2016 Air Quality Progress Report

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

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Local Authority Officer	Sam Mills	
Department	Environmental Health	
	Ardeevin	
Addross	80 Galgorm Road	
Address	Ballymena	
	BT42 1AB	
Telephone	02825 633136	
e-mail	sam.mills@midandeastantrim.gov.uk	
Report Reference	MEABC/PR2016	
number		

1 Executive Summary

Mid and East Antrim Borough Council has completed this 2016 Air Quality Progress Report in accordance with the provisions of the Environment (Northern Ireland) Order 2002 and the Northern Ireland Local Air Quality Management Policy Guidance document LAQM.PGNI (16)

In undertaking this report, we have completed a review of 2015 ambient air quality monitoring data across the borough in order to identify locations where new or existing exceedances of Air Quality Strategy (AQS) objectives and European Commission limit values are occurring.

It also considers any potential new pollutant emission sources that may have an impact on local air quality.

Mid and East Antrim Borough Council have two declared Air Quality Management Areas (AQMAs) are currently in force, one at Ballymena Ballykeel and one at Ballymena Linenhall Street due to exceedences of the AQS objectives for Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}). Following the conclusions of this report it is recommended that the present AQMA declarations should remain.

Results from automatic NO₂, PM₁₀ and SO₂ monitoring showed that all AQS objectives continued to be met at the Ballymena Ballykeel and Ballymena North Road monitoring sites.

Results from passive NO₂ diffusion tube monitoring showed exceedences of the annual mean AQS objective at three locations; one within the existing Linenhall AQMA (BDT15), and two outside of any existing AQMAs (BDT7 and BDT17).

The Ballymena diffusion tubes BDT7 and BDT17 have been bias adjusted using the locally derived bias adjustment factor of 1.13, the national bias adjustment factor is 0.92. Using the national bias adjustment factor the annual mean concentrations at these locations are both below the NO₂ annual mean AQS objective. It is recommended that monitoring is continued in this area and a decision whether a Detailed Assessment should be completed within the 2016 Annual Progress Report (APR).

With regard to developments that may have an effect on air quality there are various

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Three major road work links are ongoing throughout the borough and are at various stages of completion. These schemes have assessed air quality using the DMRB screening methodology. It was concluded for the schemes that the effect on local air quality would be of minor significance for one scheme and of a net benefit from the second scheme.

Mid and East Antrim Borough Council has identified a biomass installation which may have the potential to impact the air quality within the Borough. Two nuisance complaints have been made against the installation and are currently being investigated. Currently the required emissions data is not available to complete a screening assessment of the installation, although the Council would hope to be able to complete this in its 2016 APR.

The proposed actions from the Mid and East Antrim 2015 Updating and Screening Assessment are as follows:

- Continue to undertake both automatic and passive monitoring of NO₂, PM₁₀ and SO₂ to identify future trends in concentration and any exceedences of the AQS objectives;
- The Ballymena Ballykeel and Ballymena Linenhall Street AQMAs will be retained, and monitoring will continue within the AQMAs to assess the need for retention of the AQMAs in the future;
- Continue to monitor at diffusion tube sites BDT7 and BDT17 to assess the need for a Detailed Assessment;
- Continue to gather emissions information for the identified biomass installation to determine the impact upon local air quality; and
- Proceed to an APR in 2016.

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2 Introduction

2.1 Description of Local Authority Area

The Borough of Mid and East Antrim was created on the 1st of April 2015 through the merging of three separate Boroughs; Ballymena Borough Council, Carrickfergus Borough Council and Larne Borough Council. Mid and East Antrim is located within County Antrim along the Eastern coast from Greenisland in the south to north of Carnlough, and stretching West to bound with Lough Beg. The main settlements within the Borough are Ballymena to the West, Larne to the East, and Carrickfergus to the South East.

The main source of air pollution within the Borough is from road traffic, with good road links to Belfast and its two associated airports and also to the seaports of Larne and Belfast. A number of homes within the Borough continue to burn solid fuel although this number has declined over the years due to the arrival of Phoenix piped natural gas and the Northern Island Housing Executive home improvement schemes.

There are currently two AQMA's in force within the Borough, both are located within Ballymena; Ballykeel AQMA and Linenhall Street AQMA. Ballykeel AQMA has been declared in respect of PM_{10} concentrations predicted by domestic fuel modelling, and Linenhall AQMA has been declared due to modelled and monitored concentrations of NO₂ being above the AQS annual mean objective. The boundaries of both of the AQMAs can be seen in Figure 1.1

2.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment (Northern Ireland) Order 2002, the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air

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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 Northern Ireland, 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.

2.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre μ g/m³ (milligrammes per cubic metre, mg/m³ for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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Pollutant	Air Quality Objective		Date to be	
1 Undtant	Concentration	Measured as	achieved by	
	16.25 µg/m ³	Running annual	31.12.2003	
Benzene		mean		
	3.25 µg/m ³	Running annual	31.12.2010	
	10	mean		
1,3-butadiene	2.25 µg/m ³	Running annual	31.12.2003	
		mean		
Carbon monoxide	10 mg/m ³	Running 8-hour	31.12.2003	
	0.50	mean	04 40 0004	
Lead	0.50 µg/m°	Annual mean	31.12.2004	
	0.25 μg/m ³	Annual mean	31.12.2008	
	200 µg/m ³ not to be			
	exceeded more	1-hour mean	31.12.2005	
Nitrogen dioxide	than 18 times a			
	year		04 40 0005	
	40 μg/m°	Annual mean	31.12.2005	
	50 μ g/m ³ , not to be			
Particulate matter	exceeded more	24-hour mean	31.12.2004	
(PM ₁₀) (gravimetric)	than 35 times a			
	year			
	40 µg/m°	Annual mean	31.12.2004	
	350 µg/m [°] , not to			
	be exceeded more	1-hour mean	31.12.2004	
	than 24 times a			
Sulphur dioxide	year			
	125 µg/m ³ , not to			
	be exceeded more	24-hour mean	31.12.2004	
	than 3 times a year			

Pollutant	Air Quality Objective		Date	to	be
1 ondtant	Concentration	Measured as	achieved	by	
	266 µg/m ³ , not to				
be exceeded more		15 minuto moon	21 12 2005		
	than 35 times a		31.12.20	51.12.2005	
	year				

2.4 Summary of Previous Review and Assessments

Mid and East Antrim is comprised of the former Ballymena, Larne and Carrickfergus Borough Councils respectively. Included below are the summaries for these individual councils. This is combined from 2015 onwards

Previous Assessment	Date completed	Summarised Outcomes
1 st Stage Air Quality Review and Assessment	2000/01	SO_2 and PM_{10} from domestic fuel burning, PM_{10} and NO_2 from road traffic, and SO_2 from two industrial point sources to progress to 2 nd Stage of the Air Quality Review.
2 nd Stage Air Quality Review and Assessment	2003/04	 Modelling completed in regards to domestic fuel burning confirmed that an AQMA be declared in respect of PM₁₀ for two areas of concern, Ballykeel and Dunclug. Automatic and diffusion tube monitoring of SO₂ commenced. DMRB modelling confirmed there was no need to declare an AQMA due to road traffic sources of NO₂ or PM₁₀. GSS modelling for two industrial plants confirmed that SO₂ and PM₁₀ objectives would not be exceeded.
3 rd Stage Review and Assessment	2004	Two AQMA's, Ballykeel and Dunclug were declared in respect of PM ₁₀ concentrations on 25 th October 2004. A real-time PM ₁₀ analyser was co-located

 Table 2-2
 Ballymena Borough Council

		with the existing SO ₂ automatic monitor
		within the Ballykeel AQMA in December
		2004.
		Using updated fuel use data further
		modelling was completed regarding
		current and future PM_{10} and SO_2
		concentrations as a result of domestic
		fuel combustion emissions.
		PM ₁₀ emissions arising from domestic
4 th Stage Review		fuel combustion were predicted to cause
and Assessment	2004/05	an exceedence of the annual and daily
		AQS objective at relevant receptors
		within the assessed areas.
		SO ₂ emissions arising from domestic fuel
		combustion were not predicted to cause
		an exceedence of the AQS objectives at
		relevant receptors within the assessed
		areas.
LAQM Updating and		Detailed assessment for PM ₁₀ arising
		from domestic solid fuel burning, in the
		two declared AQMAs continued.
Screening	April 2006	Co-location study undertaken with the
Assessment 2006		NO_x real time analyser and NO_2 diffusion
		tubes.
		Ballykeel air quality monitoring station
LAQM Annual Progress Report 2007		relocated to a best-fit location within the
		Ballykeel AQMA. Monitoring undertaken
		for consideration of revocation of the
	2007	Dunclug AQMA and possible
		revocation/amendment of the Ballykeel
		AQMA.
		All NO ₂ diffusion tubes were below the

		national bias adjustment factor.
		Using the Gradko bias adjustment factor
		there were two locations that produced
		an exceedences of the NO ₂ annual mean
		AQS objective; Linenhall Street and
		George Street and four further sites were
		close to the AQS objective. Of the six
		sites only four were considered to have
		relevant exposure close to them, a
LAQM Annual	0000	Detailed Assessment was commissioned
Progress Report	2008	to determine whether an AQMA needed
2008		to be declared.
		Both SO ₂ and PM_{10} annual mean
		concentrations were below the AQS
		objective.
		FDMS upgrade to the Ballykeel analyser
		completed, to allow consideration to the
		revoking/amending of the Ballykeel
		AQMA.
		A Detailed Assessment was completed
		for the Linenhall Street/George Street
		due to exceedences of the NO ₂ annual
		mean AQS objective. The detailed
		assessment concluded that the area
LAQM Updating and		should be declared an AQMA.
Screening	2009	Due to fuel conversion undertaken by the
Assessment 2009		NIHE the AQOs are now being achieved
		within the Dunclug and Ballymena
		AQMAs. It was proposed to revoke both
		AQMAs (subject to approval).
		The assessment of sources did not
		highlight any new areas of concern.

		A Further Assessment for NO ₂				
		commissioned to review the newly				
	2040	declared AQMA.				
2010	2010	A Detailed Assessment commissioned				
2010		with a view to revoke the AQMAs in				
		Dunclug and Ballykeel.				
		Following the Detailed Assessment				
Progress Report	2011	decision reached to revoke the Dunclug				
2011	2011	AQMA, Ballymena AQMA to remain due				
2011		to continuing increased levels of PM_{10} .				
		The updating and screening assessment				
		showed that no significant actions are				
		required in relation to air quality				
	2012	management for identified pollutants.				
LAQM Updating and		NO ₂ diffusion tube monitoring showed				
Screening		exceedences within the Linenhall Street				
Assessment 2012		AQMA. The North Road AQMS showed				
		an annual mean NO ₂ concentration				
		below the annual mean AQS objective				
		and there were no exceedences of the				
		hourly AQS objective.				
		The report identified that there were no				
	August 0010	exceedences of the annual mean AQS				
Drogross Doport		objective for either NO ₂ , SO ₂ or PM_{10} .				
2013	August 2015	It was determined prudent to maintain				
2013		both the Ballykeel and Linenhall Street				
		AQMAs.				
		No exceedences of annual				
LAQM Annual	August 2014	concentrations for NO_2 , SO_2 or PM10.				
Progress Report		Exceedences occurring of hourly and				
2014		daily mean concentrations for NO2 and				
		PM ₁₀ .				

Table 2-3 Carrickfergus Borough Council

Previous Assessment	Date completed	Summarised OutcomesNO2 for roads and industrial sources,SO2 for industrial and domestic sourcesand PM10 for domestic and industrialsources to progress to 2 nd Stage of theAir Quality Review.				
1 st Stage Air Quality Review and Assessment	Feb 2001					
2 nd Stage Air Quality Review and Assessment	Feb 2002	SO ₂ and PM ₁₀ from sources and NO ₂ from industrial and road sources excluded from 3 rd Stage Review.				
3 rd Stage Review and Assessment	June 2004	Concentrated on PM ₁₀ from domestic and road sources. Modelling predicted exceedences from PM ₁₀ from domestic sources in Carrickfergus and Greenisland. Two AQMAs were declared PM ₁₀ and SO ₂ were not predicted to exceed the objectives. Both the AQMAs were revoked.				
4 th Stage Review and Assessment	July 2005					
LAQM Updating and Screening Assessment 2006	Oct 2006	No requirement to proceed to a Detailed Assessment for any of the 7 key pollutants.				
LAQM Annual Progress Report 2007	Sept 2007	No requirement to proceed to a Detailed Assessment for any of the 7 key pollutants.				
LAQM Updating and Screening April 2009		Detailed Assessment required for NO ₂ at Minorca Place, Carrickfergus. PM ₁₀ to be				

Assessment 2009		considered at the same location.				
LAQM Detailed Assessment for NO ₂ and PM ₁₀	February 2011	All AQS objectives for NO ₂ and PM ₁₀ were considered likely to be met at relevant receptor locations. Additional NO ₂ monitoring recommended at relevant receptor locations (building facades).				
LAQM Annual Progress Report 2010	February 2011	No further detailed assessments required for any pollutants				
LAQM Annual Progress Report 2011	April 2011	No further detailed assessments required for any pollutants				
Updating and Screening Assessment 2012	March 2013	No further detailed assessments required for any pollutants.				
LAQM Annual Progress Report 2013	October 2013	The report confirmed there were no exceedences of air quality objectives in the Borough for any of the prescribed pollutants. It was recommended to assess the air quality impact of new road schemes proposed as part of the Belfast Metropolitan Area Plan (2015) in the next USA.				
LAQM Annual Progress Report 2014	November 2014	The report confirmed there continued to be no exceedences of air quality objectives in the Borough for any of the prescribed pollutants. It was recommended to assess the air quality impact of new road schemes proposed as part of the Belfast Metropolitan Area Plan (2015) in the next USA.				

 Table 2-4
 Larne Borough Council

Previous Assessment	Date completed	Summarised Outcomes				
1 st Stage Air Quality Review and Assessment	July 2001	A second stage assessment was found to be required for NO ₂ due to significant road traffic and industrial sources. Second stage assessment was found to be required for SO ₂ due to significant industrial, domestic and shipping sources. Second stage assessment for PM ₁₀ was found to be required due to significant road traffic, domestic, industrial and shipping sources.				
2 nd and 3 rd Stage Air Quality Review and Assessment	2004	The air quality objectives for NO_2 , SO_2 and PM_{10} were not exceeded. No AQMA to declare.				
LAQM Annual Progress Report 2005	April 2005	SO ₂ , NO ₂ , and PM ₁₀ objectives were met, no AQMA to declare.				
LAQM Updating and Screening Assessment 2006	April 2006	No detailed assessment required for any of the seven pollutants. Monitoring of SO ₂ , NO ₂ and PM ₁₀ to continue.				
LAQM Annual Progress Report 2007	April 2007	SO ₂ , NO ₂ , and PM ₁₀ objectives met, no AQMA to declare.				
LAQM Annual Progress Report 2008	April 2008	SO ₂ , NO ₂ , and PM ₁₀ objectives met, no AQMA to declare.				
LAQM Updating and Screening Assessment 2009	August 2009	No detailed assessment required for any of the seven pollutants. Monitoring of SO ₂ , NO ₂ and PM ₁₀ to continue. SO ₂ ,				

		NO ₂ and PM ₁₀ objectives met.				
LAQM Annual						
Progress Report		SO_2 , NO_2 , and PM_{10} objectives met, no				
2010		AQMA to declare.				
		Air quality objectives for SO_2 and PM_{10}				
Addendum to	April 2010	met over the previous four years,				
Updating and		therefore continued monitoring was no				
Screening		longer required. Air quality monitoring				
Assessment Report		station decommissioned.				
2009						
LAQM Annual						
Progress Report	April 2011	NO ₂ objectives met, no AQMA declared.				
2011						
Lindating and		No detailed assessment required for any				
Screening	August 2012	of the seven pollutants. Air quality				
Assessment 2012	///////////////////////////////////////	objectives met. Monitoring of SO ₂ , NO ₂				
		and PM_{10} to continue.				
LAQM Annual						
Progress Report	April 2013	NO ₂ objectives met, no AQMA declared.				
2013						
LAQM Annual						
Progress Report	April 2014	NO ₂ objectives met, no AQMA declared.				
2014						

Table 2-5 Mid and East Antrim Borough Council

Previous Assessment	Date completed	Summarised Outcomes				

		The updating and screening assessment			
		showed that no significant actions are			
		required in relation to air quality			
		management for identified pollutants.			
LAQM Updating and		NO ₂ diffusion tube monitoring showed			
Screening	August 2015	exceedences within the Linenhall Street			
Assessment 2015		AQMA. The North Road AQMS showed			
		an annual mean NO ₂ concentration			
		below the annual mean AQS objective			
		and there were no exceedences of the			
		hourly AQS objective.			



Figure 2-1 – Map of Ballykeel and Linenhall Street AQMA Boundaries and locations of Automatic Analysers

3 New Monitoring Data

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

There are two automatic monitoring stations operated within Mid and East Antrim Borough Council, these are sited at the following locations:

- Ballymena Ballykeel; and
- Ballymena North Road.

The Ballymena Ballykeel monitor continuously monitors concentrations of Sulphur Dioxide (SO₂) using a real time ultraviolet fluorescent SO₂ analyser, and Particulate Matter (PM_{10}) using an Tapered Element Oscillating Microbalance (TEOM) with Filter Dynamics Measurement System (FDMS).

The Ballymena North Road monitor continuously monitors concentrations of Nitrogen Oxide (NO), Nitrogen Oxides (NO_x) and Nitrogen Dioxide (NO₂) using a real time NO_x analyser.

Ballymena North Analyser experienced several breakdowns throughout year and was taken out of service in September 2015 following unserviceable breakdown of the analyser.

Figure 3-1 --- Ballymena Ballykeel Automatic Monitoring Station



Figure 3-2 – Ballymena North Road Automatic Monitoring Station



Table 3-1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	RelevantExposure?(Y/N withdistance(m) frommonitoringsite torelevantexposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst- Case Exposure?
	Ballymena Ballykeel	Urban Background	311900	402600	3m	PM ₁₀ SO ₂	Y	TEOM/FDMS Fluorescent	Y	N/A	Y
	Ballymena North Road	Roadside	310636	403072	2m	NO NO _x NO ₂	N	Chemiluminescence	Y	2m	N*

* As the preferred worst-case location was not an option due to a narrow footpath, the second worst-case location was chosen.

3.1.2 Non-Automatic Monitoring Sites

A network of passive NO₂ diffusion tubes is in place within Mid and East Antrim, a total of thirty six monitoring sites were in operation during 2014. These are split between the previous administration boundaries in the sections below; sixteen sites within Ballymena, twelve sites within Carrickfergus and eight sites within Larne.

There is one location within Mid and East Antrim where a triplicate set of NO_2 diffusion tubes are co-located with an automatic NO_x analyser; Ballymena North Road. In addition there are two sets of duplicate diffusion tubes located at 59 Shore Road, Geenisland and Model PS Belfast Road, Carrickfergus.

There has been no change to the NO₂ monitoring network from 2015.

The locations of the NO₂ diffusion tubes are shown in Figures 2.2 – 2.12, and details of the monitoring network are given in Table 2.2

Figure 3-3 - Maps of Non-Automatic Monitoring Sites








































Table 3-2 Details of Non- Automatic Monitoring Sites

									Relevant		
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)	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?
BDT1	Leighinmohr Av	Urban Background	310228	402546		NO2	N	N	Y	N/A	Y
BDT2	Galgorm Road	Kerbside	310336	403196		NO2	N	N	Y	3m	Y
BDT3	Main St, Cullybackey	Kerbside	305841	405690		NO2	Ν	N	Y	2m	Y
BDT4	Cullybackey Road	Kerbside	310350	403443		NO2	N	N	Y	3m	Y
BDT5	Larne St	Kerbside	310602	402920		NO2	Ν	N	Y	3m	Y

									Relevant		
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)	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?
BDT6	Ballyloughan Ave	Urban Background	309532	404425		NO2	N	N	Y	N/A	Y
BDT7	George St	Kerbside	310584	403239		NO2	Ν	Ν	Y	1m	Y
BDT8	Wellington St	Kerbside	310795	403386		NO2	Ν	Ν	Y	2m	Y
BDT9	Ballymoney St	Kerbside	310796	403582		NO2	N	N	Y	2m	Y
BDT10	Parkway	Kerbside	311000	403905		NO2	Ν	Ν	Y	2m	Y
BDT11	Lisnevenagh Rd	Road Side	311884	397037		NO2	N	N	Y	6m	Y
BDT12	Queen St	Kerbside	310743	402219		NO2	Ν	Ν	Y	3m	Y
BDT13/ 14/14B	North Road	Roadside	310638	403079		NO2	Ν	Y - Triplicate	Y	2m	Y

									Relevant		
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)	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?
BDT15	Linenhall St	Kerbside	310687	403122		NO2	Y	N	Y	<1m	Y
BDT16	Bridge St	Kerbside	310710	403119		NO2	Ν	Ν	Y	2m	Y
BDT17	Galgorm Rd	Kerbside	310491	403314		NO2	Ν	Ν	Y	2m	Y
CDT1	27 Upper Road, Greenisland	Roadside	336386	385717		NO2	N	N	Y (1m)	1m	Y
CDT2	32 Mullaghmore Park, Greenisland	Urban Background	336901	385621		NO2	N	N	Y (30m)	3m	N

									Relevant		
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)	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?
CDT3/4	59 Shore Road, Greenisland	Roadside	337969	384916		NO2	N	Duplicate	Y (1m)	1m	Υ
CDT5	186 Shore Road, Greenisland	Roadside	338411	385380		NO2	N	Ν	Y (1m)	1m	Y
CDT6	93 Belfast Road, Carrickfergus	Roadside	339911	386741		NO2	N	N	Y (1m)	1m	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)	RelevantExposure?(Y/N withdistance(m) frommonitoringsite torelevantexposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst- Case Exposure?
CDT7/8	Model PS Belfast Road, Carrickfergus	Roadside	340781	387100		NO2	Z	Duplicate	Y (1m)	1m	Y
CDT9	Minorca Place/ Tesco junction, Carrickfergus	Roadside	340897	387381		NO2	Ν	Ν	Y (1m)	1m	Y
CDT10	42 Albert Road, Carrickfergus	Roadside	341186	387558		NO2	N	N	Y (1m)	1m	Y

									Relevant		
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)	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?
CDT11	Railway Station, Fergus Avenue, Carrickfergus	Roadside	341204	387692		NO2	N	N	Y (15m)	15m	Y
CDT12	College North Road, Carrickfergus	Roadside	341147	388596		NO2	N	Ν	Y (1m)	1m	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	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst- Case Exposure?
CDT13	Victoria Road/Larne Road junction, Carrickfergus	Roadside	342354	388216		NO2	N	N	Y (1m)	1m	Y
CDT14	Islandmagee Road, Whitehead	Roadside	347309	392433		NO2	N	N	Y (1m)	2m	Y
LDT1	Antiville Road/ A8 Junction	Roadside	153472	557105		NO2	N	N	N	N/A	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)	RelevantExposure?(Y/N withdistance(m) frommonitoringsite torelevantexposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst- Case Exposure?
LDT2	Riverdale/ Latharna House	Urban Background	154681	557306		NO2	N	Ν	N	N/A	Y
LDT3	Main St, Larne	Urban Centre	155060	557432		NO2	N	N	N	1m	Y
LDT4	Victoria Rd/ Agnew St Junction	Kerbside	155197	557647		NO2	N	N	N	3m	Y
LDT5	Upper Caincastle Rd	Kerbside	154057	558376		NO2	N	N	N	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?
LDT6	Larne Harbour Roundabout	Roadside	156003	556709		NO2	N	Ν	N	N/A	Y
LDT7	Coastguard Rd/ Castle Terrace	Urban Background	156065	556434		NO2	N	N	N	N/A	Y
LDT8	Ballylumford Rd/ Islandmage	Industrial	156847	556756		NO2	N	Ν	N	N/A	Y

4 Comparison of Monitoring Results with Air Quality Objectives

4.1 Nitrogen Dioxide (NO₂)

There are two AQS objectives for NO₂, namely:

- The annual mean of 40 μ g/m³; and
- The 1-hour mean of 200 µg/m³ not to be exceeded more than 18 times per year.

4.1.1 Automatic Monitoring Data

There is one roadside automatic NO2 monitor in operation within Mid and East Antrim Borough Council; Ballymena North Road.

Monitoring was carried out for the period January to September at this site, afterwhich it ceased due to the analyser being taken out of service following equipment failure

The monitoring data is presented in Table 4-1 and Table 4-2 below. Full details of the QA/QC procedure for the automatic monitors is provided in Appendix A

Due to failure of the North Road Analyser Data capture was below 75% at the automatic monitoring site during 2015, therefore annualisation was required, using data from other realtime analyers. No background analyser data was available and so the analysers at Newtownabbey Antrim Road, Belfast Newtownards Road, Belfast Ormeau Avenue and Castlereagh Dundonald. Appendix B for Annualisation Methodology in reference to Box 7.9 of LAQM.TG16.

The results for 2015 indicate that both the AQS annual mean and hourly mean objectives were met at the Ballymena North Road site, this is in line with previous year's results at the location.

Figure 4-1 shows the trend in annual mean NO2 concentrations from 2008 to 2015 at the Ballymena North Road monitoring location. There have been no exceedances of the AQS annual mean objective recorded at this location from 2008.

Table 4-1 Results of Automatic Monitoring for NO2: Comparison with Annual Mean Objective

		Valid Data		Annual Mean Concentration (µg/m ³)								
Site ID S	Site Type	Within AQMA?	Capture for Monitoring Period % ^a	Valid Data Capture 2015 % ^b	2008	2009	2010	2011	2012	2013	2014	2015 °
Ballymena North Road	Roadside	N	71.3	71.3	29	29	32	27	27	28	32.07	29.58

^c annualised estimates in reference to Box 7.9 LAQM.TG16, as valid data capture is less than 75%

Table 4-2 Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

	Site Type Within AQMA?		Valid Data		Number of Hourly Means > 200µg/m ³							
Site ID S		Within Capture for AQMA? Monitoring Period % ^a	Valid Data Capture 2015 % ^b	2008	2009	2010	2011	2012	2013	2014	2015 °	
Ballymena North Road	Roadside	N	71.3	71.3	0	1	2	0	9	2	5	0(108)

In **bold**, exceedence of the NO₂ hourly mean AQS objective $(200\mu g/m^3 - not to be exceeded more than 18 times per year)^c If the data capture for full calendar year is less than 85%, include the 99.8th percentile of hourly means in brackets$





4.1.2 Diffusion Tube Monitoring Data

Diffusion tube data obtained for the year 2015 was supplied and analysed by the following companies using the listed methodologies:

- Ballymena Diffusion tubes supplied and analysed by Gradko, the tubes were prepared using the 20% triethanolamine (TEA) in water preparation method.
- Carrickfergus Diffusion tubes supplied and analysed by Gradko, the tubes were prepared using the 20% triethanolamine (TEA) in water preparation method.
- Larne Diffusion tubes supplied and analysed by Environmental Scientifics Group (ESG), the tubes were prepared using the 50% triethanolamine (TEA) in acetone preparation method.

All results have been bias adjusted and there were no monitoring locations where data capture was below 75% therefore no sites have been annualised.

It is necessary to apply a bias adjustment factor to NO₂ diffusion tube results. This is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter being a more accurate method of monitoring. The Defra Technical Guidance LAQM.TG(09) provides guidance with regard to the application of a bias adjustment factor to adjust diffusion tube results.

Co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data from continuous NO_x analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method where there are no local co-location studies.

There is a set of triplicate diffusion tubes co-located with the Ballymena North Road automatic NO_x monitor, the bias factor derived from the co-location for 2015 was

1.13. This local bias adjustment factor has been used for the diffusion tubes within Ballymena. For reference the national adjustment bias factor was 0.87.

In addition the national bias adjustment factor from the national database for Gradko 20% TEA diffusion tubes based on 30 studies (0.87), and for ESG 50% TEA diffusion tubes based on 29 studies (0.79) have been used to bias adjust the diffusion tubes in Carrickfergus and Larne. Full details of the local bias adjustment procedure are provided in Appendix A.

The results of annual mean NO_2 concentrations measured using diffusion tubes in 2015 following bias adjustment are reported in Table 4-3, Table 4-4, and Table 4-5. Monthly results of NO_2 concentrations without bias adjustment are also provided in Table 8-2 of Appendix B

The results of NO₂ diffusion tube data (2010 - 2015) are presented in Table 4-6, Table 4-7 and Table 4-8 and a number of charts displaying the changing trends on annual mean NO₂ concentration over the same time period are presented in Figure 4-2, Figure 4-3 and Figure 4-4. The results of the diffusion tube data for 2015 show that there were exceedances of the AQS NO₂ annual mean objective at three diffusion tube locations, one within an existing AQMA and two outside of the existing AQMAs.

Exceedances of the AQS annual mean objective were observed at BDT7, 14B and 17.

All of these diffusion tube locations are in close proximity to the declared Linenhall AQMA

BDT7 - George Street – (Within Linenhall Street AQMA)

BDT14B - North Road

BDT15 – Linenhall Street

BDT17 – Galgorm Road

Comparing the 2015 NO_2 monitoring with concentrations of previous years the locations that have resulted in exceedances in 2015 have had previous

exceedances; BDT7 since 2009 has had an exceedance of the AQS annual mean objective in 2008/13/14 and also was very close to the 40μ g/m³ limit in 2009/10, BDT15 has exceeded every year from 2008-2014, and DBT17 has exceeded for 2013 following annualisation of the results (50% monitoring in 2013) and for 2015 with a full years monitoring.

All other tubes within Ballymena have been, and continue to be below the AQS objective.

In line with previous years monitoring the diffusion tubes located within Carrickfergus and Larne continue to be below the AQS annual mean objective, to date there has not been an exceedance at any monitoring site within these two locations.

Table 4-3 Results of NO₂ Diffusion Tubes 2015 - Ballymena

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months)	Data with less than 9 months has been annualised (Y/N)	Data Distance Corrected (Y/N)	2015 Annual Mean Concentration (μg/m ³) - Bias Adjustment local factor = 1.09
BDT1	Leighinmohr Av	Urban Background	N	Ν	12	-	N	11.90
BDT2	Galgorm Road	Kerbside	N	Ν	12	-	N	36.54
BDT3	Main St, Cullybackey	Kerbside	N	Ν	12	-	N	26.24
BDT4	Cullybackey Road	Kerbside	N	Ν	12	-	N	31.00
BDT5	Larne St	Kerbside	N	N	12	-	N	27.89
BDT6	Ballyloughan Ave	Urban Background	N	N	12	-	N	10.95
BDT7	George St	Kerbside	N	N	12	-	N	49.69

BDT8	Wellington St	Kerbside	N	N	12	-	N	26.89
BDT9	Ballymoney St	Kerbside	N	N	12	-	N	27.94
BDT10	Parkway	Kerbside	N	N	12	-	N	31.63
BDT11	Lisnevenagh Rd	Roadside	N	N	12	-	N	28.27
BDT12	Queen St	Kerbside	N	N	12	-	N	33.70
BDT13	North Road	Roadside	N	Triplicate &	12	-	N	
				co-located				29.86
BDT14	North Road	Roadside	N	Triplicate &	12	-	N	
				co-located				31.58
BDT14B	North Road	Roadside	N	Triplicate &	12	-	N	
				co-located				45.64
BDT15	Linenhall St	Kerbside	Y	N	12	-	N	37.77
BDT16	Bridge St	Kerbside	N	N	12	-	N	33.72
BDT17	Galgorm Rd	Kerbside	N	N	12	-	N	43.40

Table 4-4: Results of Nitrogen Dioxide Diffusion Tubes in 2015 – Carrickfergus

Site ID	Location	Site Type	Within AQMA?	Triplicate, Duplicate or Collocated Tube	Data Capture 2014 (Number of Months)	Data with less than 9 months has been annualised (Y/N)	Data Distance Corrected (Y/N)	2015 Annual Mean Concentration (μg/m ³) - Bias Adjustment factor = 0.87
CDT1	27 Upper Road, Greenisland	Roadside	N	Ν	11	-	N	16.58
CDT2	32 Mullaghmore Park, Greenisland	Urban Background	N	Ν	12	-	N	8.45
CDT3	59 Shore Road, Greenisland	Roadside	N	Ν	12	-	N	19.11
CDT4	59 Shore Road, Greenisland	Roadside	N	Ν	12	-	N	17.10
CDT5	186 Shore Road, Greenisland	Roadside	N	Ν	12	-	N	19.78

CDT6	93 Belfast Road, Carrickfergus	Roadside	N	N	10	-	N	21.24
CDT7	Model PS Belfast Road, Carrickfergus	Roadside	N	N	12	-	N	26.03
CDT8	Model PS Belfast Road, Carrickfergus	Roadside	N	N	10	-	N	24.78
CDT9	Minorca Place/ Tesco junction, Carrickfergus	Roadside	N	N	12	-	Ν	20.32
CDT10	42 Albert Road, Carrickfergus	Roadside	N	N	12	-	N	17.90
CDT11	Railway Station, Fergus Avenue, Carrickfergus	Roadside	N	N	12	-	Ν	12.54
CDT12	College North Road, Carrickfergus	Roadside	N	N	12	-	N	17.30
CDT13	Victoria Road/Larne Road junction, Carrickfergus	Roadside	N	N	12	-	Ν	21.85

	Islandmagee Road,	Poodsido	N	N	12	_	N	
CD114	Whitehead	Rodusiue	IN	IN	12	-		11.39

Table 4-5: Results of Nitrogen Dioxide Diffusion Tubes in 2015 – Larne

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months)	Data with less than 9 months has been annualised (Y/N)	Data Distance Corrected (Y/N)	2015 Annual Mean Concentration (μg/m ³) - Bias Adjustment factor = 0.79
LDT1	Antiville Road/ A8 Junction	Roadside	N	Ν	11	-	Ν	21.97
LDT2	Riverdale/ Latharna House	Urban Background	N	Ν	12	-	N	13.42
LDT3	Main St, Larne	Urban Centre	Ν	Ν	12	-	Ν	22.86
LDT4	Victoria Rd/ Agnew St Junction	Kerbside	N	N	12	-	N	24.05
LDT5	Upper Caincastle Rd	Kerbside	N	N	9	-	N	18.45

LDT6	Larne Harbour Roundabout	Roadside	Ν	Ν	10	-	Ν	11.78
LDT7	Coastguard Rd/ Castle Terrace	Urban Background	Ν	Ν	12	-	Ν	11.27
LDT8	Ballylumford Rd/ Islandmage	Industrial	Ν	Ν	12	-	Ν	10.81

			Annual Mean Concentration (μg/m ³) - Adjusted for Bias								
Site ID	Site Type	Within AQMA ?	2009 (Bias Adjustmen t Factor = 0.9)	2010 (Bias Adjustmen t Factor = 0.92)	2011 (Bias Adjustmen t Factor = 0.91)	2012 (Bias Adjustmen t Factor = 0.96)	2013 (Bias Adjustmen t Factor = 1.02)	2014 (Bias Adjustmen t Factor = 1.13)	2015 (Bias Adjustmen t Factor = 1.09)		
BDT1	Urban Backgroun d	N	11.4	13	12.63	9.53	12.32	12.70	11.90		
BDT2	Kerbside	N	33.53	34.04	30.56	27.16	33.22	36.62	36.54		
BDT3	Kerbside	N	21.67	24.56	24.04	20.90	26.84	27.52	26.24		
BDT4	Kerbside	N	30.22	31.74	30.58	25.17	32.08	33.92	31.00		
BDT5	Kerbside	N	25.8	28.89	26.28	24.11	27.17	29.78	27.89		
BDT6	Urban Backgroun d	Ν	11.1	14.44	15.26	9.32	11.45	11.95	10.95		
BDT7	Kerbside	N	39.0	39.84	35.24	33.67	40.40	45.31	49.69		

Table 4-6: Results of Nitrogen Dioxide Diffusion Tubes (2008 to 2014) - Ballymena

Mid and East Antrim Borough Council

BDT8	Kerbside	Ν	24.9	27.5	28.33	21.57	26.05	27.96	26.89
BDT9	Kerbside	Ν	28.73	31	29.92	24.58	29.19	32.85	27.94
BDT10	Kerbside	Ν	23.25	30.18	30.8	25.74	30.07	34.20	31.63
BDT11	Roadside	Ν	24.68	27.6	27.28	20.15	27.60	30.94	28.27
BDT12	Kerbside	Ν	32.78	36.98	35.54	28.47	31.44	34.99	33.70
BDT13	Roadside	Ν	21.81	27.69	28.78	24.26	29.17	31.09	29.86
BDT14	Roadside	Ν	21.81	27.69	28.78	24.18	28.96	31.89	31.58
BDT14 B	Roadside	Ν	21.81	27.69	28.78	21.74	28.35	31.88	45.64
BDT15	Kerbside	Y	49.12	58.14	57	45.42	51.78	58.18	37.77
BDT16	Kerbside	Ν	-	-	-	-	33.25	33.85	33.72
BDT17	Kerbside	N	-	-	-	-	40.43	42.39	43.40

Exceedences of the AQS annual mean objective shown in Bold.

				Annual Mean Concentration (μ g/m ³) - Adjusted for Bias							
			2010	2011	2012	2013	2014	2015			
Site ID	Site Type	Within	(Bias	(Bias	(Bias	(Bias	(Bias	(Bias			
		AQMA?	Adjustment	Adjustment	Adjustment	Adjustment	Adjustment	Adjustment			
			Factor =	Factor =	Factor =	Factor =	Factor =	Factor =			
			0.83)	0.90)	0.97)	0.95)	0.92)	0.87)			
CDT1	Roadside	N	23.1	21.3	24.6	23.6	24.22	16.58			
CDT2	Urban	N	17 9	81	10.8	94					
0012	Background		11.0	0.1	10.0	0.1	9.12	8.45			
CDT3/4	Roadside	N	31.4	23.2	28.4	21.5	20.21	19.11			
CDT5	Roadside	N	28.6	28.3	30.7	26.6	23.88	19.78			
CDT6	Roadside	N	20.1	26.9	28.8	26.8	24.63	21.24			
CDT7/8	Roadside	N	26.8	25.8	34.9	31.0	30.08	24.78			
CDT9	Roadside	N	28.5	28.1	28.6	25.4	24.98	20.32			
CDT10	Roadside	N	20.5	20.8	24.4	21.3	22.07	17.90			
CDT11	Roadside	N	16.5	13.0	15.0	13.6	14.72	12.54			
CDT12	Roadside	N	21.6	19.3	21.7	19.8	19.70	17.30			

Table 4-7: Results of Nitrogen Dioxide Diffusion Tubes (2009 to 2014) – Carrickfergus

Mid and East Antrim	Borough Council
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CDT13	Roadside	N	23.2	28.5	28.6	25.9	25.03	21.85
CDT14	Roadside	Ν	17.5	14.7	14.3	14.7	13.92	11.39

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m ³) - Adjusted for Bias					
			2010	2011	2012	2013	2014	2015
			(Bias	(Bias	(Bias	(Bias	(Bias	(Bias
			Adjustment	Adjustment	Adjustment	Adjustment	Adjustment	Adjustment
			Factor =	Factor =	Factor =	Factor =	Factor =	Factor =
			0.83)	0.83)	0.79)	0.80)	0.81)	0.79)
LDT1	Roadside	N	28.32	32.30	23.15	22.7	24.29	21.97
	Urban	N	23.23	10.36	1/ 80	14.46	13.60	
	Background		20.20	10.00	14.00	14.40	10.00	13.42
LDT3	Urban Centre	N	28.00	24.14	23.36	21.96	22.44	22.86
LDT4	Kerbside	N	32.94	33.12	35.00 ^a	26.70 ^a	25.00	24.05
LDT5	Kerbside	N	21.66	21.78	20.59	22.25	20.67	18.45
LDT6	Roadside	N	21.92	20.21	16.81	17.35	14.09	11.78
LDT7	Urban	Ν	15.26	12.05	9.92	10.48	10.10	
	Background							11.27
LDT8	Industrial	N	15.99	12.46	10.97	10.54	10.79	10.81

^a Data has been annualised due to data capture being less than 75%.

Figure 4-2 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Ballymena Diffusion Tube Monitoring Sites



Figure 4-3 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Carrickfergus Diffusion Tube Monitoring Sites






4.2 Particulate Matter (PM₁₀)

There are two AQS objectives for PM₁₀, namely:

- The annual mean of 40 μ g/m³; and
- The 24-hour mean of 50 µg/m³ not to be exceeded more than 35 times a year.

Mid and East Antrim Borough Council undertook monitoring of PM_{10} using a TEOM with FDMS analyser at one location during 2015; Ballymena Ballykeel, an urban background site. The PM_{10} monitoring data is presented in Table 4-9 and Table 4-10 below. Full details of the QA/QC procedures are provided in Appendix A.

The trend graph presented as Figure 4-5 shows that in 2015 both the annual mean and the number of exceedances of the 24-hour mean objective are the lowest values recorded since 2008. The annual mean PM_{10} has seen a gradual reduction in concentration since 2008, with the number of 24-hour exceedances showing a peak in 2010 and a reduction every year following this.

The 2015 PM_{10} results show that the annual mean and the 24-hour mean continue to meet the AQS objectives at the Ballymena Ballykeel monitoring site.

			Valid	Confirm	Annual Mean Concentration (μg/m ³)									
Site Name	Site Type	Within AQMA?	Data Capture	Gravimetric Equivalent	2009	2010	2011	2012	2013	2014	2015			
			2015 % ^b	(Y or NA)										
Ballymena	Urban	Y	89.1	Y	25	24	22	21	21	18 16	14			
Ballykeel	Background		00.1		20	27		<u> </u>		10.10				

Table 4-9: Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

Table 4-10: Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

			Valid	Confirm	Number of Exceedences of 24-Hour Mean (50μg/m ³)								
Site Name	Site Type	Within AQMA?	Data Capture 2015 % ^b	Gravimetric Equivalent (Y or NA)	2009	2010	2011	2012	2013	2014	2015		
Ballymena Ballykeel	Urban Background	Y	89.1	Y	6	11	10	6	7	2	1		





4.2.1 Sulphur Dioxide (SO₂)

There are three Air Quality Objectives for sulphur dioxide, namely:

- the 1-hour mean of 350µg/m³, not to be exceeded more than 24 times a year;
- the 24-hour mean of 125µg/m³ not to be exceeded more than 3 times a year, and
- the 15-minute mean of 266µg/m³ not to be exceeded more than 35 times a year.

The 2015 monitoring data for Ballymena Ballykeel presented in Table 4-11 shows that the SO_2 objectives were met for 2015.

Table 4-11 Results of Automatic Monitoring for SO₂: Comparison with Objectives

			Data Capture	Number of	Number of Exceedences of AQS Objectives:						
Site Name	Site Type	Within AQMA?	for full calendar year 2014 % (15-minute Means)	15-minute Means > 266µg/m³	1-hour Means > 350µg/m ³	24-hour Means > 125µg/m³					
Ballymena Ballykeel	Urban Background	Y	90.33	0	0	0					

4.3 Other Pollutants Monitored

No other pollutants were monitored within Mid and East Antrim during 2015.

4.4 Summary of Compliance with AQS Objectives

Monitoring of NO₂, PM_{10} and SO₂ is completed across Mid and East Antrim Borough Council using two automatic monitors and a network of passive NO₂ diffusion tubes.

In October 2015 the North Road NO2 Analyser was taken out of service following equipment failure.

The Ballymena Ballykeel automatic monitor records both PM₁₀ and SO₂ continuously.

 PM_{10} AQS objectives, both the annual mean and the 24-hour objectives were met at the monitoring location in 2015,

SO₂ AQS objectives for were also met at the monitoring sites with no exceedances of the 15-minute, 1-hour, or 24-hour mean objectives recorded.

The North Road automatic monitor records NO₂ continuously.

 NO_2 AQS objectives both the annual mean and the 1-hour objectives were met at the monitoring location in 2015. The annual mean concentration was the highest recorded since 2008 and there were 5 exceedances of the 1-hour objective during the year.

There were three diffusion tube locations that exceeded the AQS annual mean objective for NO_2 within Mid and East Antrim Borough Council during 2014. One of these sites (BDT15) is within the existing Linenhall AQMA therefore a Detailed Assessment is not required for this location.

The further two sites (BDT7 and BDT17) that that exceeded the NO₂ AQS annual mean objective are located close to the Linenhall AQMA but are outside of the existing boundary. BDT7 has exceeded the AQS annual mean objective for four out

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of the past eight years, and BDT17 since monitoring began in 2013 the site has exceeded the AQS annual mean in 2013, 2014 and 2015.

The diffusion tubes in Ballymena have been bias adjusted using the locally derived bias adjustment factor of 1.09, the national bias adjustment factor is 0.82.

		New	Detailed		Description of		
Pollutant	General	Exceedances	Assessment	Objective	Area and		
		identified?	Required		Details		
		Ballymena Mo	onitoring Netw	ork			
					Both BDT7 and		
					17 exceeded		
					the AQS annual		
	Monitorina			Annual	mean objective		
	outside	No	No	Mean /	using the local		
			NO	Hourly	bias adjustment		
NO_2				Objective	factor but not		
					when adjusted		
					using the		
					national factor		
	Monitoring			Annual			
	inside	No	No	Mean	-		
	AQMAs			mouri			
	Monitoring						
	outside	No	No	-	-		
	AQMAs						
PM ₁₀				Annual	Both the annual		
	Monitoring			Mean /	mean and daily		
	inside	No	No	24-hour	mean AQS		
	AQMAs			Objective	objectives		
					continue to be		

Table 4-12: Summary of Compliance with AQS Objectives

					met by the
					Ballymena
					Ballykeel
					automatic
					monitor
	Monitoring				
	outside	N/A	N/A	-	-
All other	AQMAs				
pollutants	Monitoring				
	inside	N/A	N/A	-	-
	AQMAs				
		Carrickfergus I	Monitoring Net	work	
					All diffusion
	Manitarinar				tube locations
	Monitoring	NL	N I-	Annual	continue to
		NO	INO	Mean	meet the AQS
NO ₂	AQMAS				annual mean
					objective
	Monitoring				
	inside	N/A	N/A	-	-
	AQMAs				
	Monitoring				
	outside	N/A	N/A	-	-
DM	AQMAs				
PINI ₁₀	Monitoring				
	inside	N/A	N/A	-	-
	AQMAs				
	Monitoring				
	outside	N/A	N/A	-	-
	AQMAs				
	Monitoring				
pollutants	inside	Ν1/Λ	N 1 / A		
	AQMAs	N/A	N/A	-	-

Larne Monitoring Network												
					All diffusion							
	Monitorina				tube locations							
NO.	outside	No	No	Annual	continue to							
				Mean	meet the AQS							
	/ (Q//// (3				annual mean							
					objective							
	Monitoring											
	inside	N/A	N/A	-	-							
	AQMAs											
	Monitoring											
PM ₁₀	outside	N/A	N/A	-	-							
	AQMAs											
	Monitoring											
	inside	N/A	N/A	-	-							
	AQMAs											
All other	Monitoring											
nollutants	outside	N/A	N/A	-	-							
polititarits	AQMAs											
	Monitoring											
	inside N/A	N/A	N/A	-	-							
	AQMAs	IN/A										

Mid and East Antrim Borough Council has examined the results from monitoring in the Borough. Concentrations outside of the AQMAs are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

5 New Local Developments

5.1 Road Traffic Sources

Defra Technical Guidance TG(09) defines narrow congested streets to have the following:

- Daily traffic flow (AADT) of around 5,000 vehicles per day;
- A congested street is one that has slow moving traffic that is frequently stopping and starting through the day; and
- A narrow street is one where residential properties are within 2m of the kerb and there are buildings on both sides of the road.

No new roads have been identified within Mid and East Antrim as meeting the above criteria.

Mid and East Antrim 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.

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

There will be some street locations where individuals may regularly spend 1-hour or more, for example streets with many shops and streets with outdoor cafes and bars. People occupationally exposed in such locations should not be included, as they are not covered by the regulations.

No busy streets have been identified within Fareham and Gosport as meeting these criteria.

Mid and East Borough Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

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

A road with a high flow of buses of HGV's would be one where the proportion of these vehicles within the daily traffic flow is greater than 20%.

Mid and East Antrim Borough Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

5.3 Junctions

Defra Technical Guidance TG(09) states that for a junction to require assessment the flowing criteria must be met:

- A 'busy' junction can be taken to be one with more than 10,000 vehicles per day; and
- There is relevant exposure within 10m of the kerb.

Mid and East Antrim Borough Council confirms that there are no new/newly identified busy junctions/busy roads.

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

A new road where an air quality assessment has not been completed as part of the planning application should be assessed using the following criteria as per Defra Technical Guidance TG(09):

- Only proceed if there is relevant exposure within 10m, 20m in major conurbations (population is greater than 2 million);
- Establish whether the traffic flow on the new road is greater than 10,000 vehicles per day or whether the new road has increased traffic flow on existing roads previously identified as having:
 - \circ NO₂ annual mean concentrations greater than 36 μ g/m³; or
 - \circ More than 30, 24-hour exceedences of the PM₁₀ objective of 50 µg/m³.

The works to expand the A8 Belfast to Larne to a dual carriageway were completed in 2015 and the road was opened. An Environmental Statement (ES) was completed for the expansion in 2011 with Chapter 14 assessing the air quality impacts of the scheme. A DMRB assessment was completed to predict the operational effects of the scheme and it was concluded that the overall impact of the scheme upon air quality in local area would be of minor significance.

Major road works have been completed in 2015 on the A2 Shore Road. An ES was completed for this scheme in 2007 with Chapter 14 providing an assessment of the air quality impacts of the scheme. A DMRB assessment was completed to predict the operational effects of the scheme and it was concluded that there would be no significant effect on either local, or regional air quality as a result of the scheme. Furthermore from the modelling completed it was concluded that there would be a net benefit for the majority of properties in regards to improved air quality.

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

5.5 Roads with Significantly Changed Traffic Flows

Mid and East Antrim Borough Council confirm that there have been no roads with a traffic flow of greater than 10,000 vehicles per day that have experienced an increase in traffic flow of more than 25%.

Mid and East Antrim confirms that there are no new/newly identified roads with significantly changed traffic flows.

5.6 Bus and Coach Stations

The assessment considers both NO_2 and PM_{10} emissions at bus stations that are not enclosed with greater than 2,500 movements per day.

Mid and East Antrim confirms that there are no relevant bus stations in the Local Authority area.

5.7 Airports

The criteria for Airports that require assessment as a source as stated within Defra Technical Guidance TG(09) is as follows:

- Establish whether there is relevant exposure within 1,000m of the airport boundary;
- Passenger numbers of more than 10 million passengers per annum; and
- The existing NO_x background concentration is greater than 25 μ g/m³.

Mid and East Antrim Borough Council confirms that there are no airports in the Local Authority area.

5.8 Railways (Diesel and Steam Trains)

The assessment for stationary trains considers SO_2 emissions, while the assessment for moving trains also considers NO_2 emissions. The specific criteria for Railways (stationary and moving) that require assessment as stated within Defra Technical Guidance TG(09) is as follows:

- Any locations where diesel/steam trains are regularly stationary for periods of 15 minutes or more;
- There is the potential for regular outdoor exposure of individuals within 15m of the stationary locomotives; and
- Where the existing NO₂ background concentration is above 25 μ g/m³.

5.8.1 Stationary Trains

Stationary locomotives, both diesel and coal fired, can give rise to high levels of SO_2 close to the point of emission. Railway locomotives have not been identified in previous rounds of review and assessment as being a significant source of SO_2 within Mid and East Antrim Borough Council.

Mid and East Antrim Borough 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.

5.8.2 Moving Trains

Rail lines with a heavy traffic of diesel passenger trains are listed in the Defra Technical Guidance TG(09) and on the Defra website for Guidance on Assessing Emissions from Railway Locomotives¹. Of the lines that are listed, none pass through Mid and East Antrim Borough Council.

Mid and East Antrim Borough Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant

¹ Guidance on Assessing Emissions from Railway Locomotives, available online at laqm.defra.gov.uk/laqm-faqs/faq37.html

exposure within 30m.

5.9 **Ports (Shipping)**

The specific criteria for ports (shipping) that require assessment as stated within Defra Technical Guidance TG(09) should include the following:

- Relevant exposure within either 250m or 1km of the berths and main areas of ship manoeuvring;
- Ship movements of between 5,000 and 15,000 per year for relevant exposure within 250m; and
- Ship movements of more than 15,000 per year for relevant exposure within 1km.

The Port of Larne offers facilities for both passenger and freight customers, daily arrivals and departures to Cairnryan are operated by P&O. SO₂ emissions from Larne Harbour were monitored between the 1st of April 2003 and the end of December 2005. This was completed in the vicinity of the port at a site selected on the basis that it was representative of levels at the nearest sensitive receptors which were residential properties located on Coastguard Road.

The equipment was located at a distance of approximately 25m from the identified residential properties and 235m from the closest mooring quay. An automatic UV fluorescent SO₂ analyser was installed which provided real time data relating to the short-time AQS objectives. During the monitoring period all AQS objectives were met and have been reported in previous rounds of Review and Assessment.

Mid and East Antrim Borough Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5.10 Industrial Sources

This report has assessed any changes to the following since the last Updating and Screening Assessment:

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

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

Mid and East Antrim Borough 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.

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

As per Defra Technical Guidance TG(09) existing industrial installations to be taken into account should include the following criteria:

- Installation has experienced an increase in emissions by greater than 30%; and
- New relevant exposure has been identified in the vicinity of the installation.

Mid and East Antrim Borough 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.

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

Mid and East Antrim Borough 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.

5.11 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.12 Petrol Stations

The specific criteria for petrol stations that require assessment as stated within Defra Technical Guidance TG(09) is a petrol station with the following:

- An annual throughput of more than 2,000m³ of petrol;
- A busy road nearby, one with more than 30,000 vehicles per day; and
- Relevant receptors within 10m of the refuelling pumps.

Mid and East Antrim Borough Council confirms that there are no petrol stations meeting the specified criteria.

5.13 Poultry Farms

Studies have been conducted by the Environmental Agency, Department for Environment Northern Island and a local authority. From the studies completed the following guidance has been produced as to the assessment of poultry farms:

- Identify any farms housing in excess of:
 - o 400,000 birds if mechanically ventilated;
 - o 200,000 birds if naturally ventilated; and
 - 100,000 birds for any turkey farm.
- Establish whether there is any relevant exposure within 100m of the poultry farms.

Mid and East Antrim Borough Council confirms that there are no poultry farms meeting the specified criteria.

5.14 Biomass Combustion – Individual Installations

There are a large number of individual Biomass boilers within the borough due to the prevalence of the government renewal heat incentive.

Within the borough there have been over 100 applications for biomass boiler circa 100kW output in connection with commercial premises and predominately for heating for poultry installations within the borough.

Mid and East Antrim Borough Council have not been made aware of the specific application details unless specific planning application has been received for installation of these. MEABC are not aware of the exact location and so have been unable to utilise tools such as biomass calculator in order to complete screening assessments.

As further information is released in connection with commercial biomass boilers under the RHI scheme, MEABC will be in a position to assessment there impact in future air quality annual status reports.

Mid and East Antrim Borough Council did take enforcement action under Section 63 of the Clean Neighbourhoods and Environment Act (NI, 2011 against a biomass boiler located within the borough relating to smoke emissions from the unit.

This unit is currently not in operation, however the situation will be reviewed by council

Mid and East Antrim Borough Council has identified a number of biomass combustion plants within the Borough. Currently full specifications of the installations are unavailable. When these are available it be concluded if it is necessary to proceed to a Detailed Assessment.

5.15 Biomass Combustion – Combined Impacts

Mid and East Antrim Borough Council has identified a number of biomass combustion plants within the Borough. Currently full specifications of the installations are unavailable. When these are available it be concluded if it is necessary to proceed to a Detailed Assessment.

5.16 Domestic Solid-Fuel Burning

The current enforced Ballykeel AQMA and the revoked Dunclug AQMA were both declared in respect to PM_{10} concentrations from domestic fuel burning, principally coal. During the time of these declarations the Northern Island Housing Executive

(NIHE) began a fuel conversion scheme introducing natural gas as the fuel used within residential properties.

Due to the fuel conversion that took place the AQS objectives for PM_{10} are continually met and the Dunclug AQMA was revoked in 2011. PM_{10} modelling completed within the 2011 Detailed Assessment concluded that the Ballykeel AQMA remain.

Mid and East Antrim Borough Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

5.17 New Developments with Fugitive or Uncontrolled Sources

The assessment of fugitive or uncontrolled sources considers only PM₁₀ AQS objectives. The assessment considers but is not limited to the following sources of dust; quarries, landfill sites, opencast coal mining, waste transfer sites, materials handling (i.e. ports, major construction sites). Only sources with planning approval granted need to be considered. An assessment should only be completed if there are locations that haven't been covered by previous rounds of Review and Assessment or where there is new relevant exposure.

Relevant exposure is defined within the Defra Technical Guidance TG(09) using the following criteria as to whether there is exposure 'near' to the source:

- Within 1000m for a local PM_{10} background concentration > 28 μ g/m³;
- Within 400m for a local PM_{10} background concentration between 26 and 28 μ g/m³; and
- Within 200m for a local PM₁₀ background concentration < 26 μg/m³.

Mid and East Antrim Borough Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Monitoring of NO_{2} , PM_{10} and SO_{2} is completed within East and Mid Antrim utilising continuous automatic monitors and passive NO_{2} diffusion tubes. There are two continuous monitors and a total of thirty six diffusion tubes locations in place during 2015; eighteen sites within Ballymena, twelve sites within Carrickfergus and eight within Larne.

A review of the 2015 NO_2 monitoring data found that there were no exceedences of any the AQS annual mean objectives for NO_2 , PM_{10} or SO_2 at automatic monitoring locations of North Street and Ballymena Ballykeel.

There were three NO₂ diffusion tube monitoring sites where an exceedences of the AQS annual mean objective were recorded; BDT7, BDT14B and BDT17. None of the diffusion tubes had an annual mean greater than 60 μ g/m³, therefore there are no diffusion tube sites likely to be at risk of exceeding the 1-hour mean AQS objective.

The three sites where exceedences occurred are at locations on the perimeter of the designated Linenhall Street AQMA.

It is recommended that monitoring is continued in this area and a decision whether a Detailed Assessment should be completed within the 2017 Annual Status Report.

6.2 Other Conclusions

Two new road links have been completed during 2015 within Mid and East Antrim Borough Council. Both schemes completed air quality assessments using DMRB as part of their Environmental Statements (ES), it was concluded for the schemes that the effect on local air quality would be of minor significance for one scheme and a net benefit from the second scheme.

Mid and East Antrim Borough Council has identified a biomass installation which may have the potential to impact the air quality within the Borough, two nuisance

complaints have been made against the installation and are currently being investigated. Currently the required emissions data is not available to complete a screening assessment of the installation, this will be completed within Review and Assessment when the emissions data becomes available.

6.3 Proposed Actions

The proposed actions from the Mid and East Antrim 2016 Progress Report are as follows:

- Continue to undertake both automatic and passive monitoring of NO₂ and PM₁₀ to identify future trends in concentration and any exceedences of the AQS objectives;
- The Linenhall and Ballykeel AQMAs will be retained and monitoring will continue within the Ballykeel AQMA to assess the need for retention of the AQMAs in the future;
- Continue to monitor at diffusion tube sites BDT7, BDT14,14B, BDT15 and BDT17 to assess the need for a Detailed Assessment;
- Continue to gather emissions information for the identified biomass installation to determine the impact upon local air quality; and
- Proceed to an Annual Status Report in 2017.

7 References

- Local Air Quality Management Technical Guidance LAQM.TG(16). April 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- National Diffusion Tube Bias Adjustment Spreadsheet v09_16,
- Mid and East Antrim Borough Council 2015 Updating and Screening Assessment 2015
- Ballymena Borough Council 2014 Annual Progress Report
- Ballymena Borough Council 2013 Annual Progress Report
- Ballymena Borough Council 2012 Updating and Screening Assessment
- Dunclug and Ballykeel Detailed Assessment of Air Quality, PM₁₀ Modelling Study, March 2011, produced by AEA.
- Carrickfergus Borough Council 2014 Annual Progress Report
- Carrickfergus Borough Council 2013 Annual Progress Report
- Carrickfergus Borough Council 2012 Updating and Screening Assessment
- Larne Borough Council 2014 Annual Progress Report
- Larne Borough Council 2013 Annual Progress Report
- Larne Borough Council 2012 Updating and Screening Assessment

8 Appendices

Appendix A: QA/QC Data

8.1.1 Factor from Local Co-location Studies (if available)

There is one triplicated diffusion tube monitoring site located within Mid and East Antrim Borough Council, these are located at the North Road automatic monitoring station. A local bias adjustment factor has been calculated from the Precision and Bias Adjustment spreadsheet $(v04)^2$ and is shown in Table 8-1 and the outputs from the spreadsheet are shown in **Error! Reference source not found.**

Table 8-1Local Bias Correction Factor

Location	Diffusion Tube Data Capture	usion Data Data Dture Continuous Monitor Data Capture	Diffusion Tube Annual Mean (µg/m ³)	Continuous Monitor Annual Mean (μg/m ³)	Ratio
North Road, Ballymena	97	97	26	28	1.09

² AEA_DifTPAB_v04.xls, version 04 published in February 2015

С	Checking Precision and Accuracy of Triplicate Tubes													
	5		0.10						0,	Fror	m the AEA	group		
			Diffi	usion lu	bes Mea	surements	5	0			Automa	tic Method	Data Qual	ty Check
13	Start Date	End Date	Tube 1	Tube 2	Tube 3	Triplicate	Standard	Coefficient	95% CI		Period	Data	Tubes	Automatic
E I	dd/mm/yyyy	dd/mm/yyyy	uam-3	uam-3	uam-3	Mean	Deviation	of variation	of mean		Mean	Capture	Precision	Monitor
	0710410045	0010010045	015	04.5	- 3		10	(CV)	47			(% DC)	Спеск	Data
	07/01/2015	03/02/2015	31.5	31.5	34.8	33	1.9	6	4.7		32.02	59.41	Good	ir Data Captur
	03/02/2015	21/02/2015	26.0	21.2	23.0	20	2.3	3	(.Z		37.35	99.02	Good	Good
I ⊢ °	31/03/2015	30/04/2015	26.0	26.1	26.3	23	0.4	1	0.0		34.25	99.03	Good	Good
l ,	30/04/2015	28/05/2015	20.0	21.4	19.8	20	0.4	4	19		24	97.58	Good	Good
6	28/05/2015	02/07/2015	21.6	23.4	20.7	22	1.4	6	3.4		23	97.08	Good	Good
	02/07/2015	30/07/2015	23.0	24.6	22.8	23	1.0	4	2.5		22	89.65	Good	Good
8	30/07/2015	25/08/2015	26.8	28.5	27.1	27	0.9	3	2.3		24	99.06	Good	Good
9	25/08/2015	01/10/2015	28.8	28.5	26.4	28	1.3	5	3.3		29	99.86	Good	Good
10	01/10/2015	29/10/2015	32.1	41.2	37.9	37	4.6	12	11.5			0	Good	ır Data Captur
11	29/10/2015	03/12/2015	26.0	26.1	26.7	26	0.4	1	0.9			0	Good	ir Data Captur
12	03/12/2015	07/01/2015	32.9	29.8		31	2.2	7	19.9			0	Good	ır Data Captur
13														
It is	necessary to	have results	for at lea	st tvo tu	bes in ore	ler to calcul	ate the prec	ision of the m	easuremen	ts	Overa	II survey>	Good	Good
C:	a Nama/ID	Dalla	mana M	orth Doo	d	1	n	12 (12			SU	al 20%	Check avera	Uverall
5	e Name/ ID:	Bally	mena N	orui Roa	a		Precision	12 out of 12	perioas n	ave a t	v smallel	than 20%	from Accuracy	calculations)
	Accuracy	(with	95% con	fidence	interval)		Accuracy	(with	95% conf	idence	interval)			
	without pe	riods with C	V larger	than 20	%		WITH ALL	DATA				50%	1	
	Bias calcula	ated using 8	periods	of data			Bias calcu	lated using 8	periods	of data				
	В	ias factor A	1.09) (0.98 - ⁻	1.22)			Bias factor A	1.09	(0.98 -	1.22)	8 25%		
		Bias B	-8%	(-18% -	2%)			Bias B	-8%	(-18%	- 2%)	<u> </u>		T
	Diffusion T	ubes Mean	26	uam ⁻³			Diffusion	Tubes Mean	26	uam ⁻¹		E C	Without V+20%	With of data
	Mean CV	(Drecision)	5	pym			Mean CV	/ (Drecision):	20	pgin		·ig -25%		
	Autor	(FICCISION).												
	Autor Data Cant	nauc mean:	28 do upodi	pgm ozw			Automatic Mean: 28 µgm ⁻							
	Data Capt	are for perior	us used:	9170			Data Ca	rule for pend	us used.	91%	-3			<i></i>
	Adjusted Tubes Mean: 28 (26 - 32) µgm Adjusted Tubes Mean: 28 (26 - 32) µgm Jaume Targa, for AEA													
	Version 04 - February 2011													

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

8.1.2 Diffusion Tube Bias Adjustment Factors

Diffusion tube data obtained for the year 2015 were supplied and analysed by Gradko International Limited and Environmental Scientifics Group (ESG) The Gradko tubes were prepared using the 20% Triethanolamine (TEA) in water preparation method, and the ESG tubes were prepared using the 50% TEA in acetone preparation method. The national bias adjustment factor for Gradko 20% TEA is 0.87 (based on 30 studies, version 09_16) and for ESG Didcot 50% TEA it is 0.79 (based on 29 studies, version 09_16) as derived from the national bias adjustment calculator³.

8.1.3 Discussion of Choice of Factor to Use

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The

³ National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 09_16

Defra Technical Guidance LAQM.TG(09) provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

With regard to the application of a bias adjustment factor for diffusion tubes, the Defra Technical Guidance LAQM.TG(09) and the LAQM Helpdesk⁴ recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites.

The local bias adjustment factor for the Ballymena diffusion tubes is 1.13. The colocated triplicate monitoring site at Ballymena North Road had a good data capture in 2015 (97% diffusion tubes, 97% automatic monitor) with a good precision recorded for all but one period. It was decided, in line with the 2015 Annual Progress Report that the local bias adjustment factor be applied to the 2015 diffusion tube concentrations. For comparison, the national bias adjustment factor for the laboratory for 2015 was 0.87 based on 30 studies, taken from the National Bias Adjustment Spreadsheet.

The national bias adjustment factors of 0.87 and 0.79 derived from the National Bias Adjustment Spreadsheet have been used to adjust the diffusion tube concentrations recorded in Carrickfergus and Larne. A national bias factor has been used due there not being a co-located study in operation in either of these locations, this is in line with previous LAQM reports from both Boroughs. The calculated bias factors were based on 30 (Gradko) and 29 (ESG Didcot) studies respectively.

For previous years data presented (2008 – 2014), the bias adjustment factors have been taken from the three previous Councils LAQM reports.

⁴ Laqm.defra.gov.uk

8.1.4 PM Monitoring Adjustment

A Tapered Element Oscillating Microbalance (TEOM) fitted with an Filter Dynamics Measurement System (FDMS) is in operation at the Ballymena Ballykeel monitoring location to record PM_{10} concentration. The FDMS monitor meets the equivalence criteria for PM_{10} monitoring therefore the data does not need to be adjusted.

8.1.5 Short-term to Long-term Data Adjustment

Data capture at all of the diffusion tube monitoring locations within Mid and East Antrim Borough Council was greater than 75% in 2015, therefore annualisation of any of the results was not required.

8.1.6 QA/QC of Automatic Monitoring

Formal Quality Assurance/Quality Control (QA/QC) data management duties are currently provided by Ricardo Energy & Environment at both Ballymena Ballykeel and Ballymena North Road to ensure reliability and accuracy of the concentrations recorded. Audits of all the automatic analysers at the monitoring sites are completed on a six monthly basis.

The maintenance and any urgent call outs of both monitoring sites are completed by Environmental Monitoring Systems Ltd (EMS) who have a 24-hour response time to any urgent call outs.

Calibrations and minor maintenance of the automatic monitors is completed by an air quality management officer from Mid and East Antrim Borough Council acting as the Local Site Operator (LSO), these duties are completed on a fortnightly basis.

8.1.7 QA/QC of Diffusion Tube Monitoring

Gradko International Ltd and ESG Didcot are UKAS accredited laboratories and both participate in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO₂ concentrations reported are of a high calibre.

Appendix B: Diffusion Tube Monitoring Data

Table 8-2 Monthly NO2 Concentrations – Mid and East Antrim Borough Council Diffusion Tube Sites (2015)

														Data	Average
														Capture	Concentratio
Site ID						NO2 (Concentra	ations (µg	;/m3)					Periods	n (μg/m3)
	Site Address	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Ballymena															
BDT1	Leighinmohr Ave	14.81	13.63	11.72	9.64	6.67	6.19	6.67	8.67	11.2	17.53	9.64	14.65	12	10.92
BDT2	Galgorm Road	52.66	44.48	32.48	28.01	24.13	28.14	27.06	28.04	31.46	39.21	28.01	38.52	12	33.52
BDT3	Main St, Cullybackey	24.23	27.38	25.79	23.6	22.47	19.21	19.05	19.92	25.2	35.03	23.6	23.37	12	24.07
BDT4	Cullybackey Road	31.11	32.36	28.85	26.41	20.85	23.39	24.6	26.05	29.09	38.4	26.41	33.72	12	28.44
BDT5	Larne St	27.45	31.1	26.01	22.83	19.61	21.6	21	26.53	24.72	33.03	22.83	30.36	12	25.59
BDT6	Ballyloughan Ave	12.57	13.89	11.57	8.69	6.38	4.59	6.14	8.48	9.45	15.66	8.69	14.45	12	10.05
BDT7	George St	57.95	54.44	41.22	46.69	34.01	42.93	36.73	44.08	48.11	50.6	46.69	43.62	12	45.59
BDT8	Wellington St	28.58	30.22	24.64	25.44	18.59	19.96	20.72	23.87	21.04	29.53	25.44	28	12	24.67
BDT9	Ballymoney	31.18	31.11	26.6	24.07	19.87	21.37	21.06	24.77	24.56	30.51	24.07	28.33	12	25.63
BDT10	Parkway	32.76	35.29	28.71	28.41	22.06	21.27	23.21	28.1	29.7	37.14	28.41	33.2	12	29.02
BDT11	Lisnevenagh Rd	25.65	29.73	25.74	21.45	15.48	19.49	22.13	30.76	29.78	40.45	21.45	29.17	12	25.94
BDT12	Queen St	40.61	35.85	27.81	30.17	26.65	26.37	27.33	31.47	31.52	35.24	30.17	27.83	12	30.92
BDT13	North Road	31.54	33.09	25.99	26.03	20.77	21.6	22.95	26.84	28.82	32.11	26.03	32.89	12	27.39
BDT14	North Road	31.51	35.34	31.32	26.07	21.37	23.42	24.61	28.51	28.46	41.22	26.07	29.75	12	28.97
BDT14B	North Road	60.22	68	40.98	26.66	19.82	48.74	47.79	27.05	51.37	67.54	26.66	17.65	12	41.87
BDT15	Linenhall St	34.81	29.57	28.31	45.6	42.31	20.74	22.75	57.52	26.39	37.91	23.8	46.04	12	34.65
BDT16	Bridge St	37.88	40.17	28.55	28.66	23.14	29.61	28.29	29.95	31.49	35.55	28.66	29.35	12	30.94
BDT17	Galgorm Rd	57.75	49.85	40.48	32.78	28.41	33.2	31.97	43.26	36.21	53.72	32.78	37.42	12	39.82
Carrickfergus															
CDT1	27 Upper Road,	-	3.4	19.48	21.29	17.48	9.74	18.06	27.15	21.28	31.44	26.22	14.16	11	19.06

														Data	Average Concontratio
Site ID						NO2	Concentra	ations (ug	/m3)					Periods	n (ug/m3)
	Greenisland								,,,						
CDT2	32 Mullaghmore	10.54	13.09	9.86	9.82	5.9	5.83	6.61	13.4	8.5	12.59	11.3	9.06	12	9.71
	50 Shore Road,														
CDT3	Greenisland	20.52	21.57	19.56	16.7	13.55	12.11	11.26	20.95	18.64	35.37	41.77	31.52	12	21.96
	50 Shore Road,														
CDT4	Greenisland	19.56	21.87	18.29	16.72	12.15	10.58	11.44	12.52	17.93	43.48	27.88	23.33	12	19.65
	186 Shore Road,		26.1												
CDT5	Greenisland	24.54	3	24.93	22.55	18.17	8.9	-	19.63	11.75	42.14	29.73	21.62	11	22.74
	93 Belfast Road,		26.4												
CDT6	Carrickfergus	25.7	5	24.88	27.37	20.41	22.9	25.95	23.46	22.28	33.3	24.76	15.41	12	24.41
	Model PS Belfast		28.6												
CDT7	Road, Carrickfergus	37.33	2	36.76	33.28	-	24.82	25.51	27.56	27.03	40.4	31.98	15.8	11	29.92
	Model PS Belfast		31.9												
CDT8	Road, Carrickfergus	30.7	5	35.64	33.2	-	22.47	26.03	14.03	30.57	39.1	27.67	21.89	11	28.48
	Minorca Place/ Tesco														
CDTO	Junction,	20.00	27.1	27 72		24.62	22.40	10 75	14.05	22.22	22.00	26.04	0 70	10	22.20
CD19	Carrickgtergus	29.98	1	27.72	26.54	21.63	22.19	19.75	14.95	22.22	32.68	26.84	8.73	12	23.36
CDT10	42 Albert Road	26.9	26.0	7 2 4	24.00	10 72	16 73	17.02	7 0 7	20.46	20.05	21	14.00	10	20 59
CDT10	Carricklergus	26.8	26.9	23.4	24.09	18.72	16.72	17.93	7.97	20.46	28.85	21	14.06	12	20.58
			10.6												
CDT11	Carrickforgus	1/ 00	19.0	15 26	15	10.04	0 00	10.25	72 27	10.25	15.06	12 20	16 /5	12	11 11
CDIII	Collogo North Pood	14.90	20.6	15.50	15	10.04	5.55	10.25	23.37	10.35	13.00	12.39	10.45	12	14.41
CDT12	Concele North Nodu,	16 35	20.0	20.75	22 79	1/1 15	17.64	15 71	29 97	23.06	27 25	15 13	15 1	12	19.88
CDT12	Victoria Road/Larne	10.55	,	20.75	22.75	14.15	17.04	13.71	25.57	25.00	27.25	15.15	13.1	12	19.00
	Road Junction		28.3												
CDT13	Carrickfergus	30.13	3	24.97	22.89	18.91	21.76	26.22	21.32	27	28.88	27.82	23.04	12	25.11
02.10	Islandmagee Road.	00.10	15.5	,		-0.01				_,	20.00		2010 1		20.11
CDT14	Whitehead	15.21	8	12.86	12.31	9.73	9.44	10	12.11	13.12	16.36	16.22	14.1	12	13.09
Larne							-	-							

													Data	Average
													Capture	Concentratio
Site ID	Site ID NO2 Concentrations (µg/m3)													
LDT1	DT1 Antville Roundabout 19.9 31 26.2 11.2 23.6 23.1 28.2 36.9 43.8 35.4 26.6													27.81
LDT2	Latharna House	16.6	18	19.7	7.9	13.6	19.9	13.3	18.4	23.5	17.7	18.3	11	16.99
LDT3	Main Street	33.1	33	28.1	16	19.9	-	25	39.2	36	33.7	25.4	10	28.94
LDT4	Old Glenarm Road	36.4	44.4	-	7	27.4	15.9	29.4	37.8	41.6	33.2	31.3	10	30.44
	Upper Cairncastle													
LDT5	Road	22.6	26.5	29.1	26.1	18.1	12.4	18.8	33.3	-	21	25.7	10	23.36
LDT6	Harbour Roundabout	15.1	13.1	18.9	10.6	11.1	8.4	11.1	20	26.7	10.4	18.6	11	14.91
LDT7	Castle Terrace	10.1	13.8	13.4	20.8	12.1	8.2	11.6	16.1	19.6	16.2	15	11	14.26
LDT8	Ballylumford	15.3	20.8	14.3	8.4	12.8	-	8.9	15.1	14.8	11.8	14.6	10	13.68