^{-3}

The above concentrations are the equivalent façade-concentrations. The calculated concentrations for Sites 175 & 178 are considered representative of relevant exposure.

For Site 175, the calculated concentration is below the Objective.

The façade closest to Site 176 (Castle Arcade) is not representative of relevant exposure, there being no current residential accommodation on the façade closest to the site. Being on the façade of a hotel, Site 177 (Angel Hotel) is also not representative of relevant exposure. However, data for both of these sites may reflect concentrations at locations of relevant exposure along the Duke Street and Castle Street façade. There is residential accommodation at The Rummer Tavern on Duke Street and at Dempsey's bar on Castle Street.

As detailed previously, given the above and monitoring data presented, it is considered that there is a need to proceed to a Detailed Assessment for Duke Street and Castle Street. At the time of writing this report a Detailed Assessment is being drawn together and will follow this Progress Report.

The façade closest to Site 178, being residential accommodation, is representative of relevant exposure although it should be noted that there is no residential accommodation at ground-floor level.

Monitoring at Sites 176, 177 and 178 will continue for the foreseeable future. It must be noted that at the present time sites 74, 142, 176, 177 & 178 have been relocated to improved locations of relevant exposure.

Within the City Centre AQMA, 2015 data shows continued elevated results, particularly along Westgate Street. Annual levels of NO_2 at residential accommodation in Westgate Street (Sites 126, 143 & 144) are approaching the objective with concentrations >36µg/m^3. There are also high levels recorded at residential accommodation within the Ely Bridge AQMA (Site 117).

The 2015 monitoring data at residential accommodation within the Llandaff AQMA (Sites 99 and 161) showed compliance with the Objective. As illustrated in the Interim Action Plan (Section 9), despite the levels falling below the annual objective a decision has been made to continue with the established Llandaff AQMA.

All four sites within the Stephenson Court AQMA (Sites, 81, 129, 130 & 131) showed compliance with the Objective. Following the completion of engineering works (realignment of the junction in order to reduce queuing on City Road & relocation of bus stops outside residential accommodation to positions further east) towards the end of 2015, the Interim Action Plan (Section 9) details that monitoring will continue within the established AQMA for 2016. The data will be reviewed and appropriate actions adopted.

There are 10 façade-based diffusion tube sites with complete annual mean datasets from 2002, i.e. from when the Council started determining an annual bias-adjustment factor. These sites are numbers 16, 49, 81, 82, 85, 86, 96, 97, 99 and 100. Bias-adjusted nitrogen dioxide concentrations from these 10 sites have been averaged for each year and plotted in Figure 2.4 to give a combined, representative trend over the years since 2002.

The plot seems to indicate a very slow, gradual increase in nitrogen dioxide concentrations in earlier years, possibly influenced by the noticeable concentration peaks in 2003, 2007 and 2010. It is evident that average concentrations dropped significantly for years 2014 & 2015. Both 2014 & 2015's results are very comparable to one another. Monitoring at all these sites continues in 2016.

There were no annual mean concentrations measured in 2015 which were greater than 60µgm^{-3} and consequently there is little risk of the hourly-mean Objective being exceeded at any site.

Table 2.6 shows the nitrogen dioxide diffusion tube data for Cardiff Council for 2011 – 2015 for comparison purposes.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2015

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79
16	Ninian Park Road	Roadside	N	N	12	27.86
33	Mitre Place	Kerbside	Y	N	12	**46.94**
44	City Road	Kerbside	N	N	12	27.08
45	Mackintosh Place	Kerbside	N	N	11	32.09
47	Ely Bridge	Kerbside	Y	N	11	**41.35**
49	Penarth Road	Roadside	N	N	9	29.35
56	Birchgrove Village	Roadside	N	N	12	29.64
58	Westgate Street	Kerbside	Y	N	12	**48.25**
73	Green Street	Kerbside	N	N	12	22.05
74	Station Terrace	Kerbside	N	N	11	**41.64**
81	Stephenson Court	Roadside	Y	N	12	35.29
82	104 Birchgrove Road	Roadside	N	N	10	23.79
85	497 Cowbridge Road West	Roadside	N	N	12	22.36
86	19 Fairoak Road	Roadside	N	N	12	34.85
96	Manor Way Junction	Roadside	N	N	12	31.05

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79
97	Newport Road (premises)	Roadside	N	N	12	30.49
98	Western Avenue (premises)	Roadside	N	N	12	25.44
99	Cardiff Road Llandaff	Roadside	Y	N	12	29.84
100	188 Cardiff Road	Roadside	N	N	12	28.86
101	Cardiff Centre AURN	Urban Centre	N	Y	10	20.28
102	Cardiff Centre AURN	Urban Centre	N	Y	10	21.06
103	Cardiff Centre AURN	Urban Centre	N	Y	10	20.72
106	30 Caerphilly Road	Roadside	N	N	12	29.41
107	Lynx Hotel	Roadside	N	N	11	30.70
111	98 Leckwith Road	Roadside	N	N	12	21.34
112	17 Sloper Road	Roadside	N	N	12	27.06
115	21 Llandaff Road	Roadside	N	N	12	32.47
117	25 Cowbridge Road West	Roadside	Y	N	11	39.54
119	Havelock Street	Kerbside	N	N	12	27.65
124	287 Cowbridge Road East	Roadside	N	N	12	22.48
126	Westgate Street Flats	Roadside	Y	N	11	36.00

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79
128	117 Tudor Street	Roadside	N	N	12	29.57
129	Stephenson Court 2	Roadside	Y	N	12	31.45
130	Burgess Court	Roadside	Y	N	12	35.23
131	Dragon Court	Roadside	Y	N	12	39.48
133	St Mark's Avenue	Roadside	N	N	12	31.89
134	Sandringham Hotel	Roadside	Y	N	9	32.07
139	Lower Cathedral Road	Kerbside	N	N	12	29.42
140	Clare Street	Kerbside	N	N	12	36.32
141	Fairoak Road 2	Roadside	N	N	12	32.28
142	Pure Rugby	Kerbside	Y	N	10	**41.83**
143	Windsor House	Roadside	Y	N	12	38.16
144	Marlborough House	Roadside	Y	N	12	37.22
145	Tudor Street Flats	Roadside	N	N	11	29.90
146	Neville Street	Roadside	N	N	11	26.57
147	211 Penarth Road	Roadside	N	N	12	27.70
148	161 Clare Road	Roadside	N	N	12	27.53
149	10 Corporation Road	Roadside	N	N	12	33.56
152	James Street	Roadside	N	N	12	27.60
153	Magic Roundabout	Roadside	N	N	12	28.99

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79
156	2a/4 Colum Road	Roadside	N	N	12	25.92
157	47 Birchgrove Road	Roadside	N	N	12	27.16
158	64/66 Cathays Terrace	Roadside	N	N	11	25.50
159	IMO façade replacement	Roadside	N	N	12	33.96
160	High Street Zizzi	Urban Centre	Y	N	11	27.03
161	52 Bridge Road	Roadside	Y	N	12	32.28
162	58 Cardiff Road	Roadside	N	N	12	24.47
163	118 Cardiff Road	Roadside	N	N	12	23.22
164	725 Newport Road	Roadside	N	N	10	20.31
165	6 Heol Tyrrell	Roadside	N	N	12	15.10
166	163 Lansdowne Road	Roadside	N	N	12	32.05
167	359 Lansdowne Road	Roadside	N	N	12	28.26
168	570 Cowbridge Road East	Roadside	N	N	12	24.26
169	43 Clos Hector	Urban Centre	N	N	12	16.27
170	11 Pengam Green	Roadside	N	N	12	19.08
171	23 Tweedsmuir Road	Roadside	N	N	12	18.06

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79
172	Ocean Way 1	Roadside	N	N	9	**44.50**
173	Ocean Way 2	Roadside	N	N	10	28.40
174	76 North Road	Kerbside	N	N	12	28.65
175	Northgate House	Kerbside	N	N	12	**42.00** (34.7)[b]
176	Castle Arcade	Roadside	N	N	11	**53.06 (47.8)**[b]
177	Angel Hotel	Roadside	N	N	12	**48.09**
178	Park Street/Westgate Street	Kerbside	N	N	11	**54.32 (45.4)**[b]

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

[a] Result has been annualised in accordance with Boxes 7.9 and 7.10 of LAQM.TG16 as data capture for the year was less than 75%.

[b] NO_2 exceedence is measured at a monitoring site not representative of public exposure. NO_2 concentration at the nearest relevant exposure calculated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html).

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2011 to 2015)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2011 (Bias Adjustment Factor = 0.88)	2012 (Bias Adjustment Factor = 0.86)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)
16	Roadside	N	32.1	30.9	31.3	32.4	27.86
33	Kerbside	Y	**55.0**	**49.8**	**49.6**	**51.2**	**46.94**
44	Kerbside	N	39.2	34.8	33.2	29.7	27.08
45	Kerbside	N	36.8	36.8	36.8	37.8	32.09
47	Kerbside	Y	**53.0**	**51.1**[a]	**48.0**	**47.1**	**41.35**
49	Roadside	N	31.9	27.9	32.1	32.6	29.35
56	Roadside	N	31.5	33.9	35.4	35.8	29.64
58	Kerbside	Y	**54.9**	**49.5**	**52.4**	**51.2**	**48.25**
73	Kerbside	N	28.0	25.6	24.9	26.8	22.05
74	Kerbside	N	**48.0**	**50.1**	**47.8**	**47.3**	**41.64**
81	Roadside	Y	**40.6**	**40.6**	37.2	36.4	35.29
82	Roadside	N	28.2	28.5	32.1	27.6	23.79
85	Roadside	N	28.2	27.3	26.7	27.2	22.36
86	Roadside	N	39.9	**40.3**	38.8	38.9	34.85
96	Roadside	N	34.5	35.4	35.5	34.4	31.05
97	Roadside	N	35.4	37.8	34.5	33.6	30.49
98	Roadside	N	29.1	26.9	28.3	29.8	25.44
99	Roadside	Y	39.8	34.5	38.9	39.6	29.84
100	Roadside	N	34.8	33.7	32.6	31.8	28.86
101	Urban Centre	N	26.7	25.8	26.5	24.4	20.28
102	Urban Centre	N	28.0	26.1	26.9	24.2	21.06
103	Urban Centre	N	27.4	25.8	26.2	24.4	20.72
106	Roadside	N	34.0	35.7	34.8	34.9	29.41
107	Roadside	N	36.4	37.6	34.6	34.8	30.70
111	Roadside	N	24.5	23.7	25.2	24.7	21.34
112	Roadside	N	30.2	30.6	30.7	28.8	27.06
115	Roadside	N	38.7	37.7	35.5	36.3	32.47
117	Roadside	Y	**46.5**	**42.6**	**44.9**	**42.3**	39.54

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m³				
			2011 (Bias Adjustment Factor = 0.88)	2012 (Bias Adjustment Factor = 0.86)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)
119	Kerbside	N	**40.2**	33.7	33.2	32.0	27.65
124	Roadside	N	27.0	25.5	26.1	26.3	22.48
126	Roadside	Y	**45.4**	39.9	**44.0**	**41.2**	36.00
128	Roadside	N	36.7	35.1	34.7	36.5	29.57
129	Roadside	Y	36.2	34.9	32.8	32.0	31.45
130	Roadside	Y	**44.4**	**41.5**	39.0	38.9	35.23
131	Roadside	Y	**47.3**	**47.9**	**43.9**	**41.2**	39.48
133	Roadside	N	39.5	39.3	37.8	37.5	31.89
134	Roadside	Y	**45.1**	37.2[a]	33.4[a]	34.5	32.07
139	Kerbside	N	34.3	34.3	34.1	35.5	29.42
140	Kerbside	N	**42.5**	**41.7**	**42.2**	**42.9**	36.32
141	Roadside	N	40.0	**47.6**	37.7	37.0	32.28
142	Kerbside	Y	**48.7**	**47.6**	**46.3**	**44.9**	**41.83**
143	Roadside	Y	**43.8**	**41.5**	**42.1**	**42.1**	38.16
144	Roadside	Y	**42.9**	39.5	39.0	38.2	37.22
145	Roadside	N	34.6	33.8	34.5	32.6	29.90
146	Roadside	N	29.4	29.5	30.9	29.7	26.57
147	Roadside	N	31.1	31.0	32.0	31.3	27.70
148	Roadside	N	29.0	27.8	29.3	29.1	27.53
149	Roadside	N	34.1	33.0	34.5	33.2	33.56
152	Roadside	N	32.8	32.5	31.0	29.7	27.60
153	Roadside	N	35.0	36.2	33.0	33.2	28.99
156	Roadside	N	33.4	32.6	34.9	31.4	25.92
157	Roadside	N	33.1	31.6	29.0	29.7	27.16
158	Roadside	N	31.5	28.8	30.2	29.1	25.50
159	Roadside	N	38.7	39.9	38.8	39.2	33.96
160	Urban Centre	Y	32.6	31.4	30.3	28.3	27.03
161	Roadside	Y	-	**43.0**	39.1	37.2	32.28
162	Roadside	N	-	28.5	27.6	27.6	24.47
163	Roadside	N	-	27.5	25.4	28.2	23.22
164	Roadside	N	-	-	25.4	23.9	20.31
165	Roadside	N	-	-	19.4	17.4	15.10

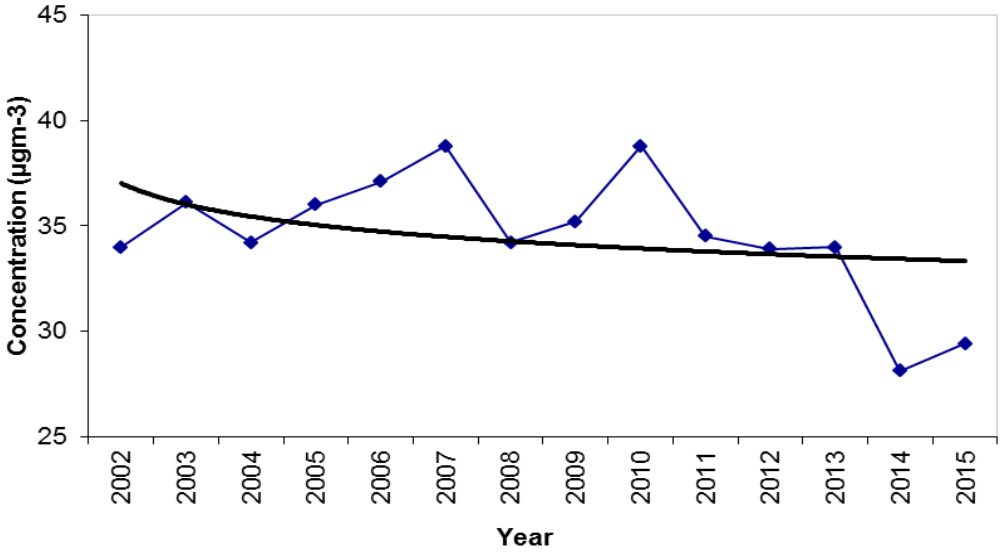
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2011 (Bias Adjustment Factor = 0.88)	2012 (Bias Adjustment Factor = 0.86)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)
166	Roadside	N	-	-	34.9	36.6	32.05
167	Roadside	N	-	-	31.7	31.5	28.26
168	Roadside	N	-	-	27.9	27.7	24.26
169	Urban Centre	N	-	-	18.0	18.1	16.27
170	Roadside	N	-	-	22.1	21.9	19.08
171	Roadside	N	-	-	22.5	20.8	18.06
172	Roadside	N	-	-	**49.5**	**47.8**	**44.50**
173	Roadside	N	-	-	33.7	33.3	28.40
174	Kerbside	N	-	-	-	33.9	28.65
175	Kerbside	N	-	-	-	**46.8**	**42.00** (34.7)[b]
176	Roadside	N	-	-	-	**55.0**	**53.06 (47.8)**[b]
177	Roadside	N	-	-	-	**51.8**	**48.09**
178	Kerbside	N	-	-	-	**51.6**	**54.32 (45.4)**[b]

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

[a] Result has been annualised in accordance with Boxes 7.9 and 7.10 of LAQM.TG16 as data capture for the year was less than 75%.

[b] NO_2 exceedence is measured at a monitoring site not representative of public exposure. NO_2 concentration at the nearest relevant exposure calculated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html).

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



2.2.4 Particulate Matter (PM_{10})

During 2015 PM_{10} was measured at the Cardiff Centre AURN monitoring site and the summary data is given in Tables 2.7 and 2.8 below.

As for previous years, there have been no exceedences of either of the National Air Quality Standards in 2015.

Figure 2.5 shows a generally downward trend in annual mean concentrations of PM_{10}.

Table 2.7 – Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2015 %	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)				
						2011	2012	2013	2014	2015
Cardiff Centre AURN	Urban Centre	N	99.7	85.5	Y	22[a]	18	19	16	16

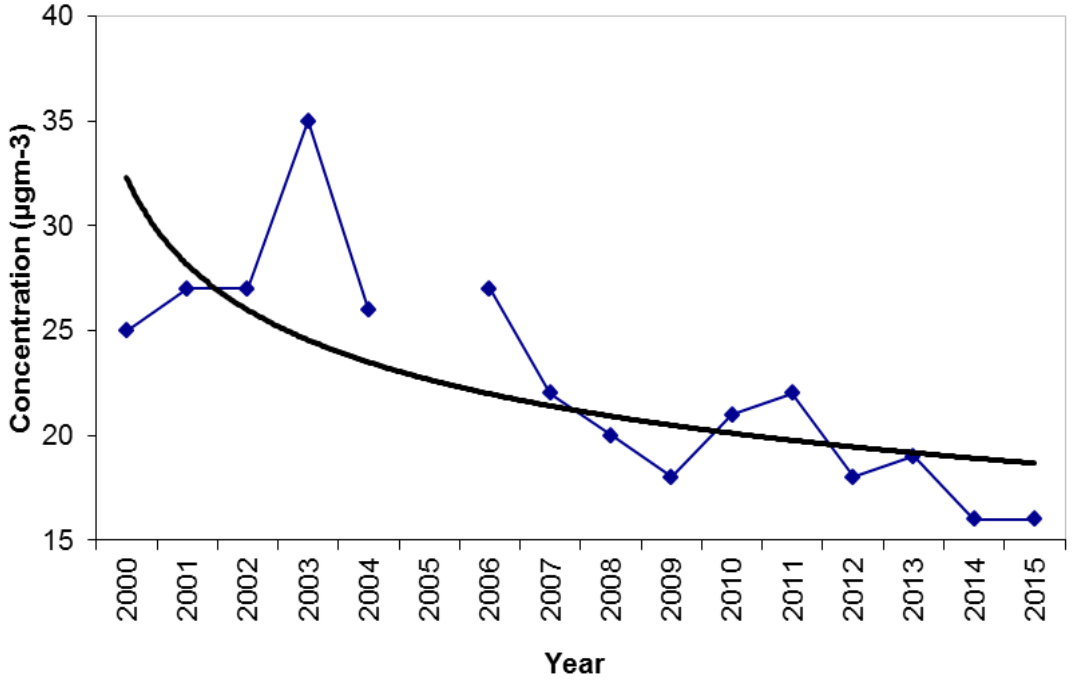
[a] Result has been "annualised" in accordance with Box 3.2 of TG(09) as data capture for the year was less than 75%

Table 2.8 – Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2015 %	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2011	2012	2013	2014	2015
Cardiff Centre AURN	Urban Centre	N	99.7	85.5	Y	3	5	3	4	5 (25.4)

[a] 90.4th percentile of 24-hour means shown in brackets due to <90% data capture for the year

Figure 2.5 – Trends in Annual Mean PM_{10} Concentrations



2.2.5 Sulphur Dioxide (SO_2)

Sulphur dioxide was measured at the Cardiff Centre AURN automatic monitoring site during 2015. The site is classified as “Urban Background” and is a relevant location for the 15-minute and 1-hour Objectives. Data for the monitoring is given in Table 2.9 below.

There were no exceedences of Objectives during 2015.

Table 2.9 – Results of Automatic Monitoring for SO_2: Comparison with Objectives

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2015 %	Number of: [a]		
					15-minute Means > 266µg/m^3	1-hour Means > 350µg/m^3	24-hour Means > 125µg/m^3
Cardiff Centre AURN	Urban Centre	N	100	89	0 (25.2)	0 (14.5)	0 (4.3)

[a] As data capture for full calendar year is less than 90%, result in brackets represents required percentile (in µg/m^3): 15-min mean = 99.9th ; 1-hour mean = 99.7th ; 24-hour mean = 99.2th percentile

2.2.6 Benzene

No monitoring of Benzene was undertaken by Cardiff Council in 2015.

2.2.7 Other Pollutants Measured

During 2015 monitoring for ozone and carbon monoxide was carried out in Cardiff. Details are in the following sections

Carbon Monoxide

Carbon monoxide was monitored at Cardiff Centre AURN during 2015.

Data capture at for the whole year at the Cardiff Centre AURN site was 87.8% and there were no exceedences of the Objective.

There continues to be no risk of the National Air Quality Standard being exceeded.

Table 2.10: Results of Automatic Monitoring of Carbon Monoxide (2015)

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2015 %	Number of 8 hour Means > 10µg/m^3
					2015
Cardiff Centre AURN	Urban Centre	N	100	87.8	0

Ozone (O_3)

Cardiff Council monitors Ozone due to its potential correlations with other pollutants. In 2015, ozone was measured at the Cardiff City Centre, Frederick Street AURN site. Although Ozone is not included in the Local Air Quality Management system, the results are included in Table 2.9 for completeness. The results are compared with the running 8-hour mean objective as set by the Expert Panel on Air Quality Standards (EPAQs) which states the running 8-hour mean should not exceed 100µg/m3 on more than 10 days per year. There are no exceedences of the ozone objective in Cardiff in 2015.

Table 2.11: Results of Automatic Monitoring of Ozone (2015)[a & b]

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2015 %	Number of Daily Means > 50µg/m^3
					2015
Cardiff Centre AURN	Urban Centre	N	100	88.3	122 (76.5)

a Exceedences are shown in bold

b Where annual data capture is less than 90%, the 97th percentile of the maximum daily 8-hour running mean is shown in brackets.

2.2.8 Summary of Compliance with AQS Objectives

The City of Cardiff Council has measured concentrations of nitrogen dioxide above the annual mean objective at relevant locations outside of an AQMA and **will need to proceed to a Detailed Assessment** for Duke Street and Castle Street in the city centre.

3 New Local Developments

3.1 Road Traffic Sources

3.1.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Cardiff Council has considered road traffic sources extensively in both this and each year in earlier reports; the monitoring network is very largely focused on measuring concentrations of nitrogen dioxide close to many of them. These have been discussed either in previous reports or earlier in this report.

There are no newly identified road traffic sources which need to be considered.

New monitoring sites were commissioned at the start of 2014 and data from these sites is reported herein. These new sites were commissioned following the granting of a planning consent which introduced new exposure near to an existing congested road link. Planning consent has also been granted for new student accommodation on the site of (the now former) Windsor House on Dumfries Place in the City Centre. Monitoring was carried out for 3 months prior to the submission of an air quality assessment for the development. This concluded that concentrations of nitrogen dioxide at the development will be elevated at ground, first and second floors and that either building design/layout and/or mitigation measures would be required.

At the time of writing the former Windsor House is currently under construction and monitoring in and around this site commenced at the beginning of 2016. Results will be published in 2017's PR. There is no need to proceed to a Detailed Assessment at this point.

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

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

Previous reports identified High Street, St Mary Street (within the St Mary Street AQMA) as a location where people might spend one hour of more close to traffic.

St Mary Street was also identified as being the only place where annual mean concentrations of nitrogen dioxide were above 60µgm^{-3} meaning that there was risk of the hourly mean objective being exceeded. Following the implementation of the Action Plan for the AQMA, High Street and St Mary Street are now largely traffic-free and compliant with the Objectives.

Since the completion of the plan for St Mary Street the main outcome was the increase in traffic along Westgate Street. This implication fundamentally led to the establishment of the City Centre AQMA, 2013. 2015's annual levels of NO_2 at residential accommodation in Westgate Street (Sites 126, 143 & 144) are approaching the objective with concentrations >36µg/m^3.

There are no new locations identified since the Council's 2015 USA was submitted and there is no need to consider this further at this time.

The City of Cardiff Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

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

The 2003, 2006 and 2009 USAs reported that there were no roads in Cardiff which meet the criteria for high flows of buses and/or/HGVs. The road link having the highest proportion of buses and/or HGVs was the High Street/St Mary Street link. However, this is now largely traffic free and buses/coaches/HDVs are not permitted access to the road link.

However, the 2012 USA reported that the closure of High Street and St Mary Street appeared to have displaced buses and coaches heading to Central Bus Station onto Westgate Street meaning that approximately 25% of the traffic using Westgate Street is buses and coaches. Monitoring data for Westgate Street indicates that there is a nitrogen dioxide issue in the area and Westgate Street is now part of the Cardiff City Centre AQMA. A Further Assessment for the Westgate Street area of the AQMA was submitted in 2014.

Other than Westgate Street, there are no roads in Cardiff where buses, coaches and HDVs account for >20% of road traffic, where flow of these vehicles is >2500 and there is relevant exposure within 10m of the kerb.

The City of Cardiff Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.1.4 Junctions

Junctions have been fully considered in previous annual reviews and assessments. Supported by monitoring at such locations over a number of years, the Council has not identified locations outside of the four current AQMAs where exceedence of the objectives is likely, except for the Kingsway/Duke Street/Castle Street link which is discussed elsewhere in this report.

The end of 2015 marked the the completion of engineering works within the Stephenson Court AQMA (realignment of the junction in order to reduce queuing on City Road & relocation of bus stops outside residential accommodation to positions further east). Monitoring will continue within the established AQMA for 2016. The data will be reviewed and appropriate actions adopted.

There are no newly constructed or proposed roads where exceedences of either the nitrogen dioxide or PM_{10} objectives are likely.

The City of Cardiff Council confirms that there are no new/newly identified busy junctions/busy roads.

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

Other than small, local roads in residential developments, there have been no new roads proposed since the 2015 USA.

The 2009 USA reported the notable alterations on Leckwith Road in association with the then newly constructed Cardiff City FC stadium. Monitoring at nearby residential accommodation remains ongoing and has not revealed and significant alteration in concentrations of nitrogen dioxide as a result of this development.

The City of Cardiff Council confirms that there are no new/proposed roads.

3.1.6 Roads with Significantly Changed Traffic Flows

Ratified traffic data has been examined and there are no roads in Cardiff which have experienced traffic flow (AADT) growth of 25% or more in the preceding three years.

There is increasing evidence from the traffic measurements both locally and regionally to suggest that, for economic and other reasons, traffic growth on major routes has stopped year-on-year and may even have declined recently. This has, for example, resulted in a number of air quality assessments submitted with planning applications assuming current levels of road traffic as a worst-case scenario.

It should be noted that Cardiff Council is actively implementing its traffic management policy of a 50:50 modal split, i.e. 50% of journeys being made other than by the private car. This is not just for new developments but also for the local road network as a whole.

The Council is currently considering planning applications for significant housing and mixed used developments at a number of “strategic sites” across the city. Potentially the most significant of these are three “strategic sites” centred on Llantrisant Road to the west of the Llandaff AQMA. The largest of these three sites includes several thousand new residences and this site is the closest of the three to the Llandaff AQMA. There is also a recent planning application for residential accommodation at the current site of the BBC Wales TV studios on Llantrisant Road immediately to the west of the AQMA.

The potential impact of the three “strategic sites” is being considered as a whole rather than individual applications due to the potential for significant traffic impact along Llantrisant Road. Air Quality Assessments have been submitted for these sites and each of them takes into account the other sites and their potential traffic impact. The application for the BBC Wales TV studios also has the benefit of an Air Quality Assessment.

In the case of the “strategic sites” the developments could take up to a decade to complete. None of the four sites mentioned above have commenced development at the time of writing and there is therefore no significantly altered traffic flows to assess currently.

The City of Cardiff Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.1.7 Bus and Coach Stations

Exposure at Cardiff Central Bus Station has been considered in previous reports with the conclusion that exceedence of the objectives was unlikely. Nothing has changed in this regard.

Since 2015’s USA Cardiff Central Bus Station has been closed and redevelopment has begun. At the time of writing this report Air Quality is currently under review whereby Air Quality Assessment proposals have had comments passed by Cardiff Council. Of particular concern is the impact the new Bus Station will have on Air Quality in Westgate Street. This concern has been addressed in the Air Quality Assessment proposal.

This might affect concentrations of nitrogen dioxide in Westgate Street and, as mentioned earlier in this report, monitoring is in place to record this.

The City of Cardiff Council confirms that there are no relevant bus stations in the Local Authority area.

3.2 Other Transport Sources

3.2.1 Airports

There are no airports in Cardiff. The nearest airport is Cardiff International which is located approximately 15 miles to the west of Cardiff in The Vale of Glamorgan Council's area.

There are no airports planned or proposed within the Council's area and nowhere to put one.

The City of Cardiff Council confirms that there are no airports in the Local Authority area.

3.2.2 Railways (Diesel and Steam Trains)

Cardiff is well-served by passenger rail transport. The main Swansea to London Paddington line is served by Cardiff Central Station. Additionally, there is a network of local-line services running, in the main, to the valleys north of Cardiff.

LAQM.TG(16) suggests that SO_2 emissions from diesel locomotives may be significant if there are outdoor locations where locomotives are regularly stationary for more than 15minutes and where members of the public could be regularly exposed over this period at such locations.

LAQM.TG(16) also requires consideration exposure to nitrogen dioxide within 30m of certain specified railway lines in those areas where the annual mean background concentration is above 25µgm^{-3}.

3.2.3 Stationary Trains

Stationary trains have been considered fully in earlier reports with regard to potential exceedences of the sulphur dioxide objective. No potential exceedences were found and nothing has changed in this regard since then. There is no need to further assess this source.

It should be recorded that works are now underway in preparation for the electrification of the main Swansea/Cardiff to London Paddington line. The effects of this on local emissions can be only beneficial.

Discussions with regard to the electrification of the local line network are ongoing.

The City of Cardiff Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

3.2.4 Moving Trains

LAQM.TG(09) introduced a new requirement to assess the potential for exceedence of nitrogen dioxide objectives. The assessment criteria are in relation to large numbers of diesel locomotive movements where there is relevant exposure within 30metres of the track in areas where the background annual mean concentration of nitrogen dioxide is above 25µm^{-3}.

This assessment was carried out for the 2009 USA and nothing has changed in the intervening period. There is no need to further assess this source.

It should be recorded that works are now underway in preparation for the electrification of the main Swansea/Cardiff to London Paddington line. The effects of this on local emissions can be only beneficial.

Discussions with regard to the electrification of the local line network are ongoing.

The City of Cardiff Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

3.2.5 Ports (Shipping)

The 2012 USA reported:

“Cardiff docks are not a ferry terminal, there is no Ro-Ro usage and no cruise liners use the port. There is some container traffic using the port and the docks handle bulk cargoes such a sand and grain. Coal-handling operations ceased some years ago.”

In accordance with LAQM.TG(16) guidance threshold of 5000 movements per annum, with relevant exposure within 250m of the berths and main areas or 15,000 large ship movements per annum, with relevant exposure within 1km of these areas is not close to being

approached and the risk of exceedence of the SO_2 objectives is considered very small.

Nothing has changed in this regard since the last 2015 USA report that time and there is no need to consider this source further.

The City of Cardiff Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

3.3 Industrial Sources- Industrial Installations

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

There are no new industrial installations for which planning approval has been granted which will give rise to potentially significant emissions of regulated pollutants.

At the time of writing this report, there is currently a scoping request for the Energy From Waste (Efw) site operated by Viridor, Tremorfa to increase the volume of waste that can be accepted and processed. The application is currently under review and an Air Quality Assessment methodology proposal has been reviewed by Shared Regulatory Services Specialist Services Team.

There are no new industrial processes in neighbouring local authority areas which could impact upon air quality in Cardiff.

It is not necessary, therefore, to consider new or proposed industrial installations further in this report.

The City of Cardiff Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

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

There are no existing industrial processes in Cardiff which have substantially increased emissions to air since the 2015 USA.

There is no need for further consideration of this aspect of the assessment further.

The City of Cardiff Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

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

There are no new or significantly changed industrial installations for which previous air quality assessments have not been carried out and which could give rise to potentially significant emissions of regulated pollutants either within Cardiff or within neighbouring local authorities.

The City of Cardiff Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

3.3.4 Major Fuel (Petrol) Storage Depots

As reported in the 2012 USA, there is one major fuel (petrol) storage depot in Cardiff. This is the Chevron Terminal located in Cardiff Docks which was assessed in previous reports. This installation is subject to an EPR Permit and regulated by the Council. Capacity and throughput at this site has not altered significantly for the worse since the last assessment and no new relevant exposure exists.

There are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

3.3.5 Petrol Stations

There are no new petrol stations in Cardiff with throughputs greater than 2000m^3 per annum with a busy road nearby where there is relevant exposure within 10m of the pumps.

It is not necessary, therefore, to consider this further.

The City of Cardiff Council confirms that there are no petrol stations meeting the specified criteria**.**

3.3.6 Poultry Farms

There are no poultry farms in Cardiff subject to IPPC control. There is therefore no need to consider this further.

The City of Cardiff Council confirms that there are no poultry farms meeting the specified criteria.

3.4 Commercial and Domestic Sources

3.4.1 Biomass Combustion – Individual Installations

No large combustion plants burning biomass materials in Cardiff, no known service sector biomass boilers and no community heating schemes using biomass boilers have been identified since the 2015 USA. No residential areas with extensive solid fuel heating have been identified in previous reports.

It is not necessary to consider this further at this time. However, the Council is aware of the potential impact of biomass burning and will be keeping a register of such plant and installations for which planning approval is granted.

The City of Cardiff Council confirms that there are no biomass combustion plants in the Local Authority area.

3.4.2 Biomass Combustion – Combined Impacts

Previous reports have confirmed that there are no known areas in Cardiff where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2015 USA, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.

The City of Cardiff Council confirms that there are no biomass combustion plants in the Local Authority area.

3.4.3 Domestic Solid-Fuel Burning

Previous reports have confirmed that there are no known areas in Cardiff where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2015 USA, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.

It should be noted that the Council receives a number of enquiries each year from residents in respect of national or local requirements were they to wish to install log-burners or similar appliances in their homes. There are no smoke control area in Cardiff and hence no legal requirements with regard to appliances that may be installed. However, residents are always reminded of the legislation in respect of statutory smoke nuisance and, where they can't be persuaded otherwise for reasons of air quality and health, recommended to seek out an appliance certified for use in a smoke control area.

The City of Cardiff Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

There are no new locations where fugitive could occur which have not been covered by previous rounds of review and assessment and no locations where new relevant exposure has been introduced to existing locations.

It is not considered necessary to consider this further at this time.

The City of Cardiff Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

4 Local / Regional Air Quality Strategy

The Council published its local air quality strategy "A Framework for the Future, 2003 – 2010" in October 2003. The Strategy recognised that the Council has the major role in securing improvements in local air quality in Cardiff and, in consequence, improved health and quality of life for those who live and work in the City.

The Strategy recognised the importance of bringing together the Council's policies, strategies and plans as they may influence or affect air quality and recognises the importance of committing both the Council and other significant organisations to secure low air pollution levels in the city in the long term.

The Strategy detailed a number of commitments for the Council in this regard and these are summarised below:

1. The Council would continue to control local sources of air pollution using available environmental and enforcement powers, local planning controls and traffic management systems.

2. The Council would continue to ensure that its statutory responsibilities in respect of air quality continue to be addressed in all relevant aspects of the Council's local policy framework.

3. The Council would continue to measure levels of key pollutants in the atmosphere using techniques and methodologies such that the data obtained may be compared to the air quality Objectives. The Council will undertake to ensure that the monitoring data is available within the public domain using the Council's internet website.

4. The Council would continue to implement the Local Air Quality Management regime and periodically review and assess air quality in its area according to statutory requirements and according to guidance from central government and the devolved administrations. The Council will develop Air Quality Action Plans as necessary and will work towards meeting the air quality Objectives.

5. The Council would continue to operate, maintain and augment its vehicle fleet with low-emission vehicles wherever practicable.

6. The Council would review this Strategy from time-to-time as appropriate to ensure that it is both factually accurate and reflective of national and local developments in air pollution knowledge, control, measurement and good practice.

It is recognised that the Strategy is overdue. Now that the Council's Local Development Plan is in place it will be appropriate for Strategy to be reviewed and updated. However, the commitments outlined above remain in place.

5 Planning Applications

The Council continues to monitor the impact of proposed developments and recent developments already underway or in use.

The following developments may either be of significance in respect of local air quality or be a proposed development where air quality is a consideration.

5.1 Central Business District/Central Bus Station

Plans are currently being developed for a new "Central Business District" centred on Callaghan Square to the south of St Mary Street and the main railway line. The plans include the provision of a new Central Bus Station. How the bus station will operate and how bus routes around the Central Business District will function is still yet to be finalised. Chapter G (Air Quality) of an Environmental Statement was published in October 2014. This report considered implications on Cardiff City's Air Quality and City Centre AQMA. The air quality assessment considered the construction phase and operational phase impacts of the proposed redevelopment assuming the relocation of the existing bus station to the site currently occupied by Marland House. The report considered scenarios which looked at surrounding traffic emissions as a result of the development, but failed to consider the bus station emissions as a contributing factor.

At the time of writing this report, planners and relevant parties are in the process stage of producing the Air Quality Chapter of the ES for the Central Square Interchange Development, incorporating the new proposed bus station emissions.

As highlighted air quality is a fundamental consideration in these plans as any changes to the existing bus station arrangements and routes to and from it will impact upon the Cardiff City Centre AQMA and Westgate Street part of it in particular.

After liaising with planners and consultants, Air Quality methodology proposals have been discussed and will be finalised.

These plans are likely to form a substantial part of an Air Quality Action Plan for the AQMA.

5.2 Windsor House

Planning application (13/01050/DCI) was received in May 2013. The plans proposed the demolition of Windsor House and erection of part six storey, part seven storey new building to accommodate managed student cluster flats and studios, including access, landscaping and associated works. At the time of writing this report construction of the new development is almost complete.

Cardiff Council's Pollution Control Team expressed concerns for the location of the development due to nearby road traffic emissions on Dumfries Place. A condition (Condition 14) was therefore implemented, requesting an Air Quality Assessment focussed on nitrogen dioxide from road traffic and its potential impacts on the occupiers of the development to be produced and accepted in writing by the Local Planning Authority before the commencement of any works. Condition 14 of the permission states;

'No development shall take place until an air quality assessment, including mitigation measures that may be necessary, has been submitted to and approved in writing by the Local Planning Authority. The agreed mitigation measures shall be implemented to the satisfaction of the Local Planning Authority prior to beneficial occupation.'

Proposed methodology for the Air Quality Assessment was agreed with Cardiff Council. It was confirmed that air quality monitoring should be undertaken prior to the commencement of development and the Air Quality Assessment should be provided prior to beneficial occupation. It was proposed and accepted by Cardiff Council that the most effective way of meeting the condition was through NO_2 monitoring over a period of 3 months between 30th August and 2nd December 2014, with the use of NO_2 passive diffusion tubes deployed at locations as close as possible to Windsor House.

The Air Quality Assessment was submitted in January 2015. The report concluded that mitigation is applied to:

- all habitable rooms on the Newport Road frontage to level 3 (inclusive) will require filtration. All levels above the floor of level 4, shown on plan 'proposed east west elevation' labelled as 25100 AoD should not require filtration based on the monitoring results.
- all habitable rooms on the Windsor Lane frontage from levels 1 to 4 as far from the Newport Road as studio B104 (inclusive); and
- all habitable rooms on the Sainsburys frontage from levels 1 to 4 as far back (i.e. from the Newport Road) as the courtyard (e.g. rooms c112 and c113a on level 1).

The report was accepted by Cardiff Council's Pollution Team and condition was passed. At the time of writing this report monitoring is in place at Windsor House, Windsor Lane. The findings from this location will be reported in 2017's Progress Report.

5.3 BBC Broadcasting House, Llantrisant Road, Llandaff

Planning application (15/00799/MJR) was received April 2015. The application details the redevelopment of the BBC Broadcasting House, Llantrisant Road site for residential development (up to 400 new homes). The plan requires demolition of all existing structures, site clearance and site preparation, the installation of new services and infrastructure and other associated works and activities. The BBC is expected to vacate the site in 2018 whereby the site will become available for redevelopment.

The proposed site lies in close proximity to the already established Llandaff AQMA. Therefore, as part of the planning application an Air Quality Assessment would need to be carried out. In February 2015 Cardiff Council's Air Pollution Officer met with consultants to discuss the Air Quality Assessment and their methodology proposal. The officer raised concerns with regards to vehicles queuing at peak hours on Llantrisant Road, new bus lane under construction outside the BBC premises and consideration of proposed developments at strategic sites further out of Cardiff along Llantrisant Road.

The Air Quality Assessment was submitted in May 2015. It assessed operational impacts of traffic emissions, arising from the development related traffic on local roads and the impact of traffic from local roads on the air quality for future residents. The Assessment based its conclusions on projected outcomes for 2019, which is anticipated to be the first year of occupation. The Assessment concluded that the overall operational air quality impacts of the development would be insignificant. Following this conclusion, Cardiff Council's officer was satisfied by the findings but did note that vehicles turning right from the west-bound carriageway of Llantrisant Road into the northern part of the development may cause queuing back into the AQMA during the evening traffic peak. It was recommended that, should consent be granted, adequate provision be required for vehicles turning right such that westbound traffic-flow is not impeded during the evening peak period.

NO_2 Monitoring has continued within the Llandaff AQMA at three specified locations. As illustrated above, both residential locations have shown compliance with the National AQS.

5.4 Glossop Road

At the time of writing this report proposals are in place for a redevelopment project located on Glossop Road, Cardiff. Plans are still premature, however discussions have taken place with Air Quality Consultants who are producing an Air Quality Assessment as part of the planning application. The project is taking place on a 0.647ha plot which runs along Glossop Road, Newport Road Lane, Howard Gardens and Moira Terrace. The aim of the redevelopment is to produce student accommodation consisting of 670 rooms. The proposed development will be car free, therefore the assessment of operational effects will focus on the exposure of future residents of the development to surrounding air quality. The development is anticipated to be completed by 2018; 2015 baseline data will be used to model projections for 2018. As expressed to the Consultants, the development is situated in close proximity to the Stephenson Court AQMA and the sensitive receptors which are already modelled by Council will need to be considered in addition to the residents of the new accommodation.

5.5 The Mill Development at the former Paper Mill Site, Sanatorium Road, Canton

Planning consent has been granted for mixed use development on the former Arjo Wiggins Papermill site On Sanatorium Road, Canton.

The initial plans included the provision of a new bus-only, left-in, left-out junction joining Cowbridge Road East between the Ely Bridge roundabout and Riverside Terrace. However, the splitting of the development means that 1/3 of the vehicular traffic would need to access/leave the site via the proposed new junction at Ely Bridge. Plans for the junction were amended to make the junction multi-directional and available to all road traffic.

Given the proximity of the proposed new junction to the Ely Bridge AQMA an Air Quality Impact Assessment was submitted in support of the plans. It was concluded that, in an extreme, worst case scenario, the proposed new junction would cause a very small negative impact on air quality within the AQMA and that, in planning terms, this impact was insignificant.

Currently infrastructure works are progressing. The Council continues to monitor air quality within the area, Sites 165- 168. These sites were implemented following the original planning application in 2013. From 2013 to current time, these sites have continued to comply with National AQS.

6 Air Quality Planning Policies

At the time of writing this report Cardiff Council has adopted a new Local Development Plan (2006- 2026). The plan was adopted on the 28th January 2016 and upon adoption it now forms the development plan and will be the basis for decisions on land use planning in Cardiff.

The plan contains two policies of relevance to air quality;

-KP18 deals with Natural Resources. It states:

"In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements.....minimising air pollution from industrial, domestic and road transportation sources and managing air quality."

-EN13 which addresses air, noise, light pollution and contaminated land states

"Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination."

The Cardiff LDP replaces several existing plans, including the South Glamorgan (Cardiff Area) Replacement Structure Plan 1991- 2011, City of Cardiff Local Plan and the Cardiff Unitary Development Plan (UDP) (to 2016).

Environmental Policy EV4 of the Replacement Structure Plan states that:

"Proposals which have an unacceptable effect on local communities or important natural resources by virtue of air, land, water or waste pollution will not be permitted."

Policy 2.64 of the Cardiff UDP concerns air, noise and light pollution, and states that:

"Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation or landscape importance because of air, noise or light pollution."

And Paragraph 2.64.6 stipulates that:

"Planning permission will not be granted for development that would contribute to poor air quality as a result of traffic emissions."

7 Local Transport Plans and Strategies

The Local Transport Plan (LTP) 2015- 2020. The implementation of this policy followed Welsh Government's decision to replace Regional Transport Plans with LTPs. Cardiff's LTP policy identifies key transport issues and strategies to tackle these issues. The LTP focuses on a range of measures common to all parts of Cardiff which will have an impact upon traffic movements, growth and emissions (and hence air quality). The programmes highlighted in the LTP include walking and cycling infrastructure, bus network and junction improvements, Cardiff Capital Region Metro Schemes, 20mph limits and road safety schemes. LTP programmes will compliment transport infrastructure provided in conjunction with development brought forward through the LDP. LTP programmes include;

- Walkable Neighbourhoods programme
- Cardiff Strategic Cycle Network (Enfys) programme
- Bus programme (Strategic Bus Network)- junctions improvements, bus prioritisation, extending the range of destination via bus.
- Cardiff Capital Region Metro programme- phased implementation of proposed rapid transit link between Cardiff Bay and Cardiff Central and rapid transit corridor in NW Cardiff to Pontyclun, Rhondda Cynon Taff
- Improve access to local stations programme
- Park and Ride programme- Proposed facility at Junction 33. Designed to intercept traffic on A470, north of Cardiff
- Highway programme- strategic junction improvements and strategic highway improvements
- Road Safety programme

The Council has published an Annual Progress Report for Transport each year since 2002. These are available here:

http://www.keepingcardiffmoving.co.uk/your-sustainable-travel-city

8 Climate Change Strategies

The Council published the “Carbon Lite Cardiff Action Plan” in June 2010.

Carbon Lite has run its course and has been superseded by “One Planet Cardiff” which has its own dedicated website with the vision document and delivery plan. Links to both the Cardiff Council website and the One Planet Cardiff website are below:

http://www.cardiff.gov.uk/ENG/Your-Council/Strategies-plans-and-policies/Sustainable-Development-and-Energy/Pages/Sustainable-Development-and-Energy.aspx

http://www.oneplanetcardiff.co.uk/

9 Implementation of Action Plans

Currently there are four established AQMAs within Cardiff:

1. **Cardiff City Centre-** declared 1st April 2013
2. **Llandaff**- declared 1st April 2013
3. **Stephenson Court**- declared 1s December 2010
4. **Ely Bridge**- declared 1st Feb 2007

Each of these AQMAs was declared as a result of road-traffic derived Nitrogen Dioxide.

At present Shared Regulatory Services (SRS) currently have one action plan in place for Ely Bridge AQMA. At the time of writing this report, discussions have been made with Welsh Government with regards to the difficulties SRS face when trying to produce formal Action Plans for its AQMAs due to foreseeable developments and the uncertainty of how these developments will affect air quality. It was agreed with Welsh Government that temporary Interim Action Plans will be implemented for Cardiff City, Llandaff and Stephenson Court AQMAs.

The Cardiff City Centre AQMA incorporates the former St Mary Street AQMA and an Action Plan for this area was adopted in February 2010. The measures contained therein were fully implemented. Essentially, the plan was to create a pedestrian-friendly environment north of the junction with Wood Street to Castle St. The works have now been completed and monitoring remains in place to access the effectiveness of the plan. However, one of the main outcomes of this plan was the increase in traffic on Westgate Street, which therefore led to increased levels of NO2 and the declaration of the City Centre AQMA in 2013.

The redevelopment of Central Square/ Cardiff Bus Station impedes on an agreed final version of an Air Quality Action Plan for the City Centre AQMA. To date the final designs or the timescales for the development and in particular any detailed transport/ air quality assessments and proposed modifications to the traffic flows on Westgate and surrounding streets have yet to be reviewed. The development of an action plan is made difficult to fulfil without final assessment and design details available. In this instance SRS has produced an “Interim Action Plan” which is detailed in Section 9.1. This plan draws upon SRS’s efforts to drive Air Quality as a major aspect of consideration during any development.

With regards to Llandaff AQMA, a further assessment was undertaken in 2014. Results highlighted levels of NO2 below the national objective of 40µg/m3. Although the outcome from this study would suggest a decision of revoking the AQMA could be undertaken, the levels were not significantly below the AQS and as such it has been decided that the AQMA would remain and reviewed on a year by year basis, as detailed in the 2015 USA. Currently there is currently no formal Action Plan in place for the Llandaff AQMA due to location of the AQMA and potential development of strategic LDP sites situated to the north of the AQMA. As detailed in Section 5 “Planning Application”, at the time of writing report there is currently planning permission granted for the redevelopment of the BBC Broadcasting House site into 400 new homes for 2018. Due to the uncertainty surrounding the AQMA an “Interim Action Plan” has been produced by Cardiff Council (see Section 9.2).

Currently no action plan is in place for Stephenson Court AQMA. Significant changes to road-layouts and bus stops immediately adjacent to the AQMA have only recently been completed by the Council and the impacts of these changes were not modelled or assessed in terms of the impact on the air quality prior to implementation and therefore we do not yet know whether these changes have had a beneficial or detrimental effect on the air quality in the AQMA. Section 9.3 contains an Interim Action Plan for Stephenson Court AQMA.

9.1 Cardiff City Centre Interim Action Plan

-Continue to monitor traffic derived NO_2 & PM_{10} with the use of passive diffusion tubes at existing sample locations in and around the City Centre AQMA and use of continuous analysers located at Cardiff City Centre's AURN site.
-Evaluate trends in the monitoring data and look to improve NO_2 tube locations (especially where new residential accommodation is created and tubes could be moved to the façade of the building) and potentially create new NO_2 monitoring locations.
-Investigate the potential expansion of the City Centre AQMA, for example elevated concentrations of NO_2 for Kingsway/ Duke Street/ Castle Street link area has prompted a Detailed Assessment to be carried out following this Progress Report.
-With the introduction of Cardiff's Local Transport Plan (LTP) 2015- 2020, it is of SRS Pollution team's best interest to influence and push those programmes which will have a beneficial impact on air quality.
-With Cardiff Central Enterprise Zone being highlighted as a Strategic site in Cardiff's Local Development Plan (LDP), SRS will aim m to drive air quality as one of the key considerations within the design stage of any development. At the time of writing this, with regards to Cardiff Central's redevelopment and the implementation of new transport hub, SRS's Specialist Services Officers have been working in close conjunction with colleagues in City Operations (transport management/ planning) and the developers of the Central Square, including attending Transport Workshops. Air Quality Assessments for the various phases of the development have both been carried out and are planned to be carried out. An Air Quality Assessment is currently being proposed for the inclusion of the new bus station development and how this will impact air quality, particularly focusing on Westgate Street. Proposed methodologies for this assessment have been evaluated and discussed through the course of various meetings. The main task of these meetings is to establish mitigation methods which can then be incorporated into a final Action Plan:-
-Potential ideas to improve air quality, especially situated along Westgate Street could be the introduction of "Low Emission Zones" which would restrict buses to meeting Euro IV standards or better. Once the designs and working principles (bus routes, leaving and entry points, signalling) of the bus station are finalised, such ideas of improving air quality can be investigated further.

9.2 Llandaff Interim Action Plan

- Continue to monitor traffic derived NO_2 with the use of passive diffusion tubes at existing sample locations. Based on previous NO_2 data, results at residential accommodations along Llantrisant Road have fallen below the AQS. Following a review of 2016's ratified diffusion tube data it may be necessary for SRS to undertake a detailed assessment which could therefore lead to the Llandaff AQMA being revoked. However any decision to revoke this AQMA needs to be mindful of the potential development of strategic LDP sites to the north of the AQMA. For example planning consent has been granted for the redevelopment of the BBC Broadcasting site into 400 new homes to the north of the AQMA (15/00799/MJR). This development is planned for 2018.

-Currently there are three NO_2 monitoring locations within the established AQMA. It has been decided that if monitoring is to continue into 2016, the locations of these passive diffusion tubes will be assessed. One of the diffusion tubes which is not located at a residential façade (site 33) and therefore will be moved to a nearby residential façade to represent a worst case scenario.

- SRS will work closely with Cardiff Council's Planning Department, advising on any development with the potential for detrimental impacts on air quality, requesting Air Quality Assessments and applying conditions where necessary.

9.3 Stephenson Court Interim Action Plan

-Following the completion of engineering works towards the end of 2015 (realignment of the junction in order to reduce queuing on City Road & relocation of bus stops outside residential accommodation to positions further east) Shared Regulatory Services Specialist Services Team has decided to continue NO_2 monitoring with the use of passive diffusion tubes for 2016 in order to assess the effectiveness of the changes that have taken place. Once the 2016 data has been ratified and evaluated it will be investigated whether or not to proceed to a detailed assessment and revoke the AQMA.

9.4 Ely Bridge Action Plan

The Ely Bridge AQMA is centred upon the north-western end of Cowbridge Road West (known locally as Ely Bridge).

Cowbridge Road West is a dual-carriageway road linking Culverhouse Cross to the south-west with Western Avenue and Cowbridge Road East to the north-east. It is heavily trafficked during the daytime, both during weekdays and at weekends, as it provides one of the principal routes into and out from the city centre from the A4232 Peripheral Distributor Road (PDR) and The Vale of Glamorgan to the west of Culverhouse Cross.

Towards the south-west, the road link is relatively open in aspect and traffic is free-flowing in the main. The whole length of Cowbridge Road West is subject to a 30mph speed limit and this is enforced by permanently located speed cameras at a number of points.

Within the AQMA there are terraced residential properties just a footpath's width from the kerb and there is significant localised traffic congestion adjacent to these properties. The free-flow of traffic is adversely affected by light-controlled junctions at Mill Road and Riverside Terrace and an on-demand light-controlled pedestrian crossing adjacent to these junctions. There is also a junction with Colin Way adjacent to the AQMA on the south-bound side of the carriageway.

The Ely Bridge AQMA came into force on 1st February 2007. An Action Plan for this AQMA was adopted in February 2009 following review of an earlier Action Plan for the former Cardiff West AQMA. The review concluded that there were no additional measures available for the Ely Bridge AQMA other than those which were in the former Action Plans and these drew heavily on traffic and emission reduction measures contained in the Local Transport Plan (LTP).

The LTP has a number of key themes:

- Widening Travel Choices
- Managing Travel Demand
- Network Management

The Council Produces Annual Progress Reports (APR) for the implementation of the measures Contained in the LTP. There are available online here:

http://www.cardiff.gov.uk/content.asp?nav=2870,4048,4188,4242&parent_directory_id=2865

At the time of writing the latest APR available is for 2011. Appendix 2 contains tables detailing progress with regard to implementing the LTP.

It is possible that the Action Plan will be reassessed as a result of the proposed new additional junction on Cowbridge Road West, planned to be located just east of the AQMA.

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

Monitoring data for 2015 indicates that annual mean concentrations of nitrogen dioxide were not unduly elevated during the year and that in some locations concentrations may have been lower than expected. Monitoring during 2016 and onwards may show whether this will be maintained.

As highlighted in 2015 USA and this report a detailed assessment will follow this Progress Report to determine the potential expansion of the City Centre AQMA to encompass Kingsway/Duke Street/Castle Street link past Cardiff Castle.

Following this report, the finalisation of Action Plans for Cardiff City Centre AQMA, Llandaff AQMA and Stephenson Court AQMA is a priority. As outlined above, SRS have devised Interim Action Plans for these AQMAs and these actions will be undertaken, in particular the potential to undertake of detailed assessments for Llandaff and Stephenson Court AQMAs following a review of 2016's NO_2 data.

10.2 Conclusions relating to New Local Developments

Section 5 details a number of local developments which have either gained planning consent recently or for which a planning application has been received.

These applications have been handled accordingly where Air Quality Assessments have been produced and conditions applied accordingly.

10.3 Other Conclusions

There are no other conclusions to be drawn from the information provided herein.

10.4 Proposed Actions

As a result of the information provided herein it is proposed to

1. Continue monitoring within and around the existing AQMAs and other areas of concern.
2. Proceed to a detailed assessment for Kingsway/Duke Street/Castle Street link and based on findings, expand the City Centre AQMA to encompass these areas.
3. Continue to drive Air Quality as a major aspect to be considered during any planning applications, most importantly Cardiff Central Development.
4. Continue to work towards the development of Final Action Plans for Cardiff City AQMA, Llandaff AQMA and Stephenson Court AQMA.
5. Continue monitoring within the Stephenson Court AQMA to assess the impact, if any, of the road-layout changes completed at the start of 2015. Following review of 2016's data, either proceed to develop a viable Air Quality Action Plan or proceed to a Detailed Assessment with the potential outcome of the AQMA being revoked.
6. Continue monitoring within the Llandaff AQMA. Following review of 2016's data, either proceed to develop a viable Air Quality Action Plan or proceed to a Detailed Assessment with the potential outcome of the AQMA being revoked.
7. Submit a Progress Report in 2017.

11 References

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2. Air Quality (Amendment)(Wales) Regulations 2002, No. 3182 (Wales 298)
3. The County Council of the City and County of Cardiff (The Philog Air Quality Management (NO_2)) Order 2000
4. The County Council of the City and County of Cardiff (The Newport Road Air Quality Management (NO_2)) Order 2000
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6. The County Council of the City and County of Cardiff (The St Mary Street Air Quality Management (NO_2)) Order 2002
7. The County Council of the City and County of Cardiff (Ely Bridge Air Quality Management (NO_2)) Order 2007
8. The County Council of the City and County of Cardiff (Stephenson Court Air Quality Management (NO_2)) Order 2010
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10. The County Council of the City and County of Cardiff (Llandaff Air Quality Management (NO_2)) Order 2013
11. Cardiff Council 2003 Updating and Screening Assessment
12. Cardiff Council 2004 Progress Report
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22. Cardiff Council Detailed Assessment for Stephenson Court
22. Cardiff Council 2012 Further Assessment for Stephenson Court
23. Cardiff Local Transport Plan 2000-2016
24. Cardiff Annual Progress Report for Transport 2009
25. Regional Transport Plan for South Wales
26. Cardiff Council Ely Bridge Air Quality Action Plan 2009
27. Cardiff Council St Mary Street Air Quality Action Plan 2010
28 Cardiff Council Detailed Assessment for Llandaff
29. Cardiff Council Detailed Assessment for Westgate Street
30. Cardiff Council 2014 Further Assessment for Cardiff City Centre
31. Cardiff Council 2014 Further Assessment for Llandaff
32. Cardiff Council 2014 Detailed Assessment for Fairoak Road Roundabout
33. Cardiff Council 2014 Progress Report
34. City of Cardiff Council Local Transport Plan 2015- 2020
35. Cardiff Local Development Plan 2006- 2026
36. Cardiff Council 2015 Updating and Screening Assessment

Appendices

Appendix A: Diffusion Tube Monitoring Data 2015

Site	WAQF site_id	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Biased Adjusted using national bias adjustment factor (0.79)	DC %
16	CCC-036	19.8	44.0	44.0	36.7	34.3	27.5	33.7	33	33.7	39.6	35.8	41.1	35.3	27.86	12
33	CCC-054	32.6	79.6	70.5	55.0	61.8	43.8	55.3	55.7	55.4	59.7	68.8	74.8	59.4	46.94	12
44	CCC-078	23.8	48.3	44.1	34.5	30.9	23.7	26.7	30.5	33.4	43.0	34.9	37.6	34.3	27.08	12
45	CCC-079	23.7	54.0	53.2	37.5	38.2	24.4	35.9	31.5	43.4	46.2	[redacted]	58.8	40.6	32.09	11
47	CCC-081	30.6	66.4	72.6	67.5	49.3	38.5	43.4	51.5	59.7	[redacted]	33	63.3	52.3	41.35	11
49	CCC-083	26.0	48.4	46.6	33.8	37.4	36.1	34.7	36.5	34.9	[redacted]	[redacted]	[redacted]	37.2	29.35	9
56	CCC-090	27.7	53.1	49.1	36.6	37.6	29.6	32.7	36.8	40.1	39.5	16.3	51.1	37.5	29.64	12
58	CCC-092	37.0	77.9	71.8	59.4	67.7	56.5	67.7	57.4	45.6	54.0	72.1	65.8	61.1	48.25	12
73	CCC-107	17.2	41.2	34.4	31.6	25.7	18.5	21.7	22.4	29.6	36.6	32.3	23.8	27.9	22.05	12
74	CCC-108	35.1	68.0	58.3	43.9	50.1	44.2	55.6	55.5	53.8	51.3	[redacted]	64	52.7	41.64	11
81	CCC-115	30.5	57.7	55.3	41.3	47.2	27.2	43.7	40.1	44.9	51.6	57.3	39.3	44.7	35.29	12
82	CCC-116	[redacted]	39.2	[redacted]	38.9	26.5	15.8	13.5	25.7	35.9	44.7	30.5	30.4	30.1	23.79	10
85	CCC-119	13.9	39.0	39.9	29.5	27.1	21.8	25.4	25.6	31.6	32.4	25.3	28.2	28.3	22.36	12
86	CCC-120	30.4	60.5	44.1	43.2	46.1	37.8	42.8	40.9	43.2	42.9	50	47.5	44.1	34.85	12
96	CCC-130	25.0	42.7	48.4	42.5	35.7	30.8	34.3	37.5	45.9	51.8	39.3	37.8	39.3	31.05	12
97	CCC-131	22.4	47.8	44.7	39.4	38.1	30.1	33.5	34.5	39.8	44.8	42.3	45.8	38.6	30.49	12
98	CCC-132	17.5	42.5	40.4	27.8	31.2	23.1	28.8	29.3	32.8	40.7	31.5	40.8	32.2	25.44	12
99	CCC-133	22.5	42.6	52.6	45.5	28.3	28.7	31.1	33.8	43.8	58.3	31.2	34.9	37.8	29.84	12
100	CCC-134	25.4	43.5	45.9	34.6	32.5	30.9	38.8	35.7	36.1	42.9	37.1	35	36.5	28.86	12
101	CCC-135	[redacted]	[redacted]	34.4	25.5	23.3	12.9	21.7	22.9	29.4	29.7	29.3	27.6	25.7	20.28	10
102	CCC-136	[redacted]	[redacted]	35.7	24.5	21.9	15.7	21.6	25.4	28	33.3	34.3	26.2	26.7	21.06	10
103	CCC-137	[redacted]	[redacted]	35.4	26.0	22.8	17.9	21.5	22	27.8	35.0	28.2	25.7	26.2	20.72	10
106	CCC-140	25.0	47.9	46.6	35.9	31.8	25.7	31.3	36.4	34.9	40.3	38.4	52.6	37.2	29.41	12
107	CCC-141	27.2	45.3	46.6	40.0	38.4	30.3	32.8	33	[redacted]	51.8	45.6	36.4	38.9	30.70	11
111	CCC-145	17.9	32.2	34.3	31.3	21.8	20.7	21	23.9	27.5	41.8	25.1	26.7	27.0	21.34	12
112	CCC-146	22.7	41.5	46.6	36.9	34.5	25.5	28.6	30.2	37.6	49.0	31.4	26.5	34.3	27.06	12
115	CCC-149	26.1	44.8	51.8	41.0	42.7	37	34.3	38.2	43.2	44.7	45	44.4	41.1	32.47	12
117	CCC-151	26.8	59.5	60.3	61.4	43.2	40.3	45.4	44.5	[redacted]	65.2	49.6	54.4	50.1	39.54	11
119	CCC-153	22.1	42.5	41.6	35.8	27.9	20	29.2	33.5	38.3	49.3	39	40.8	35.0	27.65	12
124	CCC-158	16.6	41.2	34.8	27.7	24.5	20.8	23.7	26.6	29.7	37.3	30	28.5	28.5	22.48	12
126	CCC-160	26.9	[redacted]	53.3	46.1	49.4	36.2	48.5	47.6	44.9	47.3	51	50	45.6	36.00	11
128	CCC-162	25.2	47.3	43.3	43.4	30.7	22.6	37.6	30.9	40	45.2	38.7	44.3	37.4	29.57	12
129	CCC-163	23.4	55.1	45.4	39.4	34.7	39.9	40	38.6	43.5	42.4	39.5	35.8	39.8	31.45	12
130	CCC-164	33.4	56.6	52.9	32.1	43.6	40.7	37.1	42.3	47.3	57.7	44.4	47	44.6	35.23	12
131	CCC-165	30.8	61.5	61.0	43.9	54.6	38.5	51.3	48	51.6	55.6	55.2	47.7	50.0	39.48	12
133	CCC-167	24.8	46.1	45.8	47.6	40.1	32.3	37.5	40.8	42.4	45.2	41.6	40.2	40.4	31.89	12
134	CCC-168	27.0	54.9	[redacted]	[redacted]	36.7	29.3	31.7	39.9	[redacted]	53.2	47.8	44.8	40.6	32.07	9
139	CCC-173	22.8	49.8	49.1	40.8	29.7	25.5	29.8	33.2	41.3	52.2	38.4	34.3	37.2	29.42	12
140	CCC-174	25.6	57.9	55.6	53.4	41.4	30.8	41.8	43.2	45.4	53.4	49.3	53.9	46.0	36.32	12
141	CCC-175	25.2	53.0	48.9	36.0	38.9	37.8	37.7	35.2	43.9	44.6	47.3	41.8	40.9	32.28	12
142	CCC-176	32.0	62.4	63.1	56.7	47	39.9	49.5	[redacted]	59.3	[redacted]	63.9	55.7	53.0	41.83	10
143	CCC-177	27.3	59.5	52.1	47.2	53.8	46.7	52.3	45.1	47	48.3	50.6	49.7	48.3	38.16	12
144	CCC-178	27.7	56.8	52.1	44.1	54.3	45.5	53.3	43.6	49.9	44.2	45.4	48.4	47.1	37.22	12
145	CCC-179	25.5	52.3	50.5	34.8	35	30.8	30.6	31.8	40.2	48.7	[redacted]	36.1	37.8	29.90	11
146	CCC-180	21.6	45.3	43.5	[redacted]	27.9	23	28.4	29.3	35.1	41.9	33.5	40.5	33.6	26.57	11
147	CCC-181	21.5	46.2	42.6	44.9	29.1	24.8	27.2	31	34.4	46.0	36.5	36.6	35.1	27.70	12
148	CCC-182	20.2	42.2	47.7	44.0	28.4	24.3	24	32.5	38.4	52.4	34	30.1	34.9	27.53	12
149	CCC-183	27.2	51.3	53.7	43.6	45.3	39.5	42.1	39.3	41.2	39.5	45.6	41.5	42.5	33.56	12
152	CCC-186	19.0	42.5	44.1	42.4	34.2	28.8	30.4	31	36.6	38.7	35	36.5	34.9	27.60	12
153	CCC-187	24.0	45.8	44.5	38.0	36.6	30.6	34.8	31.4	33.3	41.5	43.5	36.3	36.7	28.99	12
156	CCC-190	19.2	44.8	43.9	33.8	25.6	19.8	24.8	26.7	37.2	49.9	36.3	31.7	32.8	25.92	12
157	CCC-191	23.5	46.7	42.9	37.6	32.7	28.4	29.6	28.1	30.8	34.4	39.1	38.7	34.4	27.16	12
158	CCC-192	[redacted]	43.0	39.1	30.4	23.3	16.9	23.1	28	36	47.4	34.7	33.2	32.3	25.50	11
159	CCC-193	23.6	44.8	54.2	41.2	39.7	30.2	37.3	41.2	49.4	51.9	50.2	52.2	43.0	33.96	12
160	CCC-194	20.5	43.7	38.8	34.4	36	25.8	33.3	31.6	35	37.5	39.7		34.2	27.03	11
161	CCC-195	25.5	53.3	52.7	38.8	38.5	28.6	35.4	39.8	45.7	54.1	40.2	37.7	40.9	32.28	12
162	CCC-196	21.3	43.2	35.2	34.4	27.2	22.2	26.9	26.5	29.1	35.8	33.3	36.6	31.0	24.47	12
163	CCC-197	23.2	45.2	42.6	33.5	30.1	23.8	22.8	23.7	30.4	35.7	6.9	34.8	29.4	23.22	12
164	CCC-198	16.8	34.6	33.7	28.4	21.4	[redacted]	[redacted]	18.5	22.7	30.5	23.5	27	25.7	20.31	10
165	CCC-199	12.7	24.3	27.3	23.3	14.9	10.6	13.8	17	20.1	29.1	18.3	18	19.1	15.10	12
166	CCC-200	18.0	52.1	49.7	41.3	40.5	36.3	35.4	38.4	41	41.7	43	49.5	40.6	32.05	12
167	CCC-201	18.1	46.1	43.6	37.4	33.1	27.3	32.9	32.4	36.9	42.8	37	41.7	35.8	28.26	12
168	CCC-202	19.3	38.7	39.4	31.2	27.3	23.6	28.1	30.8	31.8	38.7	31.3	28.3	30.7	24.26	12
169	CCC-203	14.7	28.5	27.0	21.0	15.1	13.3	15.2	18.7	21.5	29.7	22.5	19.9	20.6	16.27	12
170	CCC-204	18.4	33.5	26.2	21.7	21.2	14.6	19	22.5	27.6	30.2	29.8	25.1	24.2	19.08	12
171	CCC-205	15.9	29.4	30.1	19.5	19.2	14.6	16	20.8	25.9	31.0	27.6	24.3	22.9	18.06	12
172	CCC-206	32.6	69.1	64.3	42.9	60.7	[redacted]	[redacted]	[redacted]	57.8	45.8	70.7	63.1	56.3	44.50	9
173	CCC-207	20.4	41.4	46.2	27.7	34.3	18.7	[redacted]	[redacted]	34	40.3	49.8	46.7	36.0	28.40	10
174	CCC-208	22.4	46.3	50.9	38.7	30.7	23.4	25.6	31.5	40.9	57.9	31.7	35.2	36.3	28.65	12
175	CCC-209	27.0	47.7	65.6	58.8	44.4	45	49.5	55.3	59.2	78.1	52.7	54.6	53.2	42.00	12
176	CCC-210	36.3		72.4	77.5	78.6	58.2	68.8	65.9	69.4	65.5	65.5	80.7	67.2	53.06	11
177	CCC-211	21.4	72.4	63.4	70.5	64.1	54.3	62.2	63.4	62.8	61.9	55.9	78.2	60.9	48.09	12
178	CCC-212	42.9	70.8	79.0	70.1	77.1	[redacted]	70.4	67.2	72	68.9	72	66	68.8	54.32	11

Appendix B: QA/QC Data

Diffusion Tube Bias Adjustment Factors

A database of bias adjustment factors determined from Local Authority co-location studies throughout the UK has been collated by the LAQM Helpdesk. The National Diffusion Tube Bias Adjustment Factor Spreadsheet (Version 06/16) was used to obtain an overall adjustment factor of 0.79 from the input data shown in the following screen-shot. This overall factor is based on 26 co-location studies where the tube preparation method and analysis laboratory used were the same as those used by Cardiff Council.

Figure B.1: National Diffusion Tube Bias Adjustment Factor Spreadsheet

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/16

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

This spreadsheet will be updated at the end of September 2016
LAQM Helpdesk Website

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[2]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2015	SU	Thanet District Council	9	17	15	10.6%	G	**0.90**
ESG Didcot	50% TEA in acetone	2015	R	Thanet District Council	12	27	23	17.8%	G	**0.85**
ESG Didcot	50% TEA in acetone	2015	B	Medway Council	12	21	12	77.3%	G	**0.56**
ESG Didcot	50% TEA in acetone	2015	R	Medway Council	11	32	23	42.6%	G	**0.70**
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	10	34	28	21.2%	P	**0.83**
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	39	28	38.6%	G	**0.72**
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	55	47	16.2%	G	**0.86**
ESG Didcot	50% TEA in acetone	2015	R	Hambleton District Council	10	22	19	17.6%	G	**0.85**
ESG Didcot	50% TEA in acetone	2015	UB	City of York Council	11	24	16	50.6%	G	**0.66**
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	36	27	31.9%	G	**0.76**
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	34	25	34.8%	G	**0.74**
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	12	39	28	41.1%	G	**0.71**
ESG Didcot	50% TEA in acetone	2015	R	Rugby Borough Council	12	23	21	10.6%	G	**0.90**
ESG Didcot	50% TEA in acetone	2015		**Overall Factor[3] (26 studies)**				**Use**		**0.79**

Discussion of Choice of Factor to use

The bias adjustment factor applied to all 2015 data is 0.79. The applied bias adjustment factor has been calculated using the national diffusion tube bias adjustment factor spreadsheet version 06/16. The individual bias adjustment factor calculated using Frederick Street, Cardiff City Centre automatic monitoring system has not been adopted due to insufficient data capture (<90%) at the automatic monitoring analyser for NO_2 and the co-location study was less than 9 months.

PM Monitoring Adjustment

The Frederick Street Automatic Monitoring Station uses a TEOM- FDMS (Tapered Element Oscillating Microbalance Filter Dynamics Measurement System) to monitor PM_{10} & $PM_{2.5}$. In accordance with Section 7.146 of the LAQM TG(16) the local authority can use this analyser without the need for correction for slope or intercept.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by Environmental Scientifics Group Didcot, using the 50% triethanolamine (TEA) in water method. Environmental Scientifics Group Didcot participates in the Annual Field Inter-Comparison Exercise and Workplace Analysis Scheme for Proficiency (WASP) inter-comparison scheme for nitrogen dioxide diffusion tube analysis. From April 2014 the WASP Scheme was combined with the STACKS scheme to form the new AIR scheme, which Environmental Scientifics Group participates in. The AIR scheme is an independent analytical proficiency testing scheme operated by LGC Standards and supported by the Health and Safety Laboratory (HSL).

The laboratory Environmental Scientifics Group Didcot is regarded ranked as the highest rank of satisfactory in relation to the WASP intercomparison scheme for spiked Nitrogen Dioxide diffusion tubes. Information regarding tube precision can be obtained via http://laqm.defra.gov.uk/diffusion-tubes/precision.html Information regarding WASP results can be obtained via http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

Uncertainties

All values presented in this report are the best possible estimates, but uncertainties in the results might cause over-or under-predictions. All of the measured concentrations presented have an intrinsic margin of error. DEFRA and the Das suggest that this is of the order of plus or minus 20% for diffusion tube data and plusor minus 10% for automatic measurements.

The UK Government's Air Quality Expert Group (AQEG) has published a report on trends in primary nitrogen dioxide in the UK (AQEG, 2007). This examines evidence that shows that while NOx emissions have fallen in line with predictions made a decade previously, the composition of NOx has, in some urban environments, changed. This may have caused nitrogen dioxide levels at some locations to fall less rapidly than was expected. The latest guidance from DEFRA and the DAs (2009) has been followed regarding NOx to NO_2 relationships.

The limitations to the assessment should be borne in mind when considering the results set out in preceding sections.