



## 2009 Air Quality Updating and Screening Assessment for Limavady Borough Council

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

September 2009

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## Executive Summary

This report comprises the Update and Screening Assessment for the Limavady Borough Council area, providing a review and assessment of new monitoring data and potential new sources of pollutants within the area.

There have been no new or significantly changed sources of pollutants identified which may cause potential exceedences of the Air Quality Strategy standards within the Local Authority, with the exception of road transport.

This assessment has highlighted that a detailed assessment is required with regard to NO<sub>2</sub> derived from road transport at three locations where residential properties are close to the kerb:

- Main Street, Ballykelly;
- Linenhall Street, Limavady; and
- Irish Green Street, Limavady

It is proposed that initially passive diffusion tubes will be located at these sites for a minimum of six months, in worst case locations of relevant exposure. Depending upon the pollutant concentrations recorded, it may be necessary to proceed further, with detailed modelling.

Monitoring of PM<sub>10</sub>, SO<sub>2</sub> and other pollutants has shown no exceedences of the Air Quality Strategy standards, and further assessment is subsequently not required for these pollutants. The assessment does not identify any other pollutant source of concern.

## Table of contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
1.1	Description of Local Authority Area	6
1.2	Purpose of Report	7
1.3	Air Quality Objectives	7
1.4	Summary of Previous Review and Assessments	8
<b>2</b>	<b>New Monitoring Data</b>	<b>10</b>
2.1	Summary of Monitoring Undertaken	10
2.2	Comparison of Monitoring Results with AQ Objectives	11
<b>3</b>	<b>Road Traffic Sources</b>	<b>13</b>
3.1	Narrow congested streets with residential properties close to the kerb	13
3.2	Busy streets where people may spend 1-hour or more close to traffic	13
3.3	Roads with high flow of buses and/or HGVs.	13
3.4	Junctions and busy roads	13
3.5	New roads constructed or proposed since the last round of review and assessment	14
3.6	All roads with significantly changed traffic flows.	14
3.7	Bus and coach stations	14
<b>4</b>	<b>Other Transport Sources</b>	<b>15</b>
4.1	Airports	15
4.2	Railways (diesel and steam trains)	15
4.3	Ports (shipping)	16
<b>5</b>	<b>Industrial Sources</b>	<b>17</b>
5.1	New or Proposed Industrial Installations	17
5.2	Major fuel (petrol) storage depots	17
5.3	Petrol stations	17
5.4	Poultry farms	18
<b>6</b>	<b>Commercial and Domestic Sources</b>	<b>19</b>
6.1	Biomass combustion – Individual Installations	19
6.2	Biomass combustion – Combined Impacts	19
6.3	Domestic Solid-Fuel Burning	19
<b>7</b>	<b>Fugitive or Uncontrolled Sources</b>	<b>20</b>
<b>8</b>	<b>Conclusions and Proposed Actions</b>	<b>21</b>
8.1	Conclusions from New Monitoring Data	21
8.2	Conclusions from Assessment of Sources	21
8.3	Proposed Actions	21

**Appendices**

Appendix 1 [QA/QC:DATA](#)

Appendix 2 [DMRB ASSESSMENT](#)

Appendix 3 [MONITORING DATA](#)

# 1 Introduction

## 1.1 Description of Local Authority Area

### Profile of Limavady Borough

The Borough of Limavady is situated in the north-west of the Province. The map below shows its location in relation to the rest of the Province. It covers an area of approximately 239 square miles and has a resident population of almost 32,000 people. The main centre of population within the Borough is Limavady town itself. Its population is in the region of 13,000 and is mainly residential in character with a small commercial base. Limavady was previously a market town but in recent years has developed into a commuter base for residents working in the neighbouring towns of Coleraine and Londonderry. Outside Limavady town are the smaller communities of Dungiven, Ballykelly, Greysteel, Bellarena and Drumsurn. These smaller areas predominately rely on agriculture as a source of revenue. Limavady Borough Council is bounded to the west by Derry City Council, one of the largest authorities in Northern Ireland, Coleraine Borough Council to the east and Magherafelt District Council to the south.



## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management 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.

## 1.3 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  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  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 Local Air Quality Management in Northern Ireland.**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM <sub>10</sub> ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## **1.4 Summary of previous Review and Assessments**

### **Stage 1 Review and Assessment**

In 1998 Limavady Borough Council completed stage 1 of its Review and Assessment. This desktop exercise evaluated the position with regard to air quality within the Borough and established if there were any areas where pollutant levels required further investigation. In line with the technical guidance at that time it was determined that further investigation of nitrogen dioxide, sulphur dioxide and particulate matter was required.

### **Stage 2 Review and Assessment**

#### **Modelling**

##### Nitrogen dioxide (NO<sub>2</sub>)

Traffic emissions were identified as a source of nitrogen dioxide within the Borough. Several roadways were seen as possible areas where the national air quality objectives for nitrogen dioxide could be exceeded. Council employed consultants to carry out DMRB modelling to determine if exceedences of the national air quality objectives existed. The modelling indicated that no exceedences were likely in the vicinity of several of these roads where relevant exposure was of concern.

##### Sulphur dioxide (SO<sub>2</sub>) and Particulate matter (PM<sub>10</sub>)

The desktop exercise indicated that there was the possibility of sulphur dioxide and particulate matter objectives being exceeded in several housing developments where solid/smokeless fuel was being burnt. Council commissioned a fuel use survey within three residential areas within Limavady town and Dungiven. The information gleaned from this survey was then used to model emissions and determine if the areas concerned were experiencing problems with pollution. The modelling determined that none of the areas surveyed were affected by elevated levels of sulphur dioxide or particulate matter. This modelling was carried out in accordance with the technical guidance available at that time. The guidance required assessment of pollutant levels within a 1km x 1km area. It was felt that if less than 100 dwellings within this area were burning solid/smokeless fuel then there was unlikely to be exceedences of the national air quality objectives. This guidance was then changed and Councils were again required to reassess the situation. The revised guidance required Councils to look at 500m x500m square areas and determine if there were more than 50 properties within the square using solid/smokeless fuel as a source of fuel. On reassessing the situation it was determined that pollutant levels within Dungiven and one of the areas within Limavady were satisfactory and were below the thresholds for both pollutants. There was a suggestion however that PM<sub>10</sub> levels within the remaining area in Limavady were high and that further investigation was required.

#### **Monitoring**

##### Nitrogen Dioxide

As no monitoring of nitrogen dioxide had been undertaken within the Borough passive diffusion tubes were erected at various locations within the Borough. They were located along several of the main arteriole routes within the Borough where housing/relevant exposure was in close proximity to the kerbside. Areas monitored included Greysteel, Ballykelly, Limavady & Dungiven. The monitoring indicated two areas of concern:

##### Linenhall Street, Limavady

At the time all traffic using the A2 (Londonderry to Limavady) to access the A37(Limavady to Coleraine) road came through Linenhall Street. In addition local traffic used this road to access other parts of the town centre. At the time traffic volumes would have been in the region of 13000 vehicles per day. Housing in this street is within 1 metre of the kerbside. Relevant exposure was probable.

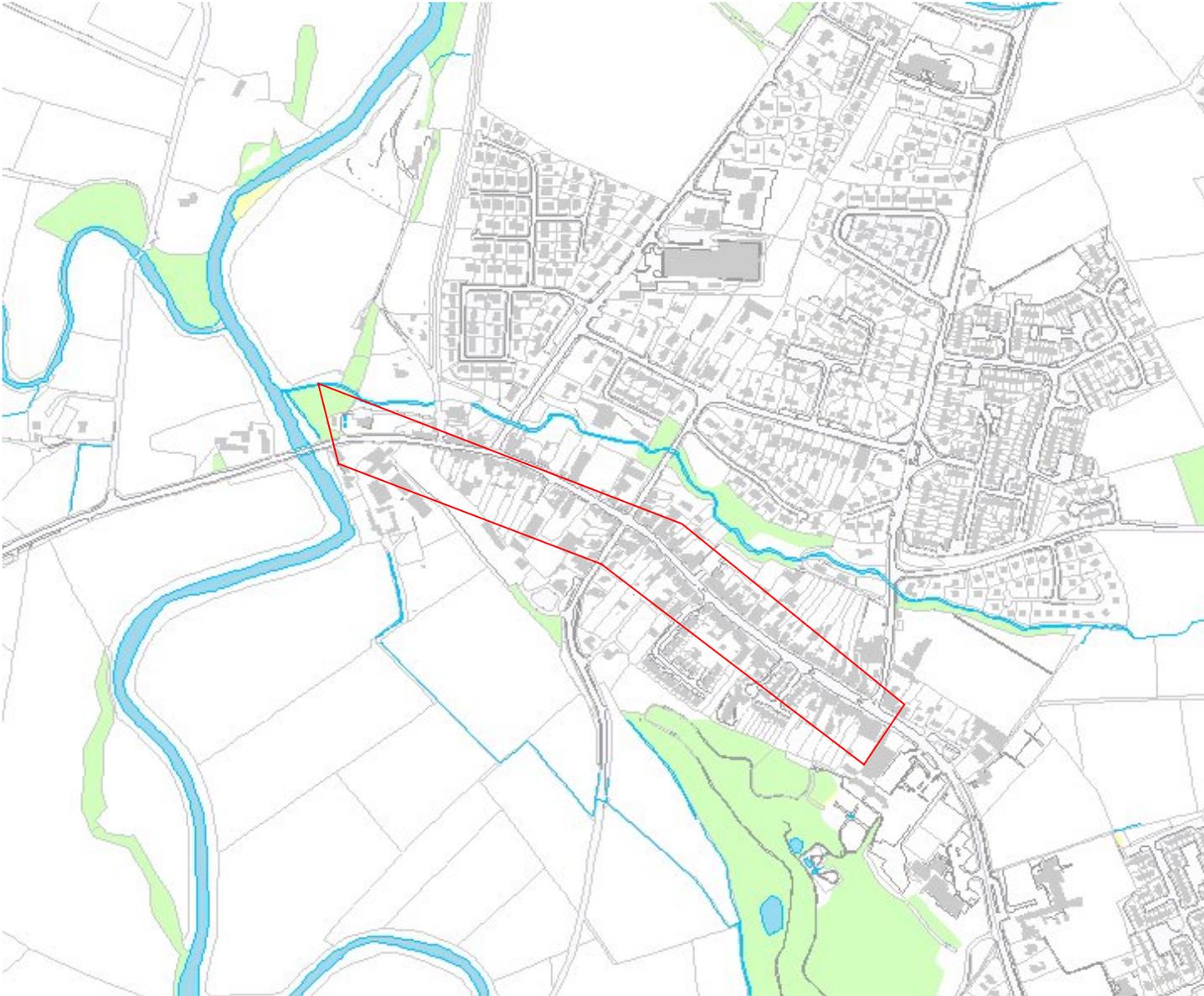
##### Main Street, Dungiven

Passive monitoring indicated levels in excess of the annual mean concentration of 40ugm<sup>-3</sup>. The volume of traffic along this road which forms part of the main A6 road from Londonderry to Belfast was estimated at 13500 vehicles per day and housing again was, in places, within 1m of the kerbside.

The problem in Linenhall Street, Limavady was dramatically improved by the construction of the Limavady bypass which opened in June 2004. Traffic volumes have reduced significantly and now it is mostly local traffic which accesses this street.

The elevated levels in Main Street Dungiven led to it being declared an Air Quality Management Area (AQMA) in 2006. The AQMA, shown below, initially covered the area from the Roe Bridge to 89/102 Main Street Dungiven. This has since been extended to include the area from the Roe Bridge to the Main Street/ Garvagh Road junction.

Map illustrating AQMA, Main Street, Dungiven



## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

No automated monitoring undertaken at present

#### 2.1.2 Non-Automatic Monitoring

Since the declaration of the AQMA in Dungiven passive monitoring has continued at several locations within the AQMA. The locations chosen included duplicate tubes at 15 locations along Main Street and one background location at New Street. This is the only area within the borough where monitoring is carried out and nitrogen dioxide is the only pollutant measured

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
A	roadside	268650 409566	NO <sub>2</sub>	Y	Y (1m)	1m	Y
B	roadside	268707 409545	NO <sub>2</sub>	Y	Y (1m)	1m	Y
C	roadside	268717 409555	NO <sub>2</sub>	Y	Y (1m)	1m	Y
D	roadside	268854 409485	NO <sub>2</sub>	Y	Y (1m)	1m	Y
E	roadside	268889 409464	NO <sub>2</sub>	Y	Y (1m)	1m	Y
F	roadside	268901 409474	NO <sub>2</sub>	Y	Y (1m)	1m	Y
G	roadside	268939 409432	NO <sub>2</sub>	Y	Y (1m)	1m	Y
H	roadside	268737 409541	NO <sub>2</sub>	Y	Y (1m)	1m	Y
I	roadside	268761 409547	NO <sub>2</sub>	Y	Y (1m)	1m	Y
J	background	268944 409372	NO <sub>2</sub>	N	N	-	-
K	roadside	268992 409372	NO <sub>2</sub>	Y	Y (1m)	1.5m	Y
L	roadside	269087 409292	NO <sub>2</sub>	Y	Y (1m)	1.5m	Y
M	roadside	269142 409272	NO <sub>2</sub>	Y	Y (1m)	1.5m	Y
N	roadside	269048 409342	NO <sub>2</sub>	Y	Y (1m)	1m	Y
O	roadside	269009 409380	NO <sub>2</sub>	Y	Y (1m)	1m	Y

The diffusion tubes are supplied by Envirotechnology plc. They are Gradko tubes and the preparation method is 20%TEA in water. The laboratory which Envirotechnology use for analysis is NAMAS accredited and complies with the requirements of WASP. With regard to the precision of these tubes they have consistently performed well. In the first two years of use the bias adjustment factors were 0.98(2006) and 0.89(2007). For 2008 the bias adjustment factor is 0.9. These figures have been obtained from the Review and Assessment website.

## 2.2 Comparison of Monitoring Results with AQ Objectives

Passive diffusion monitoring has been carried out within Main Street Dungiven to gauge nitrogen dioxide levels. The volume of traffic passing along this street and the proximity of dwellings to the kerbside indicated possible exceedence of the annual mean objective of  $40\mu\text{g}/\text{m}^3$ . The tables in appendix 3 indicate the results obtained from this monitoring from January 2006 till December 2008

### 2.2.1 Nitrogen Dioxide

All site concentrations with the exception of New Street (background site) are above the annual mean objective level for  $\text{NO}_2$  of  $40\mu\text{g}/\text{m}^3$ . We are unable to tell at present if the hourly mean is being exceeded but with the installation of a continuous monitor in progress this will give Council an insight into the number of exceedences of the hourly mean objective level

#### Automatic Monitoring Data

No automated monitoring is carried out within Limavady Borough Council at present.

#### Diffusion Tube Monitoring Data

As indicated duplicate tubes were located within the AQMA in Dungiven Main Street. Whilst these 14 locations were monitored the annual average concentrations from 12 sites have been calculated and shown in Table 2.4a. (On several occasions during the year tubes at locations N and O were found to be missing)

**Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes**

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations
				2008 ( $\mu\text{g}/\text{m}^3$ ) Adjusted for bias (x0.9)
A	Main Street Dungiven	Yes	83	<b>49.65</b>
B	Main Street Dungiven	Yes	83	<b>59.93</b>
C	Main Street Dungiven	Yes	83	<b>54.86</b>
D	Main Street Dungiven	Yes	83	<b>46.50</b>
E	Main Street Dungiven	Yes	75	<b>48.97</b>
F	Main Street Dungiven	Yes	83	38.98
G	Main Street Dungiven	Yes	83	<b>44.04</b>
H	Main Street Dungiven	Yes	83	<b>51.47</b>
I	Main Street Dungiven	Yes	75	<b>48.07</b>
J	New Street Dungiven	Yes	83	21.44 (background)
K	Main Street Dungiven	Yes	83	37.99
L	Main Street Dungiven	Yes	83	<b>47.87</b>
M	Main Street Dungiven	Yes	75	23.74

**Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes**

Site ID	Location	Within AQMA?	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ ) Adjusted for bias		
			2006 *	2007 *	2008
A	Main Street Dungiven	Yes	49.54	48.13	49.65
B	Main Street Dungiven	Yes	52.36	49.50	59.93
C	Main Street Dungiven	Yes	54.79	59.65	54.86
D	Main Street Dungiven	Yes	47.49	45.87	46.50
E	Main Street Dungiven	Yes	48.95	49.66	48.97
F	Main Street Dungiven	Yes	43.37	47.08	38.98
G	Main Street Dungiven	Yes	46.16	40.79	44.04
H	Main Street Dungiven	Yes	53.58	50.44	51.47
I	Main Street Dungiven	Yes	54.31	40.77	48.07
J	New Street Dungiven	Yes	23.43	20.43	21.44
K	Main Street Dungiven	Yes			37.99
L	Main Street Dungiven	Yes			47.87
M	Main Street Dungiven	Yes			23.74

Over the past three years levels of nitrogen dioxide have remained high within the AQMA. There have been slight dips at some tube locations and levels have increased at others. Levels however at most sites are consistently in excess of the annual mean threshold of  $40\mu\text{g}/\text{m}^3$ . Location J represents a background monitoring location outside of the AQMA boundary. Background levels are consistent at location 'J'.

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

No automated PM<sub>10</sub> monitoring is undertaken within the Borough

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

No automated monitoring of sulphur dioxide is carried out within the Borough

### **2.2.4 Benzene**

No automated monitoring of benzene is carried out within the Borough

### **2.2.5 Other pollutants monitored**

No other pollutant levels are monitored within the Borough

### **3 Road Traffic Sources**

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

The revised technical guidance indicates that streets which are congested and narrow may require detailed assessment if they are used by 5000 vehicles per day. The guidance indicates that assessment may be required where traffic is slow moving (15mph), there is stop/start driving and streets are narrow with buildings are on either side of the road within 2m of the kerb. Within the Borough 5-minute midday counts have been carried out at Linenhall Street & Irish Green Street, Limavady, Main Street, Ballykelly and Clooney Road, Greysteel. Counts at Linenhall Street, Irish Green Street and Main Street Ballykelly all indicated that traffic volumes were in excess of the 5000 vehicle per day parameter.

Limavady Borough Council has identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, not adequately considered in previous rounds of Review and Assessment, and will need to proceed to a Detailed Assessment.

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

The technical guidance indicates that consideration should be given to busy streets where there are many shops, outdoor cafes, bars etc where persons are likely to be exposed within 5m of the kerb for 1-hour or more. 'Busy streets are those where there are 10000 or more vehicles per day. Consideration should be given to the traffic flow, the vehicle speed and the percentage of vehicle types. No such areas have been identified within Limavady Borough.

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

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

The Technical Guidance indicates that consideration should be given to roads where the traffic flows are less than 20000 vehicles per day and there is an unusually high percentage of HGV and/or buses. An unusually high proportion is considered to be in the region of 20%. Roads with relevant exposure within 10m should be considered.

Traffic and Travel data (2007) indicates that there are no roads within Limavady Borough which convey 20000 vehicles per day and have an unusually high percentage of HGV's. The largest percentage of HGV's was recorded on the A6 to the west of Dungiven. The percentage here was 10.9%

Limavady Borough Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

#### **3.4 Junctions**

Pollutant concentrations are usually higher close to junctions where the combined impact of traffic emissions from two roads and/or the elevated emissions due to stopping and starting. The technical guidance suggests identifying busy junctions and determining if they are new or have been previously assessed. A 'busy' junction is defined as one which experiences 10000 vehicles per day or more.

Relevant exposure is deemed to be within 10m of the kerb. Information such as traffic speed, %HDV's including HGV'S and buses.

Limavady Borough Council confirms that there are no new/newly identified busy junctions/busy roads.

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

#### Nitrogen dioxide and particulate matter

The technical guidance suggests examining those roads which have been constructed since the last assessment. Within Limavady Borough no new roads have been constructed where relevant exposure is within 10m and the road conveys more than 10000 vehicles per day

Limavady Borough Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

This assessment looks at the impact of traffic flows on nitrogen dioxide and particulate matter levels. The technical guidance requires consideration of roads with significant changes in flow. The guidance indicates roads where the volume of traffic is in excess of 10000 vehicles per day where volumes have increased by 25 %. From the traffic data available for 2007 there are no roads within the borough where volumes have increased by 25 %

Limavady Borough Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

Consideration of bus stations is required where the station or sections of it are not enclosed and where there is relevant exposure. The annual mean and hourly mean should only be considered where relevant exposure is within 10m and the number of bus movements exceeds 2500 per day. Whilst there are two bus stations within Limavady Borough there would not be anywhere near that number of movements per day. The stations are small and not close to relevant locations.

Limavady Borough Council confirms that there are no relevant bus stations in the District.

## 4 Other Transport Sources

### 4.1 Airports

The technical guidance indicates that airports should be considered where there is relevant exposure within 1000m of the airport. Consideration should also be given to the annual throughput of passengers and the tonnes of freight which pass through the port. The equivalent passenger numbers in millions of passengers per year should be calculated and where totals exceed 10 million passengers per year and the background NO<sub>x</sub> concentrations exceed 25µg<sup>-3</sup> detailed assessment is required.

Derry City Airport is close to the western boundary of Limavady Borough and in fact part of the runway extends into the Borough. However the airport does not have excessive numbers of passengers and in no way comes close to the 10mppa required to suggest exceedence. The airports official website statistics indicate that in 2008, 441959 passengers used the airport. The background NO<sub>x</sub> concentration as per the archive maps (2006) is less than 10µg<sup>-3</sup>. Projected concentrations for 2020 will be less than 8µg<sup>-3</sup>.

Limavady Borough Council confirms that there are no airports in the District.

### 4.2 Railways (Diesel and Steam Trains)

The technical guidance suggests that stationary and moving trains should be considered with regard to sulphur dioxide (stationary) and nitrogen dioxide (moving).

#### 4.2.1 Stationary Trains

Sulphur dioxide emissions may require assessment where trains are stationary for 15 minutes or more and there is the potential for regular outdoor exposure of individuals within 15m of these stationary locomotives. The guidance suggests that where there are more than three occasions per day when trains are stationary for more than 15 minutes then a detailed assessment should be carried out.

Whilst the Londonderry to Belfast train line runs through the northern boundary of Limavady Borough there are no stations other than a request halt at Bellarena. All trains stop at this halt but those that do only stop briefly to allow passengers to embark/disembark. There are 16 return journeys between Londonderry and Belfast Monday – Saturday with an additional 8 return journeys on Sunday. All of these stop at Bellarena but only for a short time (less than 5 minutes).

Limavady 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.

#### 4.2.2 Moving Trains

Table 5.1 within the Technical guidance lists those rail lines with substantial numbers of diesel passenger trains per day. None of those listed are in Northern Ireland.

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

### **4.3 Ports (Shipping)**

The technical guidance implies that ports may be a source of sulphur dioxide. Consideration should be given to whether or not relevant exposure exists within 200m of berths and main areas within the port and 1km of areas where ships manoeuvre. It suggests that a detailed assessment will be required where there are 5000-15000 movements per year within 250m of a relevant location and 15000 movements or more within 1km of manoeuvring areas. Whilst Limavady Borough Council has a northern coastline there are no ports within the Borough. The nearest port to the borough boundary is Lisahally Port, Londonderry. This port is over 4 miles from the boundary.

Limavady Borough Council confirms that there are no ports or shipping that meets the specified criteria within the Local Authority area.

## **5 Industrial Sources**

### **5.1 Industrial Installations**

The technical guidance indicates that all pollutants should be assessed but particular attention should be paid to sulphur dioxide, nitrogen dioxide particulate matter and benzene

#### **5.1.1 New or Proposed Installations for which an Air Quality Assessment has been carried out**

Limavady Borough Council is consulted in the planning application process. The council are not aware of any new or proposed installations which will impact on air quality.

Limavady 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.

#### **5.1.2 Existing Installations where Emissions have increased substantially or New Relevant Exposure has been introduced**

The technical guidance suggests that Councils should consider those installations where emissions have significantly increased or where there is new relevant exposure. 'Substantial' increase is defined as an increase of 30% or more.

Limavady 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.

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

Limavady 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.

### **5.2 Major Fuel (Petrol) Storage Depots**

The guidance suggests that major fuels depots could lead to exceedences of the 2010 national air quality objective for benzene especially where they are close to busy roads. There are no major fuel (petrol) storage depots within Limavady Borough.

There are no major fuel (petrol) storage depots within the Limavady Borough Council area.

### **5.3 Petrol Stations**

The guidance states that consideration must be given to those petrol stations which have an annual throughput in excess of 2000m<sup>3</sup> (2M litres/year) and which are close to busy roads. A 'busy road' is defined as one which is used by 30000 vehicles per day or more and a 'petrol station' which requires consideration is one with Stage 2 Petrol Vapour recovery installed. It should be considered if there is

relevant exposure within 10m. Consideration must be given where accommodation is provided above any garage.

Limavady Borough Council confirms that there are no petrol stations meeting the specified criteria.

## **5.4 Poultry Farms**

There is some evidence to suggest that poultry farms can give rise to elevated levels of PM<sub>10</sub> and may give rise to exceedences of the air quality objectives. Consideration is required where there are any of the following:

- Farms housing more than 400,000 birds where sheds are mechanically ventilated
- Farms housing 200,000 birds if naturally ventilated
- Turkey units with 100,000 birds or more

Relevant exposure to these units should be considered if properties are within 100m. This should include any residential properties which are connected to the farm.

Whilst there are poultry units within Limavady Borough there are none which would house the above numbers of birds.

Limavady Borough Council confirms that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass Combustion – Individual Installations**

Biomass burning may increase PM<sub>10</sub> and NO<sub>2</sub> levels. Councils are required to identify all plant burning biomass in 50kW to 20MW units. Councils should have lists of such equipment

Limavady Borough Council confirms that there are no biomass combustion plants in the District.

### **6.2 Biomass Combustion – Combined Impacts**

The technical guidance states that there may be the potential that many small combustion units including domestic solid fuel burners may attribute to elevated levels of pollutants. Whilst acceptable individually they could in combination lead to unacceptably high PM<sub>10</sub> levels in areas where PM<sub>10</sub> levels are close to or above the national air quality objective.

Councils are required to identify 500mx500m grid squares where housing densities are highest and there are service sector biomass combustion appliances. To quantify the impact of domestic appliances within the grid square each type of appliance should be identified. Once identified calculations should be used in conjunction with Table 5.3 within the guidance to determine the annual domestic emission level for each grid square.

With regard to those units in the service sector the floorspace occupied within each grid square for each of solid fuel burning plants identified. Again the annual service sector emission level per hectare should be calculated and this along with the domestic emission level will indicate the total emission level within the grid square.

Estimations of the fraction of space within the grid square occupied by solid fuel burning premises can then be used to determine the emission density for each grid square (kg emissions/500x500m square).

If the source exceeds the threshold as set out nomogram Fig 5.22 detailed assessment is required.

Having considered the information which this department and Building Control retain Limavady Borough Council do not foresee that emissions from biomass combustion will be excessive.

Limavady Borough Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **6.3 Domestic Solid-Fuel Burning**

Limavady Borough Council commissioned a fuel use survey in the three highest density housing areas with the Borough. This report indicated that sulphur dioxide levels were well within the national air quality objective levels. The areas selected were well established estates and many would have been in the control of the Northern Ireland Housing Executive. No additional housing has been built in these areas since the survey was commissioned and

Building Control has no record of major adaptations having been made which would change the fuel use profile of these areas.

Limavady Borough Council has assessed areas of significant domestic solid fuel use, and concluded that it will not be necessary to proceed to a Detailed Assessment for sulphur dioxide.

## 7 Fugitive or Uncontrolled Sources

### Particulate matter (PM<sub>10</sub>)

Dust emissions can give rise to elevated levels of PM<sub>10</sub>. These emissions may arise from operations such as quarries, landfills, coal and material stockpiles, major construction works and waste management sites. Consideration should be given to any air quality studies which have been carried out with regard to such operations and if there is relevant exposure. The distance of any receptor should be assessed from source as opposed to the site boundary.

To determine accurately the impact such activities would have on PM<sub>10</sub> emissions local authorities should assess any existing air quality assessments carried out in relation to specific sites and determine if exposure falls under the definition of 'near'. 'Near' is defined in relation to local background PM<sub>10</sub> concentrations. For the 2004 National air quality objective level 'near' is defined as

- 1000m if [background] > 28ugm<sup>-3</sup>
- 400m if [background] > 26ugm<sup>-3</sup>
- 200m for any [ background]

These distances are from source which may not always coincide with the site boundary.

If the relevant exposure is within 50m of an off-site road used to access the site and there are visible deposits on the road then these sections of road which may extend up to 1000m from the site entrance are considered as 'near' as long as the background concentration is above 25 ug m<sup>-3</sup> for the 2004 objective levels.

History of complaint regarding dust and visual inspection of emissions and evidence of dust being carried out onto roadways from such sites should be considered.

If there is relevant exposure and if there is either a history of complaint and/or visual emissions detailed assessment is required.

Within Limavady Borough there are several quarries but they are in remote locations and there would be no relevant exposure in the vicinity. These would have been assessed in previous rounds. Council's landfill site is now closed and there are no privately operated landfills in the Borough. There are no coal or material stockpiles within the Borough and no major construction sites. Council are not aware of any new proposals for these types of development within the borough for which planning approval has been granted

Limavady Borough Council confirms that there are no potential sources of fugitive particulate matter emissions in the District.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

Monitoring has indicated that exceedences of the nitrogen dioxide annual mean objective level are still occurring within the AQMA in Dungiven. Levels have largely remained well above the limit of  $40\mu\text{g}\text{m}^{-3}$ . No monitoring is currently carried out outside of the AQMA.

### **8.2 Conclusions from Assessment of Sources**

Previous passive monitoring within the borough (with the exception of Main Street, Dungiven) had indicated that nitrogen dioxide levels were satisfactory and no monitoring has been carried out in these areas since early 2000. In light however of the revised technical guidance and the possibility that exceedences may arise in areas where there is relevant exposure within 10m of the kerb it is felt that additional monitoring will be required at three locations, namely

- Linenhall Street, Limavady
- Irish Green Street, Limavady
- Main Street, Ballykelly

It is proposed that this monitoring will be carried out for at least six months at these three locations. In view of the results obtained a decision will then be made as to whether more detailed modelling is required or where necessary AQMA's declared.

### **8.3 Proposed Actions**

This USA has identified the need for:

- Continued  $\text{NO}_2$  monitoring within the existing AQMA in Main Street Dungiven. No changes are required at present with regard to the extent of the AQMA boundary.
- Passive  $\text{NO}_2$  monitoring at three locations outside the AQMA namely Linenhall Street & Irish Green Street Limavady and Main Street, Ballykelly

In 2010 a progress report will be submitted but in the meantime further assessment is required within the existing AQMA.

## **9           References**

AEA Energy & Environment (2008) Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for Laboratories and Users, AEA/ENV/R/2504 – Issue 1a

AEA Energy & Environment (2009) Technical Guidance: Screening Assessment for Biomass Boilers.

Air Quality Archive (<http://www.airquality.co.uk/archive/index.php>)

Defra (2009) Local Air Quality Management, Technical Guidance LAQM.TG (09)

## **Appendices**

**Appendix 1: QA/QC Data**

**Appendix 2: DMRB Calculations**

**Appendix 3: Monitoring data**

## Appendix 1: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

The nitrogen dioxide diffusion tubes which Limavady Borough Council uses are manufactured by Gradko, supplied by Envirotechnology plc and analysed by Gradko. The preparation method is 20% TEA in water and all figures shown in the tables in Appendix 3 have been adjusted in accordance with the University of West England guidance. The bias adjustment factors are stated below.

YEAR	BIAS ADJUSTMENT FACTOR
2006	0.98
2007	0.89
2008	0.90

### QA/QC of diffusion tube monitoring

The diffusion tubes used are listed in the University of West England website as having 'good precision' and over the three years for which data is provided they have been consistently 'good'. The Envirotechnology Plc laboratory participates in the field inter-comparison scheme and the Workplace Analysis Scheme for Proficiency (WASP) programme

## Appendix 2: DMRB Calculations

All receptors			Pollutant concentrations at receptor						
Receptor number	Name	Year	CO *	Benzene	1,3-butadiene	NO <sub>x</sub>	NO <sub>2</sub> *	PM <sub>10</sub>	
			Annual mean mg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Days >50µg/m <sup>3</sup>
1	2 Linenhall Street	2009	0.09	0.08	0.08	20.80	10.58	17.86	1.30
2	38 Linenhall Street	2009	0.09	0.09	0.08	21.91	10.88	17.99	1.40
3	13 Irish Green Street	2009	0.08	0.08	0.07	20.30	10.44	17.77	1.23
4	71 Main Street Ballykelly	2009	0.14	0.14	0.15	36.72	14.55	19.51	2.83

### Verification

Model verification was not possible for the DMRB calculations above as no monitoring of NO<sub>2</sub> or PM<sub>10</sub> is undertaken in the vicinity of the junctions assessed. The results presented are hence unverified.

## Results

Location/ Receptor	Name	Year	Total NO <sub>x</sub> <sup>1</sup>	Rd NO <sub>x</sub> <sup>2</sup>	Adj Rd NO <sub>x</sub> <sup>3</sup>	Adj Total NO <sub>x</sub> <sup>4</sup>	Adj Rd NO <sub>2</sub> <sup>5</sup>	Adj Total NO <sub>2</sub> <sup>6</sup>	PM <sub>10</sub>	
			Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>	Annual mean µg/m <sup>3</sup>
1	2 Linenhall Street, Limavady	2009	20.80	13.9	n/a	n/a	9.87	16.77	-	-
2	38 Linenhall Street, Limavady	2009	21.91	15.01	n/a	n/a	10.35	17.25	-	-
3	13 Irish Green Street, Limavady	2009	20.30	13.4	n/a	n/a	9.64	16.54	-	-
4	71 Main Street, Ballykelly	2009	36.72	29.82	n/a	n/a	16.52	23.42	-	-

<sup>1</sup> Total NO<sub>x</sub> = direct from DMRB local output sheet

<sup>2</sup> Rd NO<sub>x</sub> = Total NO<sub>x</sub> – Background NO<sub>x</sub>

<sup>3</sup> Adj Rd NO<sub>x</sub> = Rd NO<sub>x</sub> x verification factor (state verification factor used)

<sup>4</sup> Adj Total NO<sub>x</sub> = Adj Rd NO<sub>x</sub> + Background NO<sub>x</sub>

<sup>5</sup> Adj Rd NO<sub>2</sub> = from NO<sub>x</sub> to NO<sub>2</sub> calculator (available LAQM Tools)

<sup>6</sup> Adj Total NO<sub>2</sub> = Adj Rd NO<sub>2</sub> + Background NO<sub>2</sub>

# Maps of Locations

Map of Linenhall Street, Limavady



Map of Irish Green Street, Limavady





## Appendix 3: Passive diffusion monitoring

Tables 1,2 & 3 indicate nitrogen dioxide levels within the AQMA in Dungiven in 2006. Table 3 indicate the levels once the figures have been adjusted to reflect the accuracy of the diffusion tubes

Table 1: NO<sub>2</sub> Passive diffusion tube monitoring, Dungiven AQMA 2006

Tube	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
A1	58.35	59.54	51.13	50.67	46.62	39.43	57.70	*	46.93	62.92	52.91	41.74
A2	56.20	52.23	53.52	45.05	43.85	42.66	52.49	*	40.50	54.34	36.71	44.45
B1	68.43	58.43	52.40	45.76	48.76	53.63	20.97	51.11	65.89	56.51	58.62	43.47
B2	65.95	67.14	58.57	38.27	45.94	55.40	21.08	45.96	65.57	64.20	60.98	43.85
C1	64.71	65.69	63.40	43.28	53.27	51.13	56.87	65.75	56.71	64.40	51.18	46.18
C2	59.18	58.32	55.55	37.97	60.67	54.61	49.51	56.06	50.23	64.79	44.56	41.13
D1	59.34	46.92	40.28	41.86	45.60	48.11	46.96	42.25	48.18	54.04	53.34	*
D2	53.56	46.19	42.83	40.80	45.66	50.84	46.75	43.49	48.12	50.19	48.41	48.29
E1	57.11	52.45	47.11	48.45	42.27	43.92	-	45.65	45.58	52.46	50.82	50.09
E2	53.97	40.44	51.52	47.59	45.15	50.56	-	47.30	53.04	46.55	52.39	52.43
F1	-	56.19	48.40	35.03	38.77	37.27	47.48	35.19	39.05	43.83	40.30	37.22
F2	-	57.87	48.05	41.00	43.62	39.55	45.03	49.57	45.80	49.16	39.68	36.27
G1	50.99	47.87	47.81	40.75	35.16	43.29	51.03	36.58	52.98	-	48.58	44.67
G2	63.06	54.41	43.45	40.03	37.98	45.19	46.28	41.01	54.11	-	41.35	49.19
H1	62.65	52.00	51.75	47.59	41.48	53.37	59.06	42.10	56.07	53.65	58.06	55.22
H2	53.72	51.22	51.22	46.52	43.85	57.24	58.43	46.06	58.66	59.07	50.55	54.69
I1	59.76	55.63	56.69	-	-	-	-	-	-	-	45.19	-
I2	*	*	*	*	*	*	*	*	*	*	*	*
J1	32.73	24.19	23.00	21.36	18.68	18.54	23.01	23.50	-	18.24	26.79	24.75
J2	30.08	24.13	22.08	14.28	19.41	19.24	22.23	22.31	-	25.69	25.67	25.01

All figures in µg/m<sup>3</sup>

- missing tube

\* control - not exposed

J1 & J2: background monitoring site, New Street, Dungiven.

\*\* bias as stated in University of West England website [www.uwe.ac.uk/aqm/review/links.html](http://www.uwe.ac.uk/aqm/review/links.html) (overall factor 0.98 (2006 data) Gradko 20%TEA in water).

These monthly results have been averaged and Table 2 shows the annual mean concentrations of NO<sub>2</sub> for each tube

Table 2: Annual mean NO<sub>2</sub> concentrations, Dungiven 2006

Sampling point	Location in Dungiven	Annual mean NO <sub>2</sub> concentration (µg/m <sup>3</sup> )
A1	Main Street	51.63
A2	Main Street	47.45
B1	Main Street	51.99
B2	Main Street	52.74
C1	Main Street	56.88
C2	Main Street	52.71
D1	Main Street	47.89
D2	Main Street	47.09
E1	Main Street	48.72
E2	Main Street	49.17
F1	Main Street	41.70
F2	Main Street	45.05
G1	Main Street	45.43
G2	Main Street	46.90
H1	Main Street	52.75
H2	Main Street	54.41
I1	Main Street/ Ballyquin Rd junction	54.31
I2	Not exposed	- (control)
J1	New Street	23.16 (background)
J2	New Street	23.71 (background)

As duplicate diffusion tubes were used at each sampling point the results for each site have been averaged and the results are shown in Table 3

**Table 3: Annual mean NO<sub>2</sub> concentration for each site, Dungiven AQMA (2006)**

Site	Location	Annual mean NO <sub>2</sub> concentration (µg/m <sup>3</sup> )
A	Main Street	49.54
B	Main Street	52.36
C	Main Street	54.79
D	Main Street	47.49
E	Main Street	48.95
F	Main Street	43.37
G	Main Street	46.16
H	Main Street	53.58
I	Main Street/ Ballyquin Rd	54.31
J	New Street	23.43 (background)

Table 4 below lists the monitoring results obtained at the sampling sites in Dungiven for the period January to December 2007. The annual mean concentrations have been calculated from these monthly values and are shown in Table 5. Monitoring at sites K-O commenced in May 2007.

Table 4: Nitrogen dioxide monitoring results 2007, AQMA Dungiven

Tube	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
A1	52.40	55.10	49.81	62.75	47.51	60.28	52.89	69.99	51.79	56.94	54.98	50.34
A2	53.92	54.08	50.27	46.98	56.61	60.68	52.54	41.26	61.10	58.13	53.87	43.90
B1	56.66	-	57.77	70.82	48.60	49.90	42.87	51.42	47.99	-	49.38	64.11
B2	54.35	-	59.31	54.83	54.11	61.89	55.26	50.42	56.41	-	50.18	76.21
C1	53.72	60.95	63.92	80.08	61.07	79.33	79.08	83.44	67.36	70.87	63.94	62.55
C2	55.91	48.11	72.69	68.56	64.50	83.27	72.18	70.32	60.21	66.23	64.34	55.72
D1	52.11	53.79	55.15	59.60	50.95	50.50	46.82	46.20	49.32	54.66	51.03	50.93
D2	53.22	52.31	56.50	60.78	50.49	42.19	52.81	45.09	50.65	50.02	52.32	49.76
E1	54.84	58.90	54.33	62.28	61.92	49.95	49.93	49.00	50.90	63.14	57.63	60.10
E2	56.21	60.04	57.41	65.42	56.10	49.24	47.67	50.34	57.04	62.50	56.97	47.42
F1	51.18	55.21	52.53	56.26	42.04	68.85	48.71	52.25	60.95	48.46	53.28	-
F2	52.08	50.21	48.91	51.69	41.99	65.83	57.82	52.34	54.19	46.55	52.63	-
G1	44.73	51.40	52.71	-	41.08	47.03	38.44	37.85	42.87	65.41	42.83	62.07
G2	45.72	53.22	47.64	-	42.07	49.55	39.18	39.30	48.69	60.58	44.03	55.04
H1	57.92	62.08	49.72	66.86	50.37	54.64	49.54	48.34	-	61.76	-	57.19
H2	56.50	63.10	51.71	65.56	57.75	61.89	50.22	49.92	-	61.40	-	57.87
I1	-	61.74	-	63.98	45.63	51.01	39.94	34.35	40.84	47.37	-	52.40
I2	*	*	*	*	*	*	*	*	*	*	*	*
J1	23.33	30.44	27.21	23.76	19.82	23.39	19.90	19.19	21.72	-	20.19	-
J2	22.71	31.98	24.73	22.05	18.68	22.98	21.26	19.24	21.02	27.78	21.00	-
K1					43.94	41.54	40.01	42.26	-	45.92	42.03	39.08
K2					36.66	41.89	40.52	41.05	-	44.10	43.09	40.06
L1					50.82	45.01	48.37	46.34	46.92	60.31	47.39	51.81
L2					48.12	46.87	48.77	47.92	49.39	56.40	45.38	52.98
M1					-	67.74	50.58	52.50	44.13	43.91	42.16	44.79
M2					-	62.90	51.31	47.01	47.74	48.20	41.86	42.64
N1					-	-	53.16	46.26	39.00	-	-	44.89
N2					-	-	55.37	43.51	44.57	-	-	39.91
O1					-	45.16	35.87	36.51	-	49.02	44.82	-
O2					-	42.78	35.65	35.69	-	36.58	42.65	-

All figures in  $\mu\text{g}/\text{m}^{-3}$   
 - missing tube  
 \* control - not exposed

J1 & J2: background monitoring site, New Street, Dungiven.

\*\* bias as stated in University of West England website [www.uwe.ac.uk/aqm/review/links.html](http://www.uwe.ac.uk/aqm/review/links.html) (overall factor 0.89 (2007 data) Gradko 20%TEA in water).

Table 5 Annual mean NO<sub>2</sub> concentrations, Dungiven AQMA (2007)

<b>Tube</b>	<b>Location</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>)</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) – bias adjusted (x 0.89)</b>
A1	Main Street	55.39	<b>49.30</b>
A2	Main Street	52.77	<b>46.96</b>
B1	Main Street	53.95	<b>48.02</b>
B2	Main Street	57.29	<b>50.99</b>
C1	Main Street	68.86	<b>61.23</b>
C2	Main Street	65.17	<b>58.00</b>
D1	Main Street	51.75	<b>46.06</b>
D1	Main Street	51.34	<b>45.69</b>
E1	Main Street	56.07	<b>49.90</b>
E2	Main Street	55.53	<b>49.22</b>
F1	Main Street	53.61	<b>47.71</b>
F2	Main Street	52.20	<b>46.46</b>
G1	Main Street	43.96	<b>39.12</b>
G2	Main Street	47.73	<b>42.47</b>
H1	Main Street	55.84	<b>49.69</b>
H2	Main Street	57.53	<b>51.20</b>
I1	Main Street	48.58	<b>43.23</b>
I2	Not exposed (control)	*	*
J1	New Street (background)	22.89	20.37
J2	New Street (background)	23.04	20.50
K1	Main Street		
K2	Main Street		
L1	Main Street		
L2	Main Street		
M1	Main Street		
M2	Main Street		
N1	Main Street		
N2	Main Street		
O1	Main Street		
O2	Main Street		

The monitored levels have been bias adjusted in line with current technical guidance. Annual data is not available at present for sites K-O.

Table 6 below indicates the bias adjusted monitoring figures within the AQMA. An adjustment figure of 0.89 has been applied to the monitoring data collected at sites A-J

Table 6 Annual mean NO<sub>2</sub> concentrations at monitoring sites in AQMA, Dungiven

<b>Site</b>	<b>Location</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>)</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) – bias adjusted (x 0.89)</b>
<b>A</b>	Main Street	54.08	<b>48.13</b>
<b>B</b>	Main Street	55.62	<b>49.50</b>
<b>C</b>	Main Street	67.02	<b>59.65</b>
<b>D</b>	Main Street	51.54	<b>45.87</b>
<b>E</b>	Main Street	55.80	<b>49.66</b>
<b>F</b>	Main Street	52.90	<b>47.08</b>
<b>G</b>	Main Street	45.84	<b>40.79</b>
<b>H</b>	Main Street	56.68	<b>50.44</b>
<b>I</b>	Main Street	45.82	<b>40.77</b>
<b>J</b>	New Street	22.96	20.43

Table 7: Nitrogen dioxide monitoring results 2008, AQMA Dungiven

Tube	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
A1	68.20	50.47	56.02	60.50			50.67	48.69	38.23	70.59	65.64	57.07
A2	62.39	46.91	45.47	63.90			44.87	57.72	47.83	51.20	62.45	54.73
B1	70.58	62.09	71.01	60.72			61.18	-	64.38	53.38	79.03	87.68
B2	64.50	71.79	58.32	65.50			57.36	43.79	52.14	63.29	66.05	69.53
C1	62.38	55.49	60.83	68.16			59.24	54.24	61.62	56.50	70.76	57.65
C2	69.51	51.87	60.72	76.98			59.46	58.71	47.76	56.04	66.83	64.56
D1	58.50	49.14	49.06	58.69			49.62	30.70	49.64	50.46	54.78	53.90
D2	57.79	52.49	56.56	60.39			50.25	49.46	40.26	55.70	52.26	53.59
E1	67.59	-	58.10	52.04			46.77	55.33	51.63	45.84	66.31	65.22
E2	61.33	-	54.10	57.94			45.36	51.11	47.11	71.69	65.84	67.11
F1	36.58	42.53	37.58	51.30			45.51	48.02	32.31	29.95	49.96	49.46
F2	38.88	42.89	44.69	58.05			46.73	38.51	45.25	38.58	49.05	40.58
G1	54.37	49.08	43.61	49.54			44.35	41.37	42.21	47.47	51.47	59.49
G2	50.58	44.48	49.68	50.34			41.85	36.21	45.36	57.95	56.52	62.97
H1	73.39	61.36	59.64	61.46			51.93	57.36	37.55	55.40	50.55	69.99
H2	66.69	57.86	50.88	57.53			56.65	51.40	41.39	58.34	65.54	58.98
I1	52.08	33.03	46.83	42.79			49.58	43.07	32.31	36.88	53.11	57.33
I2	*	*	*	*			*	*	*	*	*	*
J1		27.36	25.33	17.97			20.50	24.40	21.23	22.86	25.48	30.33
J2		26.48	24.89	21.48			18.31	18.60	22.18	27.71	26.33	27.67
K1	44.32	39.79	37.69	42.90			33.11	36.58	39.19	42.93	47.87	49.98
K2	48.47	38.60	46.34	45.50			35.44	39.72	35.24	45.84	47.03	47.64
L1	61.96	48.93	58.75	48.91			53.98	54.04	39.42	43.52	56.70	58.39
L2	65.75	66.84	59.85	58.48			47.61	43.66	41.81	38.60	56.93	59.73
M1	44.07	45.57	51.48	65.28			48.90	48.70	48.91	27.71	50.89	-
M2	42.75	45.67	37.20	59.65			51.50	47.44	52.08	37.65	49.41	-
N1	-	-	44.64	61.35			-	36.77	41.15	-	53.60	-
N2	-	-	47.81	60.07			-	-	54.41	-	54.41	-
O1	-	-					49.69	35.84	40.03	32.00	47.97	52.61
O2	-	-					53.89	45.47	44.99	21.17	36.27	54.39

All figures in  $\mu\text{g}/\text{m}^3$ 

- missing tube

\* control - not exposed

Table 8: Bias adjusted monitoring data 2008

<b>Tube</b>	<b>Location</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>)</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) – bias adjusted (x 0.9 )</b>
A1	Main Street	56.60	<b>50.94</b>
A2	Main Street	53.74	<b>48.36</b>
B1	Main Street	71.96	<b>64.76</b>
B2	Main Street	61.22	<b>55.10</b>
C1	Main Street	60.68	<b>54.61</b>
C2	Main Street	61.24	<b>55.11</b>
D1	Main Street	50.44	<b>45.39</b>
D2	Main Street	52.90	<b>47.61</b>
E1	Main Street	50.88	<b>45.79</b>
E2	Main Street	57.95	<b>52.15</b>
F1	Main Street	42.32	<b>38.08</b>
F2	Main Street	44.32	<b>39.88</b>
G1	Main Street	48.29	<b>43.46</b>
G2	Main Street	49.59	<b>44.63</b>
H1	Main Street	57.86	<b>52.07</b>
H2	Main Street	56.53	<b>50.87</b>
I1	Main Street	53.41	<b>48.07</b>
J1	New Street	23.94	21.54
J2	New Street	23.73	21.35
K1	Main Street	41.44	37.30
K2	Main Street	42.98	38.68
L1	Main Street	52.46	<b>47.21</b>
L2	Main Street	53.92	<b>48.53</b>
M1	Main Street	47.94	<b>43.15</b>
M2	Main Street	47.04	<b>44.34</b>
N1	Main Street	-	
N2	Main Street	-	
O1	Main Street	-	
O2	Main Street	-	

Table 9 Annual mean NO<sub>2</sub> concentrations at monitoring sites in AQMA, Dungiven

<b>Site</b>	<b>Location</b>	<b>Annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) – bias adjusted (x 0.9)</b>
<b>A</b>	Main Street	<b>49.65</b>
<b>B</b>	Main Street	<b>59.93</b>
<b>C</b>	Main Street	<b>54.86</b>
<b>D</b>	Main Street	<b>46.50</b>
<b>E</b>	Main Street	<b>48.97</b>
<b>F</b>	Main Street	<b>38.98</b>
<b>G</b>	Main Street	<b>44.04</b>
<b>H</b>	Main Street	<b>51.47</b>
<b>I</b>	Main Street	<b>48.07</b>
<b>J</b>	New Street	21.44
<b>K</b>	Main Street	37.99
<b>L</b>	Main Street	<b>47.87</b>
<b>M</b>	Main Street	23.74